CULTURAL RESOURCE

TECHNICAL SERIES 2015-4

NMDOT

Prehistoric Camps Along Lower Nash Draw

Volume I: Excavation and Analysis

Museum of New Mexico

Office of Archaeological Studies

AN 398

2016

NMCRIS activity no.: 132492

NMDOT project no.:
AC-GRIP-(WA)-(TPM0-028912;
CN G2112

NEW MEXICO DEPARTMENT OF TRANSPORTATION

NMCRIS Activity No. 132492

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CULTURAL RESOURCE TECHNICAL SERIES 2015-4

Prehistoric Camps Along Lower Nash Draw:

The NM 128 Project in Eastern Eddy County, New Mexico

Volume I: Excavation and Analysis
Volume II: Analysis, Research Design, and Appendixes

Regge N. Wiseman

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NMCRIS Activity No. 132492
NMDOT Project No. AC-GRIP-(WA)-(TPM)-028(12); CN G2112
MNM Project No. 833
ARPA (BLM-CFO) Permit No. 21-8152-06-15
State Permit Nos. NM-06-27 and NM-07-27

ARCHAEOLOGY NOTES 398
SANTA FE 2016 NEW MEXICO

NMCRIS INVESTIGATION ABSTRACT FORM (NIAF)

<table>
<tr><td>1. NMCRIS Activity No.:
132492</td><td>2a. Lead (Sponsoring) Agency:
US Department of Transportation, Federal Highway Administration</td><td>2b. Other Permitting Agency(ies):
Bureau of Land Management Permit No. 21-8152-06-15 (Data Recovery) Oct. 2006-Dec. 2007; NM General Archaeological Investigation Permits NM-06-27, NM-07-27</td><td>3. Lead Agency Report No.:
AC-GRIP-(WA)-(TPM)-028(12); CN G2112</td></tr>
<tr><td colspan="3">4. Title of Report: Prehistoric Camps Along Lower Nash Draw: The NM 128 Project in Eastern Eddy County, New Mexico

Author(s): Regge N. Wiseman</td><td>5. Type of Report
☐ Negative ☒ Positive</td></tr>
<tr><td colspan="4">6. Investigation Type
☐ Research Design ☐ Survey/Inventory ☐ Test Excavation ☒ Excavation
☐ Collections/Non-Field Study
☐ Overview/Lit Review ☐ Monitoring ☐ Ethnographic study ☐ Site specific visit
☐ Other</td></tr>
<tr><td colspan="2" rowspan="2">7. Description of Undertaking (what does the project entail?): Proposed improvements along NM 128 include expanding the shoulder and realigning the existing drive lanes along some stretches and the construction of new sections to circumvent potash mine wastewater ponds. All of the data recovery efforts were restricted to the existing and new sections of the highway right-of-way established by NMDOT.</td><td colspan="2">8. Dates of Investigation: Nov. 2006-Dec. 2007</td></tr>
<tr><td colspan="2">9. Report Date: 2016</td></tr>
<tr><td colspan="2" rowspan="2">10. Performing Agency/Consultant: Office of Archaeological Studies
Principal Investigator: H. Wolcott Toll and Robert Dello-Russo
Field Supervisor: Bonita A. Newman
Field Personnel Names: Phillip Alldritt, Elizabeth Bachicha, Naomi Brandenfels, Francisco Britton, Alfie Chavez, Isaiah Coan, Henry Etsitty Sr., Lynette Etsitty, Terry Etsitty, Michael Foster, Vernon Foster, Gregg Harmon, Forrest Holmes, Richard Montoya, Jeremy Omvig, Marlene Owens, Danny Y. Quinones, Donald Tatum, Jonell Vlosich, Stephanie Waldo, Dorothy Zamora</td><td colspan="2">11. Performing Agency/Consultant Report No.:
Archaeology Notes 398</td></tr>
<tr><td colspan="2">12. Applicable Cultural Resource Permit No.:
ARPA (BLM-CFO) 21-8152-06-15

NM General Archaeological Investigation Permits NM-06-27, NM-07-27</td></tr>
<tr><td colspan="2">13. Client/Customer (project proponent):
Contact: Rick Wessel
Address: 1120 Cerrillos Road, Room 205-206
Santa Fe, NM 87505-1842
Phone: (505) 827-0428</td><td colspan="2">14. Client/Customer Project No.:
AC-GRIP-(WA)-(TPM)-028(12); CN G2112</td></tr>
</table>

15. Land Ownership Status *(<u>Must</u> be indicated on project map)*:

Land Owner	Acres Surveyed	Acres in APE
TOTALS		

16 Records Search(es):

Date(s) of ARMS File Review	**Name of Reviewer(s)**	
Date(s) of NR/SR File Review	**Name of Reviewer(s)**	
Date(s) of Other Agency File Review	**Name of Reviewer(s)**	**Agency**

17. Survey Data:

a. Source Graphics

☐ **NAD 27** ☒ **NAD 83** **Note: NAD 83 is the NMCRIS standard**

☐ **USGS 7.5' (1:24,000) topo map** ☐ **Other topo map, Scale:**

☒ **GPS Unit** **Accuracy** ☐**<1.0m** ☐ **1-10m** ☐ **10-100m** ☐**>100m**

b. **USGS 7.5' Topographic Map Name** **USGS Quad Code**

USGS 7.5' Topographic Map Name	USGS Quad Code

c. County(ies):

17. Survey Data (continued):

d. Nearest City or Town:

e. Legal Description:

Township (N/S)	Range (E/W)	Section	¼ ¼ ¼
			, , .
			, , .
			, , .
			, , .
			, , .
			, , .
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			, , .
			, , .

Projected legal description? ☐ **Yes** ☐ **No** ☐ **Unplatted**

f. Other Description (e.g., well pad footages, mile markers, plats, land grant name, etc.):

18. Survey Field Methods:

Intensity: ☐ 100% coverage ☐ <100% coverage

Configuration: ☐ block survey units ☐ linear survey units (l x w):

☐ other survey units (specify):

Scope: ☐ non-selective (all sites recorded) ☐ selective/thematic (selected sites recorded)

Coverage Method: ☐ systematic pedestrian coverage ☐ other method (describe)

Survey Interval (m): **Crew Size:** **Fieldwork Dates:**

Survey Person Hours: **Recording Person Hours:** **Total Hours:**

Additional Narrative:

19. Environmental Setting (NRCS soil designation; vegetative community; elevation; etc.):

20. **a. Percent Ground Visibility:**
b. Condition of Survey Area (grazed, bladed, undisturbed, etc.):

21. CULTURAL RESOURCE FINDINGS ☐ **Yes, see next report section**
☐ **No, Discuss Why:**

22. Required Attachments (check all appropriate boxes): All of the information below is included in the attached report.
☐ **USGS 7.5 Topographic Map with sites, isolates, and survey area clearly drawn**
☐ **Copy of NMCRIS Mapserver Map Check**
☐ **LA Site Forms - new sites (*<u>with sketch map & topographic map)</u>*)**
☐ **LA Site Forms (update) - previously recorded & un-relocated sites (*<u>first 2 pages minimum)</u>*)**
☐ **Historic Cultural Property Inventory Forms**
☐ **List and Description of isolates, if applicable**
☐ **List and Description of Collections, if applicable**

23. Other Attachments:
☐ **Photographs and Log**
☐ **Other Attachments**
***(Describe)*:**

24. I certify the information provided above is correct and accurate and meets all applicable agency standards. **Principal Investigator/Responsible Archaeologist:** **Signature** ______________________________ **Date** 4/26/2016 **Title (if not PI):**

25. Reviewing Agency: **Reviewer's Name/Date** **Accepted ( ) Rejected ( )** **Tribal Consultation (if applicable):** ☐ **Yes** ☐ **No**	**26. SHPO** **Reviewer's Name/Date:** **HPD Log #:** **SHPO File Location:** **Date sent to ARMS:**

CULTURAL RESOURCE FINDINGS

[fill in appropriate section(s)]

1. NMCRIS Activity No.:	2. Lead (Sponsoring) Agency:	3. Lead Agency Report No.:

SURVEY RESULTS:
Sites discovered and registered:
Sites discovered and NOT registered:
Previously recorded sites revisited (*site update form required*):
Previously recorded sites not relocated *(site update form required):*
TOTAL SITES VISITED:
Total isolates recorded: **Non-selective isolate recording?** ☐
HCPI properties discovered and registered:
HCPI properties discovered and NOT registered:
Previously recorded HCPI properties revisited:
Previously recorded HCPI properties not relocated
TOTAL HCPI PROPERTIES (visited & recorded, including acequias):

MANAGEMENT SUMMARY:

IF REPORT IS NEGATIVE YOU ARE DONE AT THIS POINT.

SURVEY LA NUMBER LOG
Sites Discovered:

LA No.	Field/Agency No.	Eligible? (Y/N, applicable criteria)

Previously recorded revisited sites:

LA No.	Field/Agency No.	Eligible? (Y/N, applicable criteria)

MONITORING LA NUMBER LOG *(site form required)*

Sites Discovered (*site form required*) **:** **Previously recorded sites *(Site update form required):***

LA No.	Field/Agency No.	LA No.	Field/Agency No.

Areas outside known nearby site boundaries monitored? Yes ☐**, No** ☐ **If no explain why:**

TESTING & EXCAVATION LA NUMBER LOG (*site form required*)

Tested LA number(s)	Excavated LA number(s)
	LA 113042, LA 129214, LA 129216, LA 129217, LA 129218, LA 129220, LA 129222, LA 129300

This report represents the results of data recovery operations conducted along New Mexico Highway 128 from Milepost 0 to Milepost 10.6. The work was accomplished by the Office of Archaeological Studies, part of the New Mexico Department of Cultural Affairs, for the New Mexico Department of Transportation between November 2006 and December 2007. The NMDOT project consisted of the partial realignment and upgrading of the highway, starting at the highway's junction with NM 31 and ending just beyond the turnoff to the Waste Isolation Pilot Project (WIPP) facility.

The NM 128 project started on the terraced gravel ridges immediately west of Nash Draw Valley, crossed the broad lower valley of Nash Draw, and terminated on the western escarpment of Livingston Ridge, immediately east of Nash Draw. Archaeological sites LA 129216, LA 129214, and LA 113042 were situated on two gravel ridges at the west end of the project. LA 129300 and LA 129222 were on low erosional remnants in the bottom of the Nash Draw Valley, and LA 129220 was situated on the broken ground of the valley's eastern slope. LA 129217 and LA 129218 were situated among the dunes of Los Medanos on the west edge of Livingston Ridge. Los Medanos supports the westernmost extent of the shin-oak communities (*Quercus havardii*) in this part of New Mexico.

One hundred forty-five radiocarbon dates reference dozens of occupations that took place at various prehistoric sites in the area and indicate that all of the sites were used on multiple occasions. The majority of occupations occurred between AD 1 and the early to mid-1400s. Five ^{14}C dates attest to a few occupations at LA 129218 and LA 129300 from the period 4500 to 4200 BC. A single date of about 900 BC represents the only other occupation of the sites during pre-Christian times. Three Golondrina (late Paleoindian) projectile points were recovered from two of the sites, but all appear to represent "pickups" by later peoples. However, possible Paleoindian (buried) features at LA 129216 were dated by optically stimulated luminescence (OSL) to 8970 BC and 10,600 BC.

Analyses presented in this report suggest that all prehistoric occupations of the sites were of short duration by small groups of people. The three western most sites (LA 129216, LA 129214, and LA 113042) were reoccupied so frequently that anthrosols—man-caused accumulations of dark sediments—were formed. Evidently, men, women, and possibly children were present during many or most of the occupations for purposes of food collecting, processing, and consumption. Plant foods included wild annual and perennial species, with yucca stems probably being one of the main target species. Animal foods were mainly small mammals. Corn residues and pollen were documented on several tools. Seasons of site use probably included late spring, early summer, and mid-summer to fall. The nearest known sites that may have been used for overwintering by the NM 128 peoples are at a nearby group of lakes, including Laguna Plata, a few kilometers northeast of Nash Draw.

A geomorphology study of the NM 128 project area made substantive additions to Stephen A. Hall's (Hall 2002) field guide to the Mescalero Sands country.

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H. Wolcott Toll, Ph.D., initial principal investigator
Robert Dello-Russo, Ph.D., principal investigator
Bonnie Newman, project director, field phase
Regge N. Wiseman, project director, laboratory, and report phases
Donald E. Tatum, crew chief, sections of final report
Philip Alldritt, crew chief
Dorothy A. Zamora, historic-site consultant
John Acklen, interviews with local collectors
Nancy J. Akins, faunal analysis
Beta Analytic, Inc., radiocarbon dating
Naomi C. Brandenfels, certain descriptive sections of final report
Owen K. Davis, pollen analysis
Stephen A. Hall, geomorphology
Steven A. Lakatos, OxCal analysis of radiocarbon dates
Pamela J. McBride, botanical analysis and vegetation transects
Mollie S. Toll, botanical analysis and vegetation transects
James L. Moore, chipped stone analysis
Linda Scott Cummings, special biological analyses
Karen Wening, lithic analysis (other than chipped stone)
C. Dean Wilson, pottery analysis
Cameron Cunningham, financial specialist
Judi Powell, financial specialist
Kathleen Yount, office and equipment manager
Tom Ireland, editing
Sheila Martin, production assistance, tables
Robert Turner, graphics, report production manager
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Melissa Martinez, editing, report layout and production

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1 ⊻ Introduction to the Project

Regge N. Wiseman and Donald E. Tatum

From November 2006 to December 2007, the Office of Archaeological Studies performed data recovery operations at eight sites along NM 128 (Fig. 1.1) in Eddy County, New Mexico for the New Mexico Department of Transportation. Seven sites were prehistoric (LA numbers 113042, 129214, 129216, 129217, 129218, 129222, and 129300); another site (LA 129220) was a mostly abandoned and disassembled twentieth-century ranching facility that was part of the old James Ranch.

Archaeological work was necessary due to the widening and partial realignment of NM 128 from its junction with NM 31 to a point just beyond the turnoff to the Waste Isolation Pilot Project (WIPP) facility. The highway project distance was 17.22 km (10.7 mi). In-office phases and preparation of the final report took place between January 2008 and May 2011.

H. Wolcott Toll and Robert Dello-Russo served consecutively as principal investigators of the operation. Bonnie Newman directed fieldwork as well as post-excavation organization of records and collections. Author Regge N. Wiseman directed the laboratory and report-writing phases. Field assistants were Donald E. Tatum, Dorothy A. Zamora, and Philip Alldritt. Workers who participated in field, organization, laboratory, and report phases included Gavin Bird, Naomi C. Brandenfels, Frank Britton, Alfides Chavez, Isaiah Coan, Joshua Ehrhardt, Henry Etsitty, Lynette Etsitty, Terry Etsitty, Mike Foster, Vernon Foster, Greg Harmon, Forrest Holmes, Martin Homer, Collette Maes, Marlene Owens, Tom Messerli, Rick Montoya, Jonelle Vlosich, Sandra Wadsworth, Stephanie Waldo, and Mary Weahkee.

Specialists who contributed sections to this report include: John Acklen (interviews with local collectors were quoted verbatim [with permission] from Earls and Bertram 1987:134–142); Nancy J. Akins (fauna); Naomi C. Brandenfels (field methods); Byron T. Hamilton (Texas tool-stone identification); Pamela J. McBride and Mollie S. Toll (ethnobotany); James L. Moore (chipped stone); Donald E. Tatum (field methods/paleoclimate); Karen Wening (lithic analyses, other than chipped stone); C. Dean Wilson (pottery); and Steven A. Lakatos (OxCal analysis). Robert Turner, Tom Ireland, Scott Jacquith, and Melissa Martinez produced the report. Outside consultants included: Owen K. Davis (pollen); Stephen A. Hall and Ronald J. Goble (geomorphology); and Linda Scott Cummings, Melissa K. Logan, and Chad Yost (residue analyses). All chapters not directly attributed to an author were written by Wiseman.

As so often happens, several important studies from the region became available after this project report was well along in the editing stages. Consequently, it was not possible to incorporate the results of Boggess (2010), Brown (2010), Brown (2011), Brown and Brown (2011), and Simpson (2010) here. This is unfortunate, since the above studies would have proven an invaluable contribution to the results presented here.

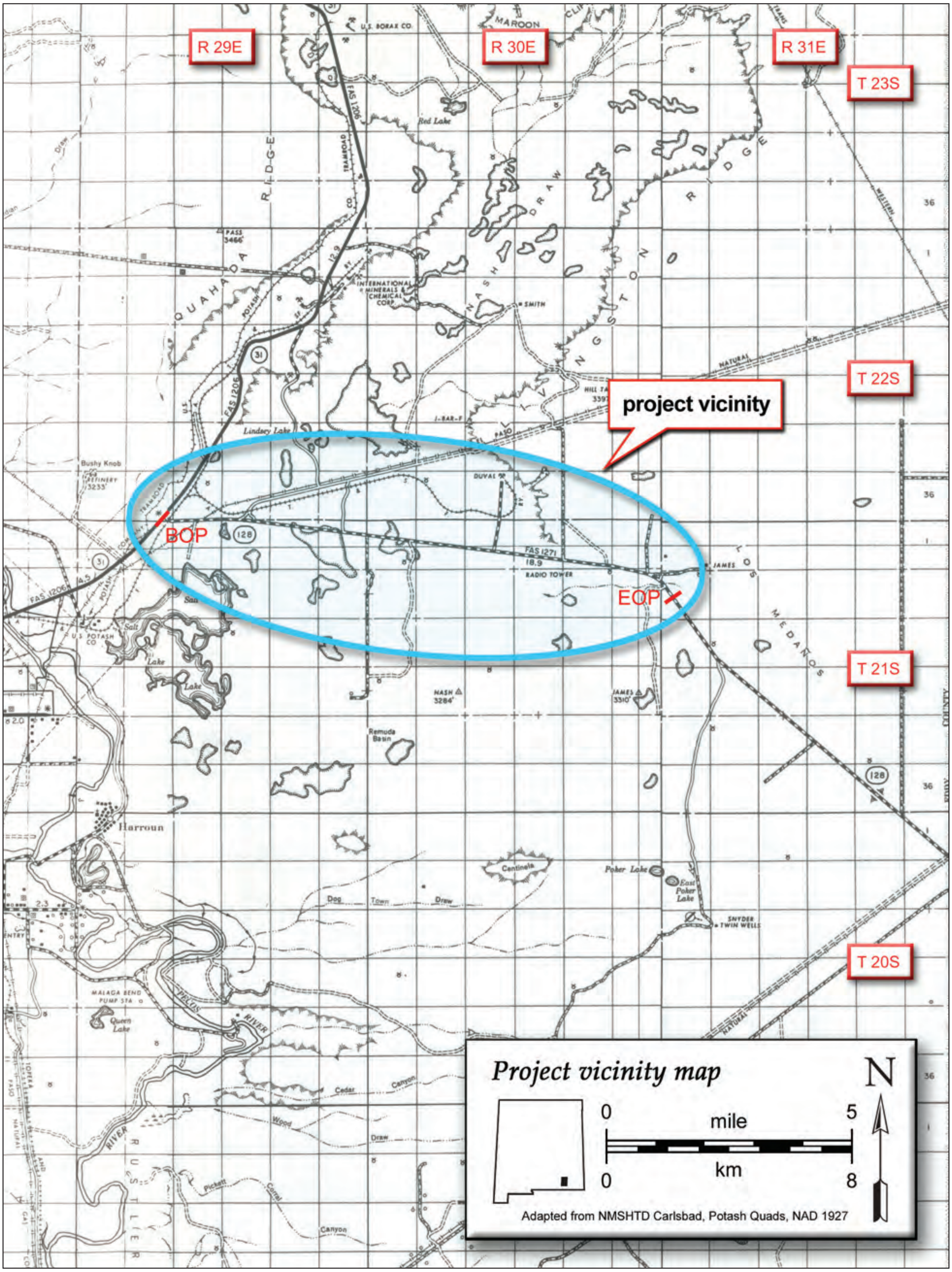

Figure 1.1. General location map of NM 128 project.

2 ⩡ Natural Environment of the Project Area

Regge N. Wiseman

Modern Climate

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

Normal annual precipitation is 33 cm (13 in), and the normal growing-season precipitation (May through September) is 20 cm (7.9 in) (Weather Bureau, US Department of Commerce, 1967). These figures were derived from data recorded for the period 1931 to 1960. Since two notable droughts occurred in the 1930s and the mid-1950s these figures may be somewhat low compared to a longer, more representative period. For instance, precipitation records from 1878 to 1930 for Roswell (120 km, or 75 mi, to the northwest, yet still within a very similar environment) provide proof of a wetter time of climatic cycling in the region. Between 1878 and 1900, annual precipitation averaged about 40 cm (16 in), and between 1886 and 1890, the average was 50 cm (20 in) (Wiseman 2001).

Winds are characteristic of plains environments, and eastern New Mexico is no exception. The predominant wind direction in the project area comes from the southeast, and the Gulf of Mexico is the primary source of summer moisture. A wind rose, developed for the Waste Isolation Pilot Project facility a few miles northeast of our project, indicated 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).

Physiography and Geology

The project area lies within the Mescalero Plain, east of the Pecos River, in east-central Eddy County, New Mexico. The Beginning of the Project (BOP) is 7 km (4.35 mi) east of the Pecos and is immediately east of the south end of Quahada Ridge (according to OAS staff member Mary Weahkee, "Quahada" is a Comanche band name that means "antelope eaters").

Quahada Ridge 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 Plain that consists of a group of low sand hills and ridges made up 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 ridge slopes of this remnant. The locations of LA 129214 and LA 113042 are depicted in Fig. 2.1.

Three kilometers (1.86 mi) east of the BOP, the project alignment drops into a playa-filled basin at an elevation of 906 m (2,973 ft). These playas, or wet-weather ponds, receive discharge from Nash Draw—a relatively short, northeast-to-southwest trending channel—that drains the Maroon Cliffs to the north, the east slope of Quahada Ridge, and the west slope of Livingston Ridge. Prior to the modern ponding of heavily mineralized waters from nearby potash mines, the Rustler Formation (Permian) was exposed at the bottom of this basin. Site LA 129300 is on a low remnant of the Rustler, which projects southward between two of the playas. At this point, the highway alignment skirts the north edge of the basin.

Approximately 9 km (5.59 mi) east of the Beginning of Project, the highway alignment begins

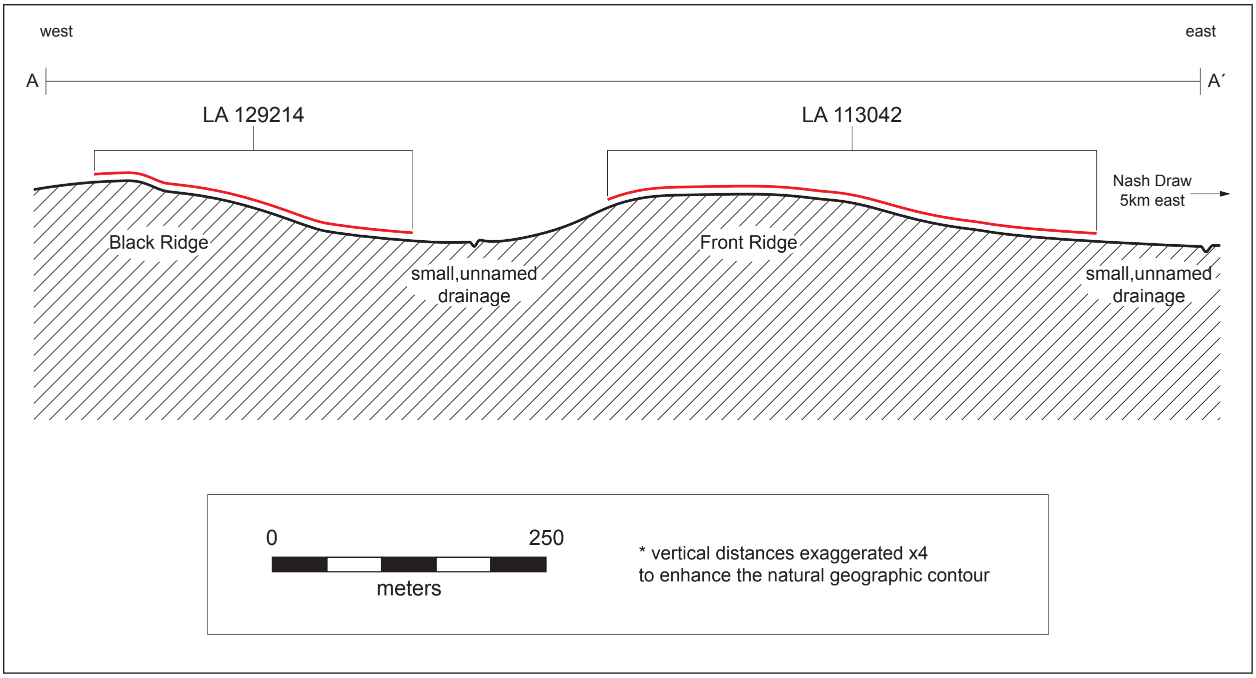

Figure 2.1. West-to-east topographic transect through LA 129214 and LA 113042.

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) are exposed on this slope. Livingston Ridge itself is capped by a continuation of the Quaternary alluvial and bolson deposits mentioned earlier. LA 129222 can be found 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 (1.49 mi) 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 WIPP facility is 1.2 km (.75 mi) east of this site.

The two easternmost archaeological sites of this project, LA 129217 and LA 129218, are within the 304 m (1,000 ft) EOP, or End of Project, zone. Both sites can be found among the parabolic dunes near the western edge of Livingston Ridge. This dune field marks the first occurrence of prehistorically important shin-oak vegetation encountered during this project and is part of a complex whose relationship to sand sheets further east and north has yet to be established (Hall, personal communication, 2002).

Soils

The soils of the project area belong to the thermic, light-colored soils of warm desertic regions (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 of soils are further characterized as droughty.

Three of the small areas of deeper soil in the No. 45 soils category 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") 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"). These soils have some potential for limited farming under primitive conditions (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, all at the west end of the project, and LA 129217 and LA 129218, at the east end of the project.

No. 41, Gypsiorthids-Torriorthents-Gypsum, are basically non-farmable due to a high gypsum and/or halite (salt) content and the substrates of these materials found at shallow depths (0.5 m or less). These soils characterize the Nash Draw Basin, of which nearby Salt Lake (just south of the west end of the project area) is a part.

The apparent absence of farmable land in the vicinity of LA 129300 is surprising, since this site may have had 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 had once belonged to the No. 45 soils but are now covered with salts piped in from nearby potash mines.

No. 40, Haplargids-Torripsamments are moderately deep to deep soils composed largely of eolian sands accumulated in dunes. Although Maker et al. (1978) characterized these soils as supporting various grass species, creosote bush, and mesquite, they did 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 prior to grazing disturbances by domestic livestock during the past 140 years.

Specifically, did shin oak exist in the vicinity of LA 129217 and LA 129218 when these sites were occupied by prehistoric 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).

Surface Water

Today, surface water in the project area is mainly available in playas or wet-weather ponds. When precipitation falls, especially during the summer monsoons emanating from the Gulf of Mexico, water becomes available in these shallow, but often extensive, features. During more severe rains, water will move to playas through short drainages like Nash Draw. The duration of standing water in the playas depends on the amount of rainfall, the air temperature, the degree of cloud cover, and the persistence of the wind. Thus, water is available for periods of time ranging from a few days to several weeks, or, following especially wet seasons, even a few months. Acklen and Railey (2001:86–89) provide a rather lengthy discussion of surface water availability, source types, water quality, and human requirements.

Springs and seeps are exceptions to the playas-only water availability scenario. Only one spring was recorded in the project area. Designated No. 20 for Eddy County (White and Kues 1992) this unnamed spring is located near the original north shore of Salt Lake and lies 1,000 to 1,200 m (3,280 to 3,937 ft) due south of LA 129214. Today, the spring lies beneath the vastly expanded Salt Lake that derives most of its salt-saturated water from potash-mine discharge. This spring would have been one of two shown on earlier versions of the Remuda Basin USGS topographic map. Tellingly, the 1943 edition of the Nash Draw 15′ USGS quadrangle shows the original extent of Salt Lake—including a freshwater lens emanating from this or other additional springs—floating on salt water at the north end of the lake (Fig. 2.2).

We have no way of knowing the potability of the water from this spring prior to groundwater pumping, for livestock and human use, and to the more recent lowering of the water table and related salt encroachment due to nearby potash mining.

Well after these two methods of water-quality depletion had gone into effect, scientists obtained specific conductance records for the spring. The 1940 record of 11,600 microsiemens and the 1975 record of 233,000 microsiemens demonstrate that water from this spring in those years was definitely not potable for humans, livestock, or farm plants.

TDS, or total dissolved solids values calculated from these specific conductance values are 8120 and 163,100 mg per liter, respectively. According to Tom Morrison, a civil engineer then employed in the NM Office of the State Engineer, humans today can tolerate TDS values of 1500 to 2000 in their drinking water, depending on what the dissolved solids are and how well people have become adapted to them.

Vegetation

Modern conditions and the appearance of the landscape today present the picture of an impoverished environment hostile to humans. But imagine, for a moment, what that landscape may have looked like

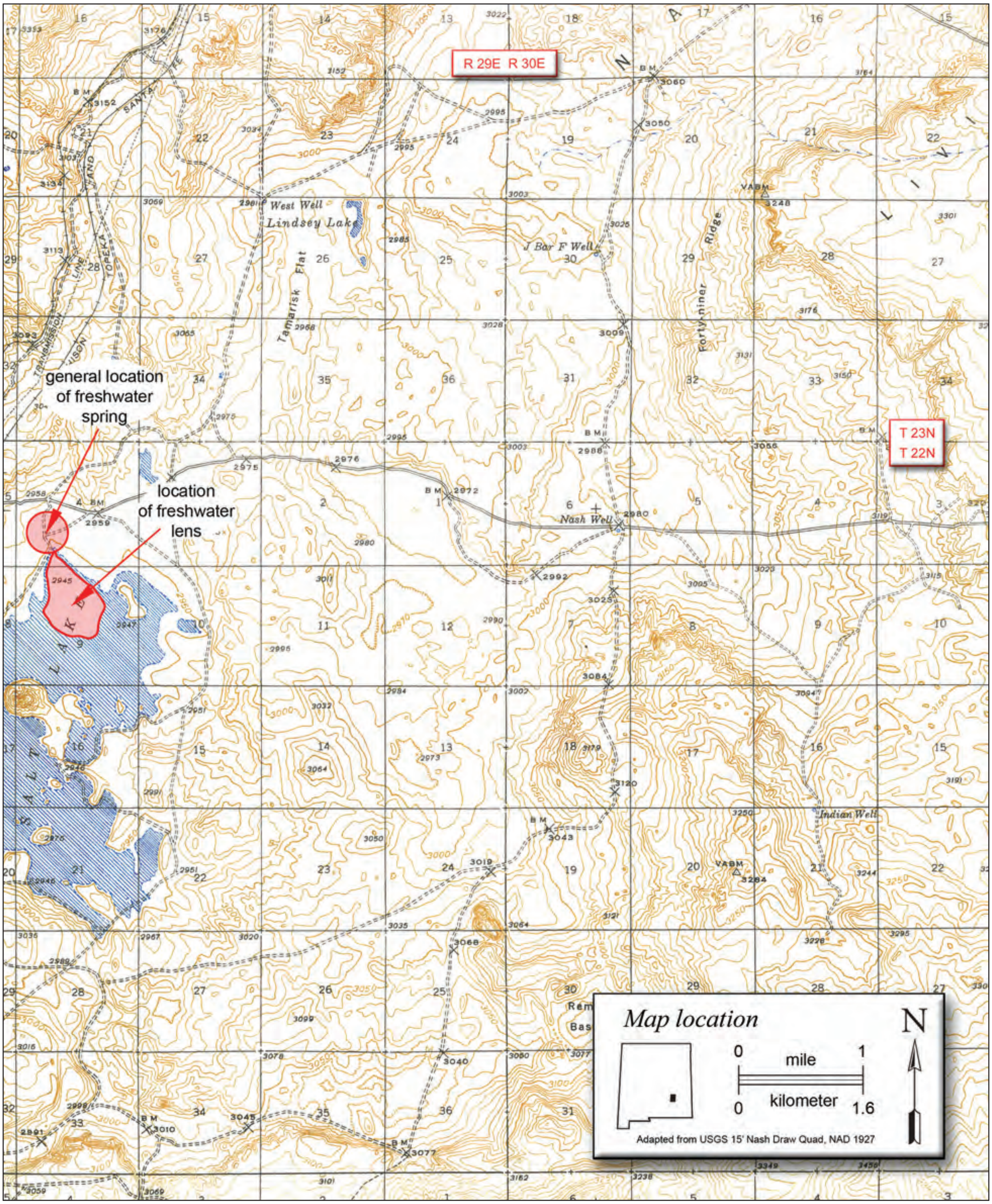

Figure 2.2. Map section showing extent of Salt Lake, with freshwater spring at north edge and freshwater lens (red arrow) floating on top of the salt water, from 1943 edition of Nash Draw, N. Mex. 15 minute USGS quadrangle map.

before the comencement of ranching and mining practices in the late-nineteenth and twentieth centuries. Ignore the more recent climate changes and consider what may have been more normal climatic cycling in years gone by as suggested earlier in Roswell precipitation records. Add a preliminary vegetation reconstruction for the Brantley Reservoir area (Burgess 1980), a few kilometers northwest of our project area, and things may well have been very different for prehistoric peoples.

Imagine a landscape with more plants—especially more grass cover—that would help rainwater and snowmelt more time to absorb into the ground and would provide a moisture reservoir to sustain those same plants, as well as the animals associated with them. Extended plant growth would mean additional stabilization and soil conservation. The soil, and the moisture within it, would be better protected the from summer heat, the blowing winds and the forces of evaporation.

Even as late as the mid-twentieth century, surface water was more readily available in the form of seeps and unrecorded springs spotted in the landscape of this project (Harvey Hicks, personal communication, 2008) during all but the driest of years. One rarely sees seeps or springs in the area today, nor are there many hints that such elements ever existed.

No wonder prehistoric peoples were able to survive, and presumably thrive, in this region. There are many reasons to believe that this was a different place back then. Three additional sources (Burgess 1980; Hinds 1977; and Langford 1973:17–18) were illustrative of pre-grazing/early grazing conditions in this part of the world, and while they did not deal specifically with this project area, these sources did discuss nearby areas and events similar in most respects to those that also took place in southeastern New Mexico.

Marron and Associates (2005), in a biological report prepared specifically for the NM 128 project, describe 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 lowlands near 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 as well as the slopes and upper limits of Livingston Ridge; Los Medanos (sand dune field) is located in the the eastern half of the project.

Animals

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

Biological Diversity of Shin-Oak Communities

Only LA 129217 and LA 129218 are located within the shin-oak or shinnery vegetation area of Los Medanos, on Livingston Ridge, at the east end of the NM 128 project. This community—or, actually, three communities as defined by biologists—is within walking distance of several project sites and would have made plant and animal resources of these very rich communities readily available to the previous occupants of the NM 128 sites. This is especially true of mammal, rodent, reptilian, and bird species.

Since the average archaeologist is unaware of these facts, a summary of the genera and species recorded in the shinnery will be presented here. These data are taken from Peterson and Boyd (1998:15–21).

Mule deer and whitetail deer are common inhabitants of the shinnery of the Southern Plains—including the project area—where acorns, buds, and leaves are a major food source. It is interesting to note that, in general, mule deer in Texas and eastern New Mexico "are on a poor to fair nutritional plane…but deer in the shinnery appear heavy bodied with broad antlers, probably due to the nutritional value of acorns." Antelope are also occasionally seen within the shinnery, "including areas far from open grassland" (Peterson and Boyd 1998:15).

Javelina also are attracted to acorns, good crops of which they find during local migration. The javelinas' favorite foods—acorns, mesquite beans, prickly pear, cholla, hog potato (rush pea), and filaree—are readily found within shin-oak communities.

Smaller-bodied species found in the shinnery include jackrabbit, cottontail, porcupine, and various mice, rats, gophers, squirrels, wood rats, cotton rats, and box turtles. Game birds include the lesser prairie chicken, turkey, mourning dove, scaled quail, and bobwhite. Twenty songbird species have also been reported. Reptiles present in the area include 25 species of snakes and 10 species of lizards.

An extensive list of predators also has been documented in the shinnery, although some of these are no longer found here. This list includes gray wolf, coyote, mountain lion, bobcat, black bear, grizzly bear, gray fox, red fox, swift fox, badger, and skunk. Predatory bird species include owl, falcon, hawk, and eagle.

Clearly, the shin-oak communities are much more productive a source for various animals fit for human consumption than modern-day visitors might suspect. Prehistoric humans, especially small groups, would have been able to make a good living in the area year round. The myriad of archaeological sites in the area certainly testify to the attractiveness of the region in this regard. As archaeologists we can no longer assume Prehistoric and Early Historic, pre-horse occupation of this region took place strictly on a seasonal basis.

I (RNW) venture to suggest that shinnery communities are, and were, as productive for human sustenance as the hill-and-mountain country to the west. As discussed in detail elsewhere in this report, making a living in shinnery country during prehistoric times also did not require the growing of cultigens such as corn.

Paleoenvironment

Donald E. Tatum

Numerous paleoclimate-related studies have been conducted in the physiographic regions surrounding the NM 128 project area; fewer studies have been conducted in the immediate vicinity of the data recovery area itself with the notable exception of recent geochronology and sedimentation-rate studies conducted in the area by Stephen A. Hall and Ronald Goble (Hall and Goble 2006; Hall 2009).

Overview of Regional Studies in Paleoclimate Processes and Events

The paleoclimatic history of the NM 128 project area can be inferred from the work of Hall and Goble and from research conducted in the surrounding regions. Region- and time-specific paleoclimate proxy data have been derived from packrat midden palynology studies conducted in the Sacramento, Guadalupe, and Hueco mountain ranges of New Mexico and Texas; in the Jornada Basin; and on Otero Mesa in New Mexico (Betancourt et al. 1990; Holmgren et al. 2003). Speciation studies of fossil ants extracted from packrat middens in the northern Chihuahua Desert have provided additional insight into the climate during the transition from early to late Holocene (MacKay and Elias 1992).

Studies of Holocene alluvial fan deposits in the Organ and Sacramento mountains (Frechette and Meyer 2009; Gile 1987; Hawley 1993) and of deflation and lag deposits at Fort Bliss (Monger et al. 1993) have also contributed correlatable data to the body of paleoclimate-related knowledge of the region. Other geochronological evidence for climate change through time includes sedimentation studies of pluvial and perennial lake basins in southern New Mexico and the southeastern Texas panhandle (Castiglia and Fawcett 2006; Hall 2001; Hawley 1993).

Studies conducted on the thickness of speleothem annular growth bands, of oxygen-stable isotopes preserved in speleothems, and of fossil mites preserved in speleothems—in Hidden Cave and Carlsbad Caverns—have provided what may be the most time-specific, detailed paleoclimatic data in the Guadalupe Mountains of New Mexico and Texas during the middle to late Holocene. This information could also be relevant to paleoclimate studies in regions proximal to the NM 128 project area (Polyak et al. 2001; Asmerom et al. 2007).

Regional Paleoclimate Proxy Overview

The more extensively documented climate events within the Permian Basin, middle Pecos Valley, northern Chihuahuan Desert, and southern High Plains paleoenvironment concern major climatological shifts of the Late Pleistocene and early to mid-Holocene—events that sometimes had geographically wide-ranging effects across much of

North America. Many climate processes that contributed to more recent paleoenvironmental conditions were rooted in the Wisconsin Glacial Episode, the most recent glacial maximum in North America that, on the Edwards Plateau of west Texas, ended approximately 14,200 calendar years ago (14.2 kya) (Ellwood and Gose 2006).

Studies of packrat midden pollen and fossil insect assemblages—coleoptera and hymenoptera—from the northern Chihuahuan Desert indicate that from about 42,000 years until about 12,875 years ago, the climate was more mesic than today. During the late Pleistocene, average summer temperatures for the region are estimated to have been about 1˚C to 4˚C lower than present-day temperatures (Brackenridge 1978; Hawley 1993; Mackay and Elias 1992; Mehringer and Haynes 1965; Phillips et al. 1986; Sebastian and Larralde 1989; Wendorf and Hester 1975). Fossil pollen studies conducted in the region indicate that piñon, juniper, and oak were the most dominant vegetation on upland slopes. Shrubs, including sage, steppe grass, and sparsely scattered non-coniferous trees grew on the lowland landscapes (Betancourt et al. 1990; Mackay and Elias 1992; Hall 2001; Holliday 1987).

The presence of cienega and spring deposits dating to the late Pleistocene indicates that there was more surface water during this time than at present (Hall 2001). Perennial and pluvial lakes occupied closed playa basins in the southern High Plains and the ancestral Rio Grande Valley of southern New Mexico (Holliday et al. 2008; Hawley et al. 1976). Geochronology studies conducted on perennial lake sediments on the southern High Plains indicate a period of high lake levels between 24 and 21 kya, while similar studies on paleolakes in New Mexico's Estancia Basin indicate lake-level high-stands between 24 and 21 kya (Allen and Anderson 2000). This time frame is consistent with playa high stands recorded across the western United States during the late Wisconsinan (Smith and Street-Perrott 1983).

Similar studies indicate that a period of lake drying might have occurred in the southern High Plains between 19,000 and 20,000 calendar years ago (Allen and Anderson 2000; Hall 2001). Proof of this brief period of a warmer, drier climate has also been found in groundwater isotope studies in northwestern New Mexico that infer that between 20,000 and 17,000 calendar years ago, a short period of higher temperatures (+3˚ C higher than the rest of the late Wisconsinan) and decreased precipitation occurred. The brief warming was followed by an interval of more mesic conditions accompanied by increasing precipitation and cooler temperatures (Phillips et al. 1986). Magnetic susceptibility measurements recorded in sediments from Hall's Cave on the Edwards Plateau also indicate a brief period with a milder climate and increasing rainfall for the same time period. This mesic interval correlates with a major Heinrich event, Event H1 that has been geochronologically dated to between 16.5 and 17.5 kya (Ellwood and Gose 2006).

The termination of the ~ 17 kya cooling period signaled the transition from the mesic Wisconsinan into a more xeric, post-glacial late Pleistocene to early Holocene. Fossil insect, plant, and pollen evidence from packrat middens indicates that the full-glacial Wisconsinan interval was followed by successively warmer and drier intervals alternating with multidecadal periods of greater effective moisture, cooler temperatures, and diminished evaporation (Van Devender and Spaulding 1978; Betancourt et al. 1990; Hawley 1993; Holmgren et al. 2003). Such short-term, cool, wet weather cycles have been linked to Pacific Decadal Oscillation and El Niño-Southern Oscillation climate cycles and the related southward shifts of winter storm tracks—processes still recurrent in modern times (Asmerom et al. 2007; Castiglia and Fawcett 2006; Collier and Webb 2002; Rasmussen et al. 2006).

During drier intervals, playa lakes on the southern High Plains began to dry out. Sedimentation rates based on ^{14}C date extrapolation at White Lake, on the west Texas Llano Estacado, indicate possible lake desiccation by 16,400 years BP (Hall 2001). About 14.5 kya, the first xeric-adapted ant species appeared on the southern High Plains (MacKay and Elias 1992). Magnetic susceptibility studies from Hall's Cave indicate termination of the full Wisconsinan Glacial at 14.2 kya (Ellwood and Gose 2006). Sedimentation rates in playa drainages began increasing shortly thereafter, indicating more sediment from drying playa basins being redeposited into the drainage channels and eolian sediments deposited in the playa basins (Hall 2001; Holliday et al. 2008). Piñon pine began disappearing from the woodlands at lower elevations and retreating to the highlands leaving oak, juniper and desert-adapted grasses as the dominant species in areas which also formerly supported piñon (Van Devender and Spaulding 1978; Van Devender 1990).

Younger Dryas

In the final millennium of the late Pleistocene, during the Clovis and Folsom cultural periods, the warming, drying climate abruptly returned to near-glacial conditions in the northern hemisphere (Haynes 2008). This dramatic climate shift, known as the Younger Dryas, lasted from about 12.9 to 11.9 kya. The cooling episode has been theorized to have occurred as a result of a glacial meltwater pulse originating from a thawing Arctic Ice Sheet that caused sea level to rise ~ 20 m. Consequently, the influx of fresh water altered the flow of salinity currents in the North Atlantic Deep Water (NADW) formation, warming the North Atlantic region and triggering the Bolling-Allerod interstadial (~ 14.6 kya) that initiated the end of the Wisconsinan Glacial stage and contributed to the melting of the Northern Hemisphere Fennoscandian and Laurentide ice sheets. As a consequence of freshwater forcing in the North Atlantic, the response by the NADW initiated the Younger Dryas cooling event in the Northern Hemisphere (Weaver et al. 2003).

The Younger Dryas was punctuated by a ~ 900 year period of climatological vacillation during the Clovis/Folsom transition. The Folsom drought saw fluctuating water levels in playas and marshes and the beginning of sand sheet deposition in upland areas (Holliday 2000). The cooling episodes were accompanied by a resurgence of higher precipitation levels and recharging aquifers.

Favorable rainfall conditions led to the reemergence of wetlands and cienegas, environments conducive to riparian plant growth. Wetland and cienega deposits are dark, organically enhanced, sometimes peaty deposits and have been recorded across North America. They can be associated with the Younger Dryas period, or may be Holocene-related. Younger Dryas-aged deposits of this type are referred to by some as black-mat deposits (Haynes 2008).

Sometimes, they are immediately underlain and overlain by eolian silt or fine sand facies indicative of warmer, drier depositional environments. This stratigraphic sequence represents the more xeric climate conditions–eolian deposits–that prevailed after the Wisconsinan Glacial terminus and the sudden onset of Younger Dryas cooling, followed by an abrupt shift back to more xeric climate conditions—eolian deposit on top. When present in Clovis period deposits, black-mat deposits may coincide with the apparent termination of Clovis culture and the sudden demise of many Rancholabrean faunal species (Firestone et al. 2007; Haynes 2008; Polyak et al. 2004; Stuiver et al. 1995; Taylor et al. 1997). On the southern High Plains and adjacent environs, extinct fauna included the saber-toothed cat (*Smilodon fatalis*), short-faced bear (*Arctodus simus*), Western horse (*Equus laurentius*), *Bison sp.*, *Camelops sp.*, Dire wolf *(Canis dirus)*, Columbian mammoth *(Mammuthus columbi)*, and others (Johnson 1986; Lucas et al. 2002; Foote, personal communication, 2003).

Scharbauer Interval

After the Younger Dryas, the climate in the southern High Plains/northern Chihuahuan Desert continued warming and drying during a thousand-year period known as the Scharbauer Interval (Sebastian and Larralde 1989). Piñon and juniper woodlands disappeared from lowland areas (Holmgren et al. 2003) and moved upslope into the highlands (Sebastian and Larralde 1989). As a result of the increased eolian movement of sediment, soil deflation occurred, creating localized accretions of coarse-grained particles known as lag deposits that have been dated to this drying period (Monger et al. 1993).

Lubbock Subpluvial

Beginning around 10.9 kya, the region experienced increasing rainfall and slightly cooler temperatures during a period that would become known as the Lubbock Subpluvial. Pollen preserved in packrat middens indicates a brief advance of piñon and juniper forests into lowland areas (Betancourt et al. 1990; Sebastian and Larralde 1989).

Altithermal Period

During the middle Holocene, the southern High Plains/Llano Estacado experienced long-term drying and warming conditions known as the Altithermal (Antevs 1948; Holliday 1988; Meltzer 1991). Evidently, this period was punctuated by more mesic climate intervals, as evidenced by the mid-Holocene (~ 7 to 7.6 kya) development of constructional beach ridges in closed playa basins of the northern Mexico Chihuahuan Desert (Castiglia and Fawcett 2006).

In contrast, researchers have recorded a near cessation of speleothem growth in caves in the Guadalupe Mountains lasting until about 7 kya (Polyak et al. 2004; Asmerom et al. 2007). Eolian reworking of playa basin sediments continued as lake replenishment rates slowed (Allen et al. 2005, 2009; Holliday et al. 2008). Drought-related accretionary lag deposits and erosional alluvial fans dating to this time period have been recorded at Fort Bliss and in the Organ Mountains (Monger et al. 1993).

During the Altithermal, more xeric-adapted plant and animal species began arriving on the southern High Plains and northern Chihuahuan Desert in the time leading up to the establishment of the modern climate regime, about 4000 years ago. Pollen records infer the final demise of the late Wisconsinan winter rainfall regime during this time period (Betancourt et al. 1990). Desert grass species continued to gain inroads into territory previously dominated by piñon, juniper, and oak species, followed by the arrival of Chihuahuan Desert scrub vegetation in the region (Buck and Monger 1999). Xeric-adapted ant species began replacing the more mesic-adapted ones (MacKay and Elias 1992), and perhaps for the first time on the southern High Plains, people began excavating water wells to replace former surface water sources. Altithermal wells have been recorded near former playas, springs, and valley floor streambeds at Blackwater Draw in New Mexico and at Mustang Springs in Texas (Meltzer 1991). Charcoal-rich alluvial fans in the Sacramento Mountains, dating between 5.8 and 4.2 kya, indicate episodic forest fires and slope failure during the Altithermal period (Frechette and Meyer 2009).

Neoglacial Period

Beginning about 4000 calendar years ago another period of slightly moister, cooler climate took hold. Modern-day researchers recorded magnetic susceptibility variations, occurring ~ 4.4 kya, in Hall's Cave sediments (Edwards Plateau) and have linked them to a North American climate event termed the Neoglacial period (Ellwood and Gose 2006). During the Neoglacial, a resurgence of alpine glacial activity occurred in the North American Cordillera. Additional evidence of cooling during this time has been inferred by the formation of constructional playa beach ridges coinciding with playa lake-level high-stands that developed during the same time period in the northern Chihuahuan Desert (Castiglia and Fawcett 2006). Goodfriend and Ellis (2000), in a study of stable carbon isotopes from the shells of gastropods recovered from Hinds Cave on the southern High Plains, recorded a period of progressively moister conditions dating to the onset of the Neoglacial. Geomorphology and geochemistry studies conducted in the northern Chihuahuan Desert identified stable geomorphic surfaces with stable pedogenic carbon isotopes dating back to the Neoglacial between 4 and 2.2 kya (Buck and Monger 1999).

From caves in the Guadalupe Mountains of New Mexico, geochemical and geochronological studies measured oxygen-stable isotope concentrations and speleothem growth over time: Asmerom and Polyak et al. recorded low oxygen-stable isotope signatures indicative of Neoglacial pluvial conditions—corresponding to increased speleothem development occurring during moist climate conditions—beginning ~ 7 kya, and especially about 3.3 kya and 2.7 kya (Asmerom et al. 2007), and another study focusing on caverns in the Guadalupe Mountains found three mesically adapted, Neoglacial mite genera preserved in speleothems from Hidden Cave. The speleothem samples showed increased growth during the time the mites lived in cave environs—from 3171 to 819 years ago (Polyak et al. 2001).

Post Neoglacial

Some climate researchers have placed the final establishment of the modern climate regime in the southern High Plains as occurring about 3000 to 4000 years before present.

During post-Neoglacial times, pollen records from packrat middens as well as stable isotope and stalagmite growth records from speleothems in Guadalupe Mountain caves indicate a continuing warming, drying trend punctuated by multidecadal mesic intervals (Polyak et al. 2001; Betancourt et al. 1990).

Geochronologic Dates and Climate Implications for Human Occupation and Adaptation at the NM 128 Project Area

A total of 206 chronometrically dated archaeological features from NM 128 and other sites in the Nash Draw vicinity indicate that humans have occupied the area intermittently from 10,977 years before present until modern times. Two late Paleoindian dates were obtained from features at LA 129216; seven Early Archaic 2 period dates were obtained at LA 129218, LA 129300, and LA 130738; and four Archaic 3 dates were obtained from LA 113042, LA 132494, and LA 109291. Human occupation between 2010 and 610 years ago is especially well represented by the preponderance of post-Neoglacial chronometric dates thus far collected from the Nash Draw archaeological record (Fig. 2.3).

Accelerator mass spectrometer (AMS) dates of features from sites in the vicinity of Nash Draw were calibrated using OxCal v. 3.10 (Lakatos this report). The resulting dates are loosely correlative with regionally documented paleoclimate periods and events. Stable oxygen isotope signatures, and the corresponding chronometric data from speleothems collected from caves in the Guadalupe Mountains, provide chronologically and climatologically specific proxy data, especially with regard to the post-Neoglacial period (Polyak et al. 2001; Polyak and Asmerom 2001). Sampled at .2 mm intervals, speleothems yielded precipitation data ranging from sub-decadal to 30 years ago. Correlations of chronometric dates from NM 128 archaeological features, with temporally specific climate data derived from speleothems, provides some degree of information about climate conditions during times of human occupation in the vicinity of Nash Draw. To achieve these correlations, climatic and chronometric records from the Guadalupe Mountains speleothem data was interpolated to intervals consistent with chronometric dates from NM 128 archaeological features.

The oldest dates obtained for cultural features sampled on the NM 128 data recovery were inferred from sedimentation rates based on optically stimulated luminescence (OSL) dates that bracketed Features 11 and 12 on LA 129216. A date of 10,977 calendar years before present (BP) obtained for Feature 12 indicates landform usage by humans during the last decades of the Younger Dryas cooling period (Hall this report; Betancourt et al. 1990; Haynes 2008; Holliday 2000; Holmgren et al. 2003).

A date of 8956 years BP obtained for Feature 11 indicates human activity during the early stages of the demise of the late Wisconsinan winter precipitation regime, the decline of mesically adapted grasslands, and the advent of Chihuahuan Desert scrub (Hall this report; Betancourt et al. 1990; Buck and Monger 1999; Holliday 2000; Meltzer 1991).

Early Archaic 2 period chronometric dates obtained from seven features at LA 130738, LA 129218, and LA 129300 were dated between 6000 and 6670 calendar years BP, indicating human activity at these sites during increasingly mesic conditions at the end of the Altithermal. Stable oxygen isotope data from cave formations in the Guadalupe Mountains suggest drier conditions at the beginning of the period, followed by increasingly mesic conditions (Meltzer 1991; Castiglia and Fawcett 2006; Asmerom et al. 2007).

Early post Neoglacial (Archaic 3) chronometric dates ranging from 2810 to 3010 calendar years BP were obtained from five thermal features at LA 113042, LA 132494, and LA 109291. Oxygen isotope and fossil mite studies from caves in the Guadalupe Mountains indicate an increasingly mesic climate interval occurred in the vicinity of the project site at this time (Polyak and Asmerom 2001; Asmerom et al. 2007).

Post-Neoglacial occupations occurred during multidecadal mesic and mesic-xeric-mesic climate fluctuations that punctuated progressively warmer and dryer conditions (Betancourt et al. 1990; Frechette and Meyer 2009; Rasmussen et al. 2006). The time period between 2010 and 1760 years ago is represented in the archaeological record from four Nash Draw vicinity sites. Thirteen features were chronometrically dated to this period; comparison of dates from these features with stable oxygen isotope data indicates that local inhabitants experienced mesic climate conditions during this period (Rasmussen et al. 2006; Polyak and Asmerom 2001).

A warming, drying climate trend—as indicated by the oxygen isotope studies of speleothems—is inferred for the period between 1560 and 1760 calendar years ago. Fourteen thermal features from five different sites were dated to this 200 year interval. Near the end of this period a return to slightly more mesic conditions in the Guadalupe Mountains came about, lasting until sometime between 1360 to 1140

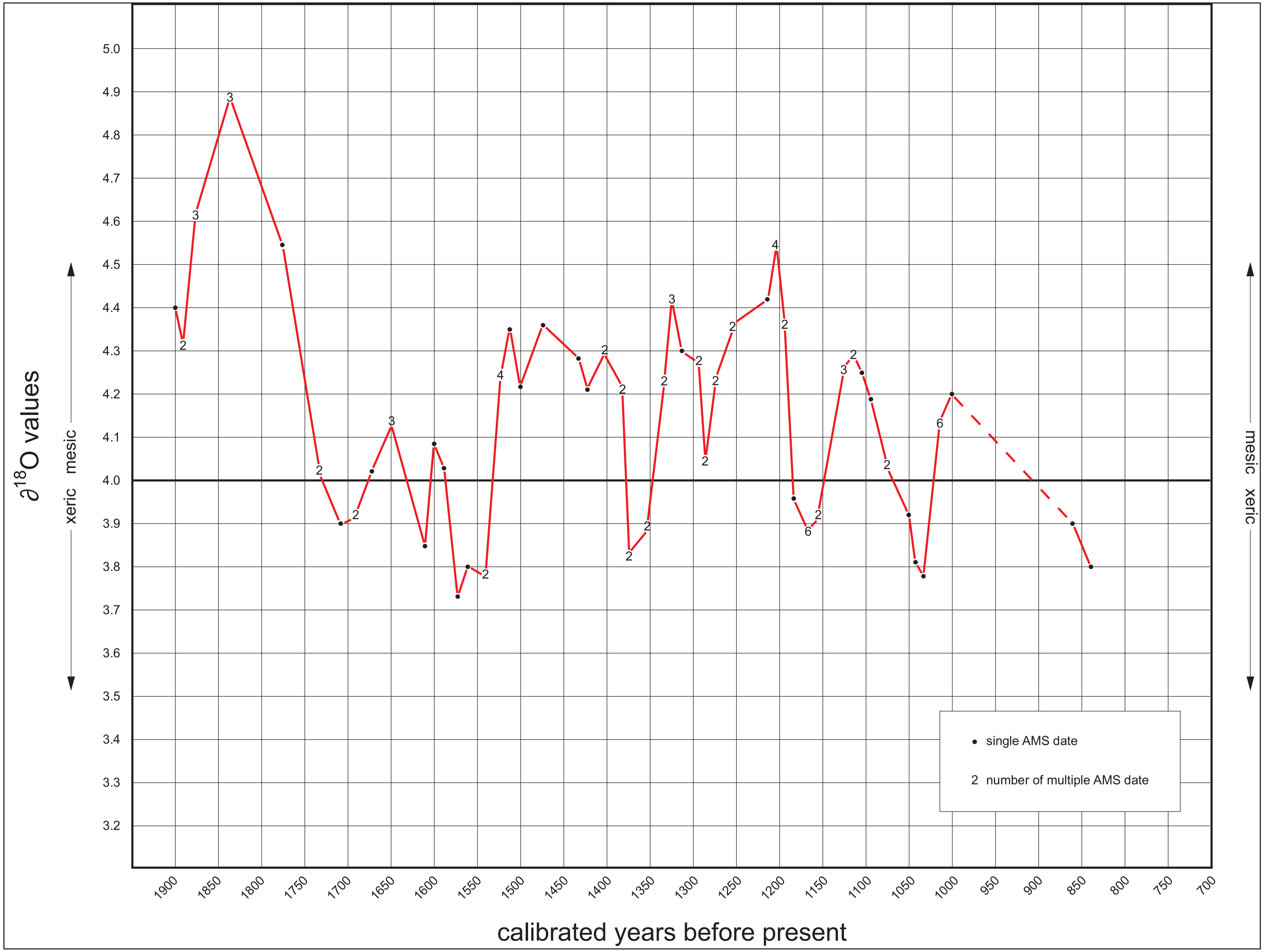

Figure 2.3. NM 128 project archaeological feature AMS dates compared to 18 oxygen isotope values derived from cave speleothems from the Guadalupe Mountains in Eddy County, New Mexico.

calendar years ago. In the archaeological record of the Nash Draw area, this slightly more mesic period is represented in 68 dates obtained from 15 different sites.

Speleothem oxygen isotope data indicate that, following the roughly 200 year period between 1360 and 1140 calendar years ago, multidecadal fluctuations between more mesic and more xeric conditions began to occur with greater frequency. This period, represented by geochronologic dates from 34 features sampled from nine Nash Draw sites, was followed by a brief return to slightly more mesic conditions between 440 and 290 calendar years ago during a period known as the Little Ice Age. Two thermal features from two sites had date ranges within this period, and an overall drying, warming trend continued shortly thereafter (Gile 1987; Rasmussen et al. 2006; Frechette and Meyer 2009).

Conclusion

Chronometrically dated features from the Nash Draw area indicate that humans occupied the area intermittently from late Paleoindian times until about 530 years before present (Hall 2007a). Human occupation from 2010 to 610 years ago is especially well represented by an abundance of features chronometrically dated to this time period (Lakatos this report).

Calibrated accelerator mass spectrometer (AMS) dates of features from NM 128 are roughly correlatable with regionally documented paleoclimate periods and events. Stable oxygen isotope signatures, and corresponding chronometric data from speleothem samples collected in the Guadalupe Mountains, provide chronologically and climatologically specific data from a region proximal to the project area (Polyak and Asmeron 2001, 2005). Cultural dates from the project area, correlated with time-sensitive data from speleothems, may provide temporal and climate data relevant to human adaptations to the landscape.

Such correlations between speleothem data and occupation periods are best represented in the archaeological record from 3010 to 610 years ago and indicate extensive human exploitation of the landscape during multidecadal mesic and xeric climate fluctuations (Betancourt et al. 1990; Frechette and Meyer 2009).

Specifically, the data indicate that occupations occurred during mesic periods between 3010 and 2810 years ago (Archaic 3) and from about 2010 until about 1760 years ago. A series of occupations occurred during a xeric period of overall warmer, drier climate between 1710 and 1540 calendar years ago. This period was modulated by slightly more mesic intervals lasting several decades (Rasmussen et al. 2006; Polyak and Asmeron 2001). A predominantly mesic interval followed, with occupations occurring between 1360 and 1140 years ago. This 220 year period was punctuated by two periods of warmer, drier weather, each of which lasted about two decades. Finally, an occupational period marked by multidecadal fluctuations between mesic and xeric climate conditions lasted from about 1140 to about 610 years ago.

3 ⊻ Regional Culture History

Regge N. Wiseman

> Our taxonomies should not limit the interpretation of the archaeological record or compel us to construe it inappropriately into preconceived frameworks. (Hofman 1997:xv)

> We must remain as flexible in our classifications of the archaeological record as prehistoric people had to be to live by foraging in the Plains-Mountain region during the Holocene. (Hofman 1997:xix)

In the Data Recovery Plan for the NM 128 Project (OAS Staff 2006) we used Paul and Susana Katz's (2001) section on the cultural history of southeastern New Mexico in the document entitled "The Archaeological Record of Southern New Mexico: Sites and Sequences of Prehistory." In that document, the Katz family proposes the sequence that will be applied to the vast area encompassed (from south to north) by Eddy, Lea, Chaves, Roosevelt, DeBaca, and Curry counties in southeastern and east-central New Mexico. Each period is represented by the appearance of specific projectile point styles, pottery types, habitation forms, and changes in subsistence. In some instances, period dates are partly supported by radiocarbon dates. Otherwise, the appearance of specific projectile point and pottery types provides much of the chronological framework; however, most of these items were made, and are dated, well outside the region.

Since imported, mostly painted, pottery types occur *sporadically* and in *small numbers* at New Mexico sites east of the Pecos River, they are potentially useful as temporal indicators. Furthermore, because they are unusual—i.e., colorful or different in some way—such sherds might have constituted mere curiosities to ancient passersby just as they do for modern people and could have led to collection and transport from other, earlier sites to final deposition at a later location. Thus, we cannot always be certain that the recovery of imported sherds—especially one-of-a-kind sherds at specific sites—provides an accurate reflection of occupation timing at particular sites.

Several other problems are inherent in this sequence. The six-county area outlined above measures approximately 322 km (200 mi) north–south by 193 km (120 mi) east–west and equals 62,136 sq km (or 23,990 sq mi). Prior to the Katz and Katz formulation, archaeologists devised three cultural sequences that pertained to specific sub-areas: Jelinek's (1967) for the Middle Pecos Valley (Fort Sumner to Roswell); the Katz's (1985a, 1985b) for the Brantley Reservoir; and Corley's (1965, as modified by Leslie 1979) for Lea and parts of Eddy and Chaves counties. Jelinek's and Katz's sequences were primarily developed from archaeological work in tracts that are especially small when compared to the 62,136 sq km (23,990 sq mi) total. The Corley and Leslie sequences are based on more extensive survey work, but excavations by the Lea County Archaeological Society (LCAS), which also underpin the work, were mainly confined to very few sites in southern Lea County.

The important point here is that these three primary works relate directly to comparatively small tracts, yet are used to form the basis for culture histories extrapolated to the entire region. It is becoming increasingly clear that the accuracy and usefulness of this practice are less and less viable. I will be discussing this subject in greater detail in a forthcoming monograph but will outline some parts of my proposed revisions here.

I would like to make several modifications to the Katz and Katz sequence, incorporating some aspects from Shelly (1994) for the Archaic period. These are presented in Table 3.1 and include a simple substitution of the word "Neo-Archaic" for the term "Formative"; the reduction of the total number of temporal subdivisions to 13; the addition of a Paleoindian category reserved for pre-Clovis materials if,

Table 3.1 Archaeological periods, dates, and diagonistic artifacts for southeastern and east-central New Mexico, east of the Pecos River.

PERIOD	DIAGNOSTIC ARTIFACTS	DATE RANGE
Neo-Archaic 4 (Ethnohistoric)	Garza and metal points	AD 1500–1750
Neo-Archaic 3 (Protohistoric)	tipi rings, Toyah	AD 1375–1500
Ochoa Phase (Plains Village)	–	AD 1350–1450/1500
Neo-Archaic 2	Chupadero Black-on-white pottery and (later) wide array of imported pottery; side-notched arrow points	AD 1100–1375
Neo-Archaic 1	first brown ware pottery; appearance of bow and arrow using corner-notched points	AD 200/500–1100
Archaic 4 (Terminal)	early: previous types plus Darl; later: Ensor, San Pedro, Pecos, and Leslie's 6c and 6d	500 BC–AD 200/500
Archaic 3 (Late)	Leslie's 8a–8d, 9, 10b, 10c, Pedernales, Marcos, Palmillas, Travis, Trinity, Carlsbad, Maljamar, Williams	2500–500 BC
Archaic 2 (Middle)	Bulverde, Pandale	4500–2500 BC
Archaic 1 (Early)	Jay	6200–4500 BC
Paleoindian 4	Plainview, Golondrina	8000–6200 BC
Paleoindian 3	Folsom, Midland	9000–8000 BC
Paleoindian 2	Clovis	11,000–9000 BC
Paleoindian 1	Pre-Clovis	?–? BC

Modified in part from Katz and Katz, 2001; Shelley, 1994; and Turner and Hester, 1993. Subject to modification.

and when, they are found in New Mexico; and adjustments to the dates assigned to some of the periods.

In addition, the word "Neo-Archaic" is substituted for the word "Formative" (as introduced in Lord and Reynolds 1985) because the word Formative implies that a farming lifestyle, including the use of pottery and the bow and arrow, was extant throughout southeastern and east-central New Mexico when, in fact, we have no direct evidence for farming. The inference/supposition about widespread farming, as mentioned earlier, is based on Jelinek's (1967) Middle Pecos Valley sequence and the Corley/Leslie (1965/1979) sequence for southeastern New Mexico east of the Pecos River. It should be noted here that Corley and Leslie were well aware that no direct evidence of farming had been found during any of the LCAS work. That is, no macroremains of burned corn cobs or kernels were found in any of their excavations. Yet, the very use of the term "Jornada Mogollon" for the archaeological sites east of the Pecos River implies the presence of farming. Thus, an inherent contradiction exists, leading to ever-present confusion about the matter.

In view of the foregoing facts, it is far more parsimonious in the present state of knowledge to assume that the Prehistoric and Early Historic occupants of much, if not all, of southeastern and east-central New Mexico—that part lying east of the Pecos River—were full-time hunter-gatherers. Late in the Prehistoric period, they acquired bow-and-arrow technology—along with everyone else in the Southwest—and occasionally traded for and used pottery and some farming products such as corn. This characterization may also apply to Ochoa phase peoples even though I think that they might be appropriately considered a Southwestern variant of the Plains Village tradition. This proposal is based on their structures and, therefore, on the implication that they may have been more a sedentary people than others in the region. It should be remembered in this connection that much of the LCAS excavation, which failed to find corn remains, was conducted at Ochoa-phase sites such as Merchant and Bell Lake.

This position ignores the remains assigned by the LCAS to the Querecho and Maljamar phases (Leslie 1979). Although these phases are defined as potential precursors to the Ochoa no excavations have confirmed the presence of true pithouses or surface houses—other than what we presume to be *jacales* or *cimientos*—at any sites east of the Pecos except for those clearly assignable to the Ochoa phase like the Merchant site (Leslie 1965a). It should be noted in this regard that the 2 m deep, rectangular pithouse excavated at the Merchant Site was presumed to predate the Ochoa. No evidence to support this assignment is given in LCAS publications. The lower fill of the unfinished excavation in another pithouse at Merchant had Rio Grande Glaze sherds in it, indicating that structure probably dated to the Ochoa and not to an earlier phase (Leslie, personal communication, 1981). Does this pertain to the fully excavated, rectangular pithouse as well?

By true pithouse, I am referring to structures similar to those of the Ochoa phase or to those pithouses in adjacent regions such as the Glencoe phase of the Sierra Blanca (Ruidoso) country of south-central New Mexico (Kelley 1984). This is the paradigm of the archaeological "Southwestern world view" that I was taught in the 1960s. Structures are generally Southwestern-like if they are: round or rectangular; are at least half a meter deep; relatively substantial in size; have floor areas exceeding 4 sq m; and contain features such as fire pits, postholes, and the like.

Southwestern pithouses clearly contrast with oval brush-shelters, or wickiups, with floors set approximately 10 to 20 cm below the aboriginal ground surface and few or no other floor features. For examples of brush shelter floors, see Structure 2 at LA 34150E (Akins 2003b), Structure 1 at LA 116503 (Bullock 1999), or the structures at Laguna Plata (Runyan 1972).

Exceptions to this definition of pithouses can be found in smaller hunter-gatherer pithouses documented at sites like Fox Place (Wiseman 2004), the Townsend site (Akins 2003b), and the King Ranch site in the Roswell area of the Pecos Valley (Wiseman 1981, 1988). These pithouses are oval; 2 to 3 m in diameter; have vertical walls 25 to 100 cm deep, as opposed to the shallow saucer-shaped depressions of wickiup floors, and have "fire spots" or small, shallow ash concentrations on or slightly imbedded in the floors, if and when they occur. Only one example of an actual fire pit has yet been found in these structures (Wiseman 1981). In short, these structures are tiny compared to the "usual" Southwestern pithouse, but they are actual pits nonetheless.

Perhaps just as importantly, in his last formulation of the phase sequence, Leslie (1979:191) was so uncertain of a direct relationship between the Maljamar and the Ochoa that he suggests a break in occupation after the end of the Maljamar. He then postulates the existence of what he calls a Post-Maljamar/Pre-Ochoa phase, but he is uncertain just how it relates to the Maljamar and Ochoa phases. In one place, he questions whether there was a continuity of people and culture through the three phases—Maljamar, Post-Maljamar/Pre-Ochoa, Ochoa—or whether new people entered the area from the west to establish the last two of these phases. In another place, he states unequivocally that the three phases were a continuum.

Then there is the question of farming, or gardening, and cultigens. There seems to be little question that prehistoric peoples in the Sierra Blanca region and some peoples in the Roswell Oasis grew cultigens, especially corn, as a regular part of their diet. However, those are the only and closest areas to the NM 128 project area where this enterprise has been unquestionably documented.

Over the past several decades, there have been rumors and anecdotal statements that cultigens—corn in this case—have been recovered from the Carlsbad region. John Roney (1995:21) summarizes three reports of corn from Guadalupe Mountain caves, two from poorly documented, early twentieth century excavations and one from more recent professional excavations in Pratt Cave (Schroeder 1983). Roney apparently accepts all three as evidence of Archaic period use of corn. However, in the Pratt Cave example, chile seeds were recovered from the same test as the corn (Schroeder 1983:67) presenting us with the possibility that the corn, like the chile, was a recent introduction by either Apaches or Hispanics. More recently yet, excavations at a site in Indian Basin west of Carlsbad and at another site along Bear Grass Draw west of Loco Hills (Puseman 1995) recovered one or two tiny corn fragments, illustrating unequivocally that this food was consumed in the region during prehistoric times. However, and this is a critical point, the presence of these fragments does not necessarily mean that corn was grown at any of the sites or even in the region.

In other cases, stories have been recounted about the presence of pueblos, pithouses, and puebloan occupations in the Carlsbad region. If pueblos, pithouses, and puebloan occupations in the Southwestern archaeological sense were present, this would logically imply the presence or certainly the possibility of the practice of the gardening or farming of corn. Where possible, I have followed up on these reports, trying to ascertain whether they are true. In some cases I have interviewed knowledgeable local informants, and in a couple of instances I have been taken to some of these purported sites. The short answer is that none of these rumors or stories could be substantiated.

More recently, a variety of microtechniques and chemical analyses applied to archaeological sediments have discovered evidence of corn and potential evidence of corn, beans, and squash. These are discussed in more detail in Chapters 26 and 27. The presence of corn pollen, starch, and residues indicate that corn was prepared, cooked, and presumably consumed at sites near the NM 128 project, but, as discussed later, several complicating factors prevent a straightforward interpretation of these residues as being the result of actual gardening or farming at the sites in question and in the region as a whole. Among other things, the remains might have been introduced on the artifacts from which they were recovered.

So where does this leave us with respect to providing a culture historical background for the NM 128 project? The sequence in Table 3.1 and the following paragraphs present my working outline on the subject.

Paleoindian Periods

The sequence starts with a pre-Clovis Paleoindian period because evidence for such a period in various regions of the Western Hemisphere is virtually overwhelming, despite the opinions of some old-guard archaeologists (Largent 2007). This is not to say that such evidence has been found in southeastern New Mexico, for it has not, as of yet. Time will tell.

My conception of the general Paleoindian period for this part of New Mexico follows more recent thinking that Paleoindians tended to have led a more typical hunter-gatherer lifestyle than that of the megafauna hunter usually portrayed. That is, instead of an essentially exclusive emphasis on big game such as mammoths and extinct forms of bison, they in all likelihood consumed many smaller animals such as rabbits and turtles and medium animals such as antelope, as well as collected and consumed a variety of wild plant foods (Bamforth 2007:227–257).

This lifestyle continued from at least as early as Clovis times and continued throughout the Paleoindian period, with changes in weapons tips—Clovis points, to Folsom and Midland points, to Plainview and other late point styles—marking succeeding time periods. As the big game disappeared, the people focused on available smaller species, including more modern forms of bison, antelope, rabbits, and the like. Plant foods also probably continued to play an important role in their diets.

Archaic Periods

One of the still unresolved questions is whether the Paleoindian peoples moved out of southeastern New Mexico, and the Southwest in general, and were replaced by peoples using different weapons tips—Jay and Bajada points, for instance—or whether the Paleoindians themselves made these changes. Whichever the case, the advent of the Archaic period saw a shift to a warmer climate as the Pleistocene period gave way to the Holocene. Not surprisingly, the people of southeastern New Mexico adapted to the changing environment, which would only support smaller bodied animals and plant species better adapted to the growing aridity of the region. Through time, projectile point styles changed, often in tandem with similar changes taking place in surrounding regions, but overall, the hunter-gatherer lifestyle appears to have changed little in its basic aspects.

Neo-Archaic Periods (into the Historic Periods)

The Paleo/Archaic lifestyle east of the Pecos River appears to have continued right into the Early Historic period. The Neo-Archaic (Lord and Reynolds 1985) includes what most archaeologists and most syntheses carve out as the Late Prehistoric, Protohistoric, and Early Historic, or Ethnohistoric, periods—segments that denote specific periods prior to and spanning the coming of Europeans to the Southwest and Southern Plains. These distinctions are not made here so as to avoid the imposition of arbitrary “pauses” in what was an essentially seamless Native American lifestyle until these groups disappeared or were removed from the region during the AD 1700s and 1800s.

Once pottery was being made in nearby regions such as the Sierra Blanca (Ruidoso) country to the west—excluding the Guadalupe Mountains—the hunter-gatherers of southeastern New

Mexico began to acquire vessels and carry them out to their sites. We currently have no evidence whatsoever that pottery was made east of the Pecos River until the late-dating Ochoa phase of southern Lea County. For these reasons, I refer to the Late Prehistoric period east of the Pecos as the Neo-Archaic period to signal the continuation of the hunter-gatherer lifestyle. As mentioned in the introductory section, there is still no direct excavation evidence for supposed Jornada-Mogollon traits—i.e., pottery-making, farming, actual Jornada-Mogollon structures—which would confirm the presence of Corley's and Leslie's Querecho and Maljamar phases.

The Ochoa Phase

I believe that the occupants of Ochoa phase villages were more sedentary in some respects than the majority of peoples inhabiting the region. They lived in fairly substantial, 2 m deep pithouses and had surface rooms made of flimsy materials. Given the nature of Plains weather, the pithouses presumably would have been used during the winter and during severe storms at other times of the year. Surface structures presumably were used during moderate to warm weather.

While the Ochoa people made and used Ochoa Indented pottery (Alvarado 2008) no evidence of farming has yet been documented for their sites (see discussions above and in the concluding sections of this report). Instead, according to Robert H. Leslie (R.N. Wiseman, personal communication, 1981), their lithic assemblage was Plains-like in content and character. That is, Ochoa sites produce the numerous small end scrapers and occasional beveled knives typical of the Late Prehistoric/Early Historic bison-hunting cultures then common throughout the Great Plains. The Ochoa phase, then, might have been a variant of the Plains Village pattern which constituted Late Prehistoric, pre-horse times throughout the Great Plains of the central United States and portions of Canada.

For the foregoing reasons, I believe future researchers should consider the possibility that Ochoa sites should be characterized as part of the Plains Village pattern of the Southern Plains, rather than as a Southwestern one. I propose this in spite of the facts that the farming component appears to be missing, and we need to discover whether the people engaged in a bi-seasonal pattern typical of Plains Villagers—i.e., warm weather tending of gardens at a village versus partial abandonment of a village to hunt bison during winter. Speth (2004) develops a case that the occupants of the Henderson site at Roswell engaged in a bi-seasonal pattern in addition to some level of farming. I believe that we are at a point where all sorts of interpretive scenarios need to be considered—and reconsidered—in some instances.

At this time, we cannot be certain where the Ochoa peoples came from, or where they went. Leslie (1979:190–193) suggests that they came from the Sierra Blanca (Ruidoso) country of south-central New Mexico. In this part of his discussion, Leslie refers to Jelinek's then hypothesis that the Middle Pecos peoples abandoned their farms along the Pecos River Valley near modern Fort Sumner to follow the bison herds, thereby becoming the Plains peoples ultimately discovered by the Spanish at a later date. While both Speth and I were initially dubious of such a scenario such, we have begun to reconsider this interpretation more seriously (Speth 2004; Wiseman 2002a).

Regarding the peoples responsible for the majority of sites which occur throughout southeastern and east-central New Mexico, it seems certain that they continued their hunter-gatherer lifestyle and became one or more of the many groups chronicled in brief by the early Spanish explorers. What became of them after the entry of Apachean speakers onto the Southern Plains during the AD 1600s, later followed by the Comanches in the 1700s, requires more study. Most were probably pushed well out of the region, probably into Texas and northern Mexico (Wade 2001) while some were probably assimilated into Apache and Comanche bands, among others (Kenmotsu 2001; Wade 2001; Wiseman 2002b).

4 ⩡ Previous Archaeological Work in the Project Area

Regge N. Wiseman and John Acklen

The study region defined here is framed on the west by, but does not include: the south-central mountains of New Mexico; on the north by Salt Creek in central Chaves County; on the east by the eastern edge of the Llano Estacado in Texas; and on the south by Interstate Highway 10 in west Texas.

For the most part, the cultural periods represented here span the Archaic through the Late Prehistoric. The latter period name, used commonly in 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 who inhabited them. Southwestern archaeologists seem to prefer the term "Formative" for the pottery period, but the term always begs the question formative to what? No classic period similar to that in the complex societies of Mexico and Peru ever appeared in the Southwestern United States. Thus, the term "Late Prehistoric" is more appropriate for the Greater Plains, including the plains of eastern New Mexico. As discussed in a previous chapter, we also use the term "Neo-Archaic" specifically for pottery-period remains in our study area, since we have no evidence of actual pottery manufacture there except for during the very last phase, the Ochoa.

Two types of information are presented in this chapter—the standard listing of professional research, including university field schools and cultural-resource management projects; the projects listed below concern testing programs, excavations, 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 even lesser value.

The second type of information is the results of interviews with local collectors. This section is included here because of the profound effect that 80 or more years of artifact collecting has had on the surface content of the sites in the region. For those archaeologists who like to characterize the sites recorded and re-recorded today—and who think that what they see is somehow reflective of the sites left by the prehistoric occupants—nothing can be more illusory. To plan for and move forward with archaeological studies based on site surface characteristics—and worse yet, to perform "triage" as to which sites appear to be worthy of treatment versus those that do no—is tantamount to a bad joke. While one can argue that sites everywhere suffer these problems to some degree, nowhere is the problem worse than in southeastern New Mexico. I submit that the majority of sites have not come close to the severity of problems that have been experienced in the oil, gas, and potash "patches" of the area.

The interview section—following information regarding professional research and CRM studies as related to this area—is reprinted in its entirety from Earls and Bertram (1987) with permission from Dr. Howard Higgins (personal communication, 2008) of TRC Associates (formerly Mariah Associates, Inc.). The information was collected and assembled by John Acklen in the 1980s. Unfortunately, as far as I can ascertain, his results are applicable to this day. Friends in the region tell me that artifact collecting is as active as ever, resulting in many site surfaces being "vacuumed" clean of items on a fairly regular basis.

Professional Research and CRM Studies

Acklen and Railey (2001). Testing and excavation at five "camp" sites along Nash Draw just north of the NM 128 project area; the 34 (mostly) thermal features excavated at LA 98820, the main site of the project, provided radiocarbon dates representing the Late Archaic, Late Prehistoric, and possibly Protohistoric to Early Historic periods. Includes work at LA 98820, a site investigated in part by Cunnar (1997).

Akins (2003a). Major excavations at the

Townsend site along Salt Creek north of Roswell; features include one Archaic thermal feature and two Late Prehistoric components with small pithouses, wickiup floors, and extramural thermal features.

Applegarth (1976). Doctoral dissertation detailing excavations at several caves and shelters in the Guadalupe Mountains; this study follows on Riches (1970).

Beckett (1976). Summary of survey and interpretations of a survey of large tracts in the Mescalero Sands east of Roswell; following Leslie (1965a), Beckett proposes that the acorns of shin oak were a major subsistence attraction to the prehistoric inhabitants of the region.

Boggess (2010). Small-scale excavations at 14 sites contained within four study units associated with potash mines in and around Nash Draw. Twenty-one radiocarbon dates; lipid analysis of burned rocks, etc.

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

Bullock (1999). The excavation of a Late Prehistoric wickiup floor and associated features at a site on the edge of a small playa east of the Pecos River and Roswell.

Carmichael and Usinn (2000). This study defined a midden "ring" bearing four distinct piles of discarded burned rocks—as opposed to a solid ring—as being indicative of a Mescalero form of the feature.

Collins (1968). Important master's thesis detailing excavation of Ochoa phase components in Andrews County, Texas (north of Midland).

Collins (1971). An early but 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.

Condon et al. (2008). Testing and Data Recovery Plan for 16 sites along Bear Grass Draw west of Loco Hills.

Corley (1965). Corley's formulation of the Eastern Extension of the Jornada Mogollon culture.

Cunnar (1997). Excavations at six "camp" sites along Nash Draw and adjacent Livingston Ridge; 17 thermal features were investigated, with dates representing the Late Archaic and Late Prehistoric periods. Includes work at both LA 113042 of the NM 128 project and LA 98820 of Acklen and Railey (2001).

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

Gallagher and Bearden (1980). Excavations by Southern Methodist University at open sites of most cultural periods in the Brantley Reservoir between Carlsbad and Artesia.

Greer (1965). Defines the difference between midden circles and mescal pits, with sub-types in both.

Greer (1968). Report on radiocarbon dates for 21 midden-ring sites, all of which suggest these features date mainly after AD 800.

Hall (2002). Geoarchaeology of the sand sheets of southeastern New Mexico, with particular attention to probabilities of occurrence of archaeological sites in the defined stratigraphic units.

Hamilton (2001). Results of analyses of materials recovered from Granado Cave in the Rustler Hills between the Delaware Mountains and the Pecos River in West Texas; includes coprolite studies and a definition of the Castile phase—AD 200 to 1450—as a "hunting and gathering culture of the Great Gypsum Plain and the Rustler Hills of Culberson County, Texas". Because the Granado Cave occupations occurred at precisely the same time as the NM 128 site occupations, the perishable material culture from the cave may accurately reflect the perishable material culture used by the occupants of the NM 128 sites. Granado Cave lies within a very similar environment, the Chihuahuan Desert, about

80 km (50 mi) south-southwest of the NM 128 project area.

Haskell (1977). An early, but thorough, treatment of Archaic to Late Prehistoric features and materials from one of the many sites situated around Laguna Plata.

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

Hogan (2006). The most recent synthesis and general research design that the Historic Preservation Division of the State of New Mexico and the State Office of the Bureau of Land Management will use to form an integral part of all CRM driven research conducted in southeastern New Mexico in the coming years.

Howard, E. B. (1930, 1932, 1935). Excavations at several caves in the Guadalupe Mountains of New Mexico and Texas.

Hurst (1976). Report drafted from intensive survey of three sections, as well as the extensive survey of three-and-a-half sections of land, at Maroon Cliffs east of Carlsbad.

Jones et al. (2010). Draft report of excavations at 43 sites of all periods along the AT&T NexGen/Core Project along US 62/180 from Hobbs to the Texas state line southwest of White City.

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

Katz, Paul (1978). Survey and assessment of sites in Guadalupe Mountains National Park.

Katz and Katz (1985a, 1985b). Excavations of prehistoric and historic resources in the Brantley Reservoir, with a presentation of the Brantley cultural sequence and phase names appearing in 1985a.

Katz and Katz, editors (2001). Final version of synthesis of prehistory and history of the southeastern, south-central, and southwestern regions of New Mexico, each region written by different authors; commissioned by the Historic Preservation Division, Department of Cultural Affairs, State of 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. The first professionally documented finding of corn—two cob cupule fragments—in the Guadalupe region.

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

Landis (1985). Testing at two Late Prehistoric sites along Bear Grass Draw east of Carlsbad; pottery, ground stone, and a lengthy interpretive section, rare for earlier CRM reports.

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

Leslie (1965a). Brief description (original and reprint) of pithouses and surface rooms at the Merchant site by the Lea County Archaeological Society, with Collins (1968). This work provides the only published original descriptions of Ochoa phase remains.

Leslie (1978). Leslie's much-cited, well-illustrated typology of projectile points from southeastern New Mexico east of the Pecos River; based almost entirely on surface collections from multicomponent surface sites.

Leslie (1979). Summary, revision, and best available description of Corley's (1965) Eastern Extension sequence.

Lord and Reynolds (1985). Excavation of three open sites in the Waste Isolation Pilot Project area in eastern Eddy County in the state of New Mexico; introduces concept of the Neo-Archaic period—in lieu of the term Late Prehistoric—to southeastern New Mexico literature.

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

Mallouf (1985). Master's thesis is a cultural synthesis of the Trans-Pecos Texas region, including the Guadalupe Mountains.

Mera (1933). "Mescal Pit—A Misnomer", as appeared in *Science* 77:168–169.

Mera (1938). Survey and excavations in caves and open sites—including ring middens—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 Carlsbad and the Pecos River; the 1985 report presents numerous radiocarbon dates associated with thermal features and pottery.

Parry and Speth (1984). Excavation of a Late Prehistoric open camp site immediately east of the Pecos River at Roswell.

Phippen et al. (2000). Excavation of 13 Archaic and Late Prehistoric sites along a pipeline from the Pecos River to Cornucopia Draw, 24.14 km (15 mi) west of the Guadalupe Mountains; important descriptions, discussions, and synthesis of various forms of thermal features pertinent to the archaeology of the Guadalupe Mountains and adjacent Pecos River included.

Rocek and Speth (1986). Analysis and interpretation of burials recovered from the Henderson site, a Late Prehistoric pueblo-style village at Roswell.

Roney (1995). Excavations at Hooper Canyon Cave in the Guadalupe Mountains and survey along upper Rocky Arroyo; good discussion of projectile point chronology with regional comparisons and the formulation and testing of hypotheses regarding subsistence-settlement systems.

Runyan (1972). Excavation of a site in the Laguna Plata Archaeological District; describes man-made "clay pads", or floors, of wickiups unique to this and perhaps one other, unreported site in the region.

Schroeder (1983). Modern studies of various cultural aspects found in a cave in the Guadalupe Mountains.

Sebastian and Larralde (1989). An outstanding cultural overview, assessment, and synthesis of the prehistory and history of the Roswell District, Bureau of Land Management; introduces concepts from Cultural Ecology and Optimal Foraging Theory to southeastern New Mexico literature.

Shelley (1994). Summary and interpretation of Archaic period geoarchaeology, projectile point sequence, and lithic technology on the Llano Estacado and in the Pecos River Valley to the west.

Simpson (2004). Excavations of thermal features at four sites along Sheep Draw south of Carlsbad; lipid residue analysis performed on several burned rocks.

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 just east of the Pecos River at Roswell.

Speth (2004). Papers on the fauna, pottery, projectile points, ground stone, etc., of the Henderson site, a Late Prehistoric pueblo-style village at Roswell.

Staley et al. (1996a, 1996b). Excavation of 11 Archaic through Protohistoric sites, including a Late Prehistoric/Early Historic bison processing locale along two transmission lines on the Mescalero Plain east of the Pecos River in Eddy and Lea counties.

Thompson (1980). Large-scale surface collections and limited tests at six sites near the Duval Potash Mine, east of Carlsbad and the Pecos River.

Wiseman (1999). Example of how surface artifacts can be totally misleading as to the dating of features, in this case annular thermal features ("midden rings").

Wiseman (2000a). Excavation of part of a large campsite immediately east of the Pecos River and northeast of Roswell where US 70 crosses the Pecos River.

Wiseman (2002a). Excavation at the Fox Place, a Late Prehistoric hunter-gatherer pithouse village at Roswell; site appears to be that of a Plains-adapted people who occupied small pithouses but who also used a large socio-religious structure like those commonly found in Glencoe phase and Lincoln phase sites at nearby Bloom Mound, Rocky Arroyo at Roswell, and in the Sierra Blanca country to the west.

Wiseman (2003c). Investigation and excavation of a camp site, a mortar site, and a site of uncertain function—primarily a cemetery?—representing the Archaic through Protohistoric periods along US 285 from Carlsbad north to Rocky Arroyo.

Wiseman (2004). Documentation of an extensive bedrock basin metate and mortar site at the north edge of Roswell.

Wiseman (2010). Excavations at three open sites along the South Seven Rivers west of the Pecos River and north of Carlsbad.

Young (1982). Excavation of an Early Historic ring midden, recovery of major samples of Archaic and Late Prehistoric projectile points, and a survey of numerous other sites in a small canyon in Pecos County, west Texas.

Zamora (2000). Excavation of a lithic quarry site and a Late Prehistoric site with structure floors—wickiups?—and a burned wickiup, all immediately east of the Pecos River at Carlsbad.

Additional Studies That Became Available Too Late to Incorporate into this Report

Boggess (2010). Testing and analysis of three sites next to Intrepid Potash's West Mine, northwest of Tower Hill in Eddy County.

Brown, K. (2010). Testing and evaluation of the Laguna Plata site as part of the Bureau of Land Management's Permian Basin Memorandum of Agreement Program.

Brown, M. (2011). Testing and evaluation of the Boot Hill site as part of the Bureau of Land Management's Permian Basin Memorandum of Agreement Program.

Brown and Brown (2011). Data recovery at six sites located along a powerline from Seven Rivers to the junction of NM 31 with US 62/180 east of Carlsbad, Eddy County.

Simpson (2010). Final report on testing at seven sites along Cedar Draw east of Loco Hills, Eddy County.

Interviews with Local Collectors

John Acklen

This section is quoted verbatim with permission from Chapter 7 of *Report of Class II Survey and Testing of Cultural Resources at the WIPP Site at Carlsbad, New Mexico*, edited by Amy Earls and Jack B. Bertram (1987). Two photographs in the section are omitted here because they did not reproduce well in the original document.

The significance of this document, and the reason for its inclusion here, is that it describes artifact collection activities by local residents of the Carlsbad region as told to Acklen by some of those individuals. It also provides description of collector activities and natural events that have changed the surface characteristics and artifact contents of sites in the region, undoubtedly including those reported in the current document.

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7.1 Introduction

> The five archaeological interviews conducted with local amateurs and professionals in conjunction with the WIPP Project are summarized in the following section. Interviews

were conducted with Mr. Harvey Hicks, Dr. Charles Crooks, and Mr. Tom Lewis; these men are or were collectors. Mr. Lee Hubbard, curator of the Carlsbad Municipal Museum, was interviewed as was Ms. Linda Brett, Carlsbad Area Archaeologist for the Bureau of Land Management (BLM). Interviews were conducted by Mr. John Acklen who was generally assisted by Ms. Linda Brett.

The interviews and collections were very informative. All individuals contacted were helpful, interested, and intimately familiar with the local archaeology. The collections observed and documented added substantially to the information collected during survey and testing phases of the project. One collection was particularly helpful. Mr. Hicks has provenienced every artifact in his collection as to site; he has recorded most of the sites on BLM forms and plotted each on maps. The data potential inherent in his extensive collection is formidable; it was in no way exhausted during the course of a four hour interview.

The summary discussion consists of four parts. The first section includes a consideration of changes in the physical environment as described by informants. In the second section, the artifacts observed in collections are discussed. In the third section, informant descriptions of site characteristics are considered. Finally, the results of the interviews are summarized.

7.2. Factors Affecting the Changing Visibility and Integrity of Archaeological Resources in the WIPP Project Vicinity

Informant data suggest that archaeological Resources in the WIPP vicinity should not be viewed statically; rather, several important factors have contributed to significant changes in resource visibility and integrity during the last century. Two primary factors conditioning changes include the effects of overgrazing on site visibility and integrity and the activities of amateur collectors.

7.2.1 Environmental Changes

Dramatic changes in the vegetation of the area and the resulting effects upon archaeological sites were mentioned several times by informants. In contrast to the patchy distribution of annuals in the vicinity today, informants suggest that vegetation was once characterized by dense matted grasses which were waist high or higher in some areas. As ranching became a dominant subsistence pursuit early in the century, overgrazing resulted and vegetation was increasingly denuded. There were fewer plants to retain groundwater, and rates of runoff increased. As a result, the water table dropped and soil became increasing subject to erosion. These factors resulted in erosion of some land surfaces, leading to increased visibility of many archaeological sites. Active dune formation as a result of soil movement may also have resulted in burial of other sites.

Whereas increased visibility and erosion of archaeological sites in this century may be a trend, it is by no means the only factor involved. Climatic factors also appear to have had a pronounced effect on resource visibility. Dr. Crooks began collection during the 1950s during a drought. His favorite area was in the Guadalupe foothills where numerous sites were exposed.

When Dr. Crooks returned to the same area in the 1970s, he was unable to locate any sites at all. He suspects that an increase in effective moisture and vegetation after a drought in the 1950s was responsible for soil formation and that the sites are now buried. A shift from grasses to shrubs may also have been involved. Fluctuations in climate or land use practice can apparently have significant effects on site-formation processes in the WIPP Project vicinity. These fluctuations have apparently alternately exposed and buried archaeological resources. The implications for interpretation of settlement patterns are significant.

7.2.2 Changing Activities of Amateur Collectors

Changes in amateur collection of artifacts over the last 100 years involve increasing collection intensity as population density has raised, a related depletion of time diagnostic artifacts from exposed surfaces, and changes in artifact types collected. The early decades of the twentieth century produced extensive collections from private ranches. The development of the mining and oil and gas industries in the 1920s and 1930s led to a higher incidence of collection, which collectors report has reduced the proportion of projectile point(s) on site surfaces. Informants indicate that site surfaces today do not reflect site contents present before intensive modern-day collection.

Informants suggested that the earliest ranchers were not generally interested in prehistoric remains or that they were so involved in making a living that they did not notice sites. One account suggested that projectile points were so common in the area in the early part of the century that they were not regarded as interesting or worthy of the attention required to have collected them. One of the most impressive collections dating from the early 1900s is the Mr. and Mrs. Dewey Holloveke collection now resident in the Carlsbad Municipal Museum. The Hollovekes collected prehistoric projectile points and tools from sites located in and around their 161 km (100 mi) Delaware River ranch over a period of time spanning at least 65 years. Another early collection mentioned was the James collection, which consisted largely of projectile points and tools collected on the James Ranch, part of the project area. This fine collection was donated to the local museum, but was later stolen.

Collection apparently became a common activity as the oil and gas and potash industries began to develop in the 1920s and 1930s. Workers in both industries commonly lived in camps. Isolated from the mainstream social activities of the day, workers adopted artifact collection as a popular past time. The development of oil and gas industries in particular had another profound effect on archaeological resources in the area; that is, the construction of mile after mile of well pad and pipeline dirt roads provided easy access to areas which were previously inaccessible. Site distance from roads and its effect on assemblage composition are discussed in the lithic summary in Section 5.4. Unfortunately, few of the collections from this time period are known today.

Informants all agreed that point and tool collecting today is not as productive as it was in the past. Of the three collectors interviewed, two no longer collect. Points have become very scarce, making collecting hardly worth their time. The collectors agreed that in the early 1960s, one could still find 12 to 13 points a day on sites considered to be picked over. Two of the amateurs have collected extensively in Mexico, where site integrity is more intact. Informants suggest there are still areas in the Chihuahuan Desert where points are more common than debitage. Mr. Hicks and Dr. Crooks agreed that it was still possible to collect 12 or more points in one hour in some areas. Mr. Hicks tells of a family that collected 12,000 points around a lake on their ranch within a year. They sold the points for a peso a piece and in this way made a payment on their ranch. Informants agreed that certain areas in southeastern New Mexico and southwest Texas were once similar. What we see on sites today particularly those accessible by roads might not reflect assemblages originally deposited.

Another fascinating observation mentioned several times was the differential nature of artifacts collected through time. Mr. Hicks and Dr. Crooks both stated that the earliest collections contained the largest projectiles. After large projectiles became rare, smaller points and sherds became the preferred collectibles. Later ground stone and other tool types were also collected. Today, some collectors pick up debitage as well.

7.3 The Collections

Several classes of artifacts were observed in museum and private collections. These include, minimally, projectile points, ceramics, formal chipped tools and ground stone. The overwhelming majority of artifacts observed were projectiles, and discussion will center upon that artifact type.

7.3.1 Projectile Point Typology

As stated in the research design (Section 3.1.3), a locally based projectile point typology does not exist for southeastern New Mexico. All chronologies currently in use are extrapolated from other areas. Most assigned dates are poorly substantiated; some are admittedly nothing more than educated guesses. Chronological arguments based on observations made on privately collected projectiles from the project area are probably not warranted. In the absence of a valid chronological typology, types observed in the private collections will be related to technological types described in the Oshara sequence (Irwin-Williams 1973) and Texas and Oklahoma types wherever possible.

Paleoindian types are generally understood to be spear points. The earliest types, the Llano tradition materials which include Clovis and some examples of the Plainview type are thought to precede Folsom/Midland materials; these are followed by Plano types. All these types are lanceolate shaped points. Craftsmanship is superior. Early Archaic points are similar morphologically in that they are lanceolate; however, workmanship is extremely crude in comparison to earlier Paleoindian materials. Early Archaic point size indicates that they may have been spear points, but basal morphology, i.e., the lack of thinning and careful grinding, suggests the use of a different hafting technique.

The transition from Early to Middle Archaic may reflect the change from a spear to atlatl dart technology. In the Middle Archaic, points are smaller in size and tend to be stemmed; stems are shorter relative to width. Hafts tend to be more complex. In the Oshara sequence, San Jose points are the hallmark of the Middle Archaic.

Late Archaic points are typically palmate; stems change to corner notches. Stems may be either long or short. In the Early Ceramic period, palmate shape and corner notching are maintained. However, the size of points is drastically reduced; this apparently reflects the transition from dart to bow and arrow technology.

In the Late Ceramic period, corner notches are superseded by side notches. In the Protohistoric period, side-notched points may have been replaced by triangular types with a single basal notch.

7.3.2.1 Paleoindian

Although relatively rare in comparison to Late Archaic and ceramic point types, a complete range of Paleoindian types was observed in the local collections. Notable was the presence of a possible Sandia point, a complete Clovis point and several Plainview points resembling unfluted Clovis…Much more common were Folsom and Midland types. Several examples of Meserve points were noted; these appeared to be re-sharpened. Many of the Paleoindian points observed were manufactured of a dark gray chalcedonic chert which was apparently a preferred material. Collectors stated that none of the points were picked up on unambiguous Paleoindian sites in the area and that later point types were picked up on the same sites.

7.3.2.2 Archaic

Archaic materials in southeastern New Mexico have been compared to those in the El Paso, southwestern and northwestern New Mexico, Trans-Pecos Texas, Edwards Plateau, and northern Mexico (Coahuila) region. The occurrence of projectile points in the WIPP area that are similar to those in so many other areas may suggest similar Archaic adaptive strategies in these areas (O'Laughlin 1980:24). While forthcoming studies of the Chihuahuan Desert Archaic define it as an entity separate from, although related to, other Southwestern culture histories (Regge Wiseman, personal communication, 1987), this report makes reference to the presently available literature from New Mexico, Texas, and Oklahoma.

Early Archaic points are very rare in the collections observed, even in comparison to Paleoindian. Local typologies may be so poorly understood that points dating to this time period went unrecognized. It could also be true that Early Archaic occupation of the area was sparse. Whatever the case, it is quite clear that, as in other areas, Early Archaic settlement and subsistence in the WIPP vicinity are poorly documented.

Middle Archaic points were also poorly represented in the collections observed. Several San Jose-like points were observed in the museum collections and in the Hicks and Crooks collections, but they were not common. Some of the very large corner-notched points observed may in fact date to the Middle Archaic time period.

Once again the reasons for their apparent rarity may reflect the lack of accurate chronologies or the lack of intensive occupation of the area. Another possibility is that the typological sequence proposed in the Oshara chronology is not applicable to the southeastern New Mexico area.

In contrast to Early and Middle Archaic materials, Late Archaic forms are common indeed…Forms thought to be Late Archaic are characteristically palmate with corner notches and convex or straight bases. Late Archaic points observed are similar to the Basketmaker II points in the Oshara Tradition or to the Marcos, Marshall, Edgewood, Ellis, and Shumla points in the Texas sequence. Carlsbad points may also be associated with the Late Archaic in the area. Points representing all types mentioned were present in the local collections.

7.3.2.3 Ceramic

Points thought to date to Early Ceramic times were also very common in collections. Although much smaller in size than the points thought to date to Late Archaic times, they are quite similar in morphology…Points which could be typed as Alba, Bonham, Deadmans, Livermore, and Scallorn were observed in the collections.

Late Ceramic period points, while well represented, were not as common as Early Ceramic points in the collections. Points observed which could be classed as Late Ceramic include Reed, Toyah, Harrell, and Garza points. One unambiguous Protohistoric point, a lanceolate stemmed projectile made of metal was observed in the Hicks collection. Mr. Hicks suggested that it was a French steel variety; it was found along with an Army button on a multicomponent site.

One other projectile point which was quite common in the collections has unknown temporal associations, but is thought to date to the AD 900s to 1000s. Maljamar points were present in every collection observed. This irregularly shaped notched point has a limited distribution outside the Carlsbad vicinity. It is distinguished by a leaf shape and is always serrated. Notches, when present, occur on the sides. The stem, base, and blade edges are extremely variable (Leslie 1978:140–142).

7.3.3 Ceramic Artifacts

Ceramic artifacts were quite rare in comparison to projectiles in the collections observed. Ceramics commonly were collected from multicomponent sites. Types observed included Rio Grande glazes, Mimbres Black-on-white, Chupadero Black-on-white, Lincoln Black-on-red, Three Rivers Red-on-terracotta, Jornada Brown, Jornada Corrugated, and Playas Red Incised. Ceramic types span the Early and Late Ceramic periods. The sites for some of these types are as distant as the Mimbres Mogollon, Gran Quivira, and Casas Grandes areas.

7.3.4 Other Chipped Stone

A number of knives, biface scrapers, and occasional gravers and burins were present in the composite collections. Quality of material and workmanship were variable. The variability of tool types observed in collections was far greater than variability observed on archaeological sites in the field. Although based on biased collection, this pattern does indicate that surface assemblages visible today do not reflect original site contents.

7.3.5 Groundstone

Groundstone was well represented in the Hicks collection; it was also observed in the museum. According to Mr. Hicks, metates were commonly found inverted over manos. This pattern suggests that metates and manos were kept as furniture at sites which were repeatedly reoccupied, probably on a seasonal basis. Other ground stone artifacts observed were a comal and pestle. The pestle came from Nash Draw.

7.3.6 Possible Hoes

Another tool present in the Hicks collection consisted of several bipointed, biconvex chipped limestone artifacts. These materials were as large as 50 cm by 30 cm; according to Mr. Hicks, all were collected in dune areas, some as isolated occurrences. Morphologically, these artifacts resemble hoes, a classification supported by Mr. Hicks and Dr. Crooks. The practice of agriculture or horticulture in southeastern New Mexico could be confirmed by association of agricultural products with these hoe-like implements. While no cultigens have been identified from southeastern New Mexico sites east of the Pecos River, this pattern could relate to excavation prior to institution of modern flotation procedures. These artifacts could be mesquite firewood root “grubbers” (Regge Wiseman, personal communication, 1987).

7.4 Site Characteristics

Another informative aspect of archaeological interviews was the way in which local collectors locate sites. Mr. Hicks examines a map and searches near water sources. The largest sites in the area are generally located on the southwest side of available water, according to collectors. Mr. Hicks attributes this pattern to placement of the camp upwind of water, keeping it relatively free of insects.

The large camps are frequently multicomponent containing the entire range of projectile points. This factor may contribute to difficulty in defining a local chronology. This problem is addressed in the research design (Chapter 3).

7.5 Conclusions

Interview data suggest that artifactual assemblages visible on stable land surfaces in the Carlsbad area have fewer artifacts than were originally present. Within this century, frequent collection has severely altered assemblage characteristics. Projectile points have suffered particularly from collection. The range of collected artifact types apparently broadens to include smaller and smaller items. Additional major effects are changes in climate and land use which have resulted in a general pattern of increasing potential instability of archaeological deposits. Overgrazing and fluctuations in climate may result in erosion, burial, and reburial of deposits.

Point frequencies suggest extensive use of the local area in Late Archaic and Ceramic periods, although more recent sites are probably also more visible than Paleoindian and Early Archaic sites. Paleoindian points are generally quite rare as are Early Archaic points in the area. Late Archaic points are quite common by comparison as are Early and Late Ceramic period points. Early Ceramic period types appear to be more common than later types.

Other artifact types including ceramics, bifaces, and burins, were not nearly so well represented in collections observed as were the projectile. Of particular interest were hoe-like objects of limestone which could reflect horticultural activities.

Finally, collectors reported that large sites frequently occur on the southwest margin of water sources. These large sites are almost invariably multicomponent, indicating the importance of water sources in settlement location. The multicomponency is, unfortunately, reflected in a poorly developed local chronology.

5 ⸙ Research Design

Regge N. Wiseman

This chapter, with minor modifications, is taken from the original document, NM 128 Research Design and Data Recovery Plan, for the NM 128 project, (OAS Staff 2006).

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 or the Pecos River to the east.

In the mid-1960s, John Corley (1965) 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 16 to 26 km (10 to 15 mi). 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 32 km (20 mi) wide to the south in the vicinity of Carlsbad and as much as 97 km (60 mi) 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 that upon finding pottery associated with pithouses and surface houses, Southwestern archaeologists tend to assume that the inhabitants of such sites also engaged in farming. Based on this perspective, the attribution of sites across southeastern New Mexico to a Southwestern affiliation seemed reasonable and appropriate.

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), former 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 similar to those of the desert. Although he does not actually describe 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) 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 took the place of farm products, especially corn. Habitation, or 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 in 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 the nearby Pecos River (Brantley) areas 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, these claims have not been substantiated through location visits and extended discussions with 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 similar to those of the Guadalupe Mountains-Brantley region. However, in the first millennium AD, at least some of the peoples in both regions began living first in pithouses and later in surface structures or pueblo-like units (Lehmer 1948; Miller and Kenmotsu 2004; Corley 1965; 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 or three contiguous rooms. Main Jornada and Eastern Extension peoples—the Ochoa in particular—also made their own pottery. 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 a mainstay food source.

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 NM 128 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 western most shin-oak tracts in this part of the state. Thus, project sites span the presumed boundary, or boundary zone, between the Guadalupe Mountains-Brantley archaeological manifestation to the west and the Eastern Extension manifestation to the east, providing the opportunity to assess the relationship between the two manifestations and to document archaeological sites within an area basically omitted from consideration during the formulation of the Guadalupe Mountains-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 the 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 pre-empted 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 on the west side 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 patch-like 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 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, 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 target resources, and take 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—often 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 and might be used only once. The special activity sites 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.

Serial Foragers: Sebastian and Larralde (1989) and Collins (1991:8) emphasize an alternative view of these strategies: that foragers and collectors, 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 camp sites 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 the plant species 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 available throughout the year, precluding the need for storage but usually requiring greater mobility because the species' 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 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 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, and 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; 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. 1996a, 1996b), 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 non-rock 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 what 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 non-riverine 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) 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) have precluded the need for, or usefulness of, the adoption of farming, as has been suggested?

Data Recovery Questions

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 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 were contemporaneous and which were not and to identify the specific time periods represented. Were the activities and site functions during each component the same or different?

At this stage in the investigations (at the time, completion of documentation at the survey level) 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.

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, materials, and activities that occurred at a site but did not leave other traces such as broken tools.

With these details worked out, we can compare the different components among the project sites—we can also, then, compare these components with those from other sites in the Guadalupe Mountains-Brantley and Eastern Extension regions.

Subsistence

What plants and animals were being collected, hunted, processed, and/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 a selected few? Were cultigens being grown or consumed? During 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 the 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 (or 4.35 mi) 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, 1990b; 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 Maliza 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.

Exchange and Mobility

What exotic materials or items are present at the sites? Do they indicate exchange or mobility by the sites' 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. 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 re-sharpening during the occupation, then tiny flakes from that re-sharpening 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.

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, personal communication, 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.

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 pre-disturbance shin-oak distribution within a 16 km (or 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.

These 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 Maliza 2004a, 2004b) and nutritive composition. Determining levels of tannic acid is especially important, since it has implications for the study of food and food preparation techniques.

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 these details. It seems from this perspective that cultural locations within the overall sits may be spottily distributed throughout the area, and therefore some of them will be difficult to locate.

Hall (2002) recently completed a geoarchaeological study of the Mescalero sand sheet 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 both LA 129217 and LA 129218, must be examined by a geomorphologist to guide the decision-making process in the exploration for evidence of cultural activity loci within the deep sands of the NM 128 region.

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 (TRC Associates 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, 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, personal communication, 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 2003c).

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 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.

6 ⩡ Field Methods

Naomi C. Brandenfels and Donald E. Tatum

The NM 128 data recovery excavations commenced in mid-October 2006 and continued through late January 2008. The excavation was overseen by Project Director Bonnie Newman and two BLM permitted field directors, Philip Aldritt and Donald E. Tatum. The project director was responsible for planning and supervising daily field operations of the excavation crews and for ensuring that data recovery was conducted in accordance with the NM 128 Research Design and Data Recovery Plan. The project director and principal investigator also coordinated information sharing and planning between the various state and federal agencies involved, including: the New Mexico Department of Transportation; the New Mexico State Historic Preservation Division; the federal Bureau of Land Management; and the Office of Archaeological Studies. Field directors were responsible for directing and assisting excavation crews as well as maintaining daily field records of crew activities and excavation results. Field directors were also responsible for coordinating field logistics, excavation strategies, and backhoe-trenching strategies with the project director.

Excavation crews were responsible for staking and flagging NM 128 realignment rights-of-way and buffer zones; for placing excavation block grids and datums; and for identifying, flagging, and collecting surface artifacts. Crews conducted and documented grid excavations, archaeological feature excavations, and also recovered artifacts and archaeological samples. Excavation crew members also assisted field directors in supervising archaeological laborers. OAS excavation crew members were Naomi Brandenfels, Alfi Chavez, Isaiah Coan, Henry Etsitty Sr., Lynette Etsitty, Vernon Foster, Forrest Holmes, Collette Maes, Tom Meserly, Rick Montoya, Jeremy Omvig, Marlene Owens, Greg Rudy, Sandy Wadsworth, and Stephanie Waldo.

Locally hired laborers were employed as assistant excavators under the supervision of experienced OAS staff. Excavation assistants were responsible for helping crews dig, screen, and carry field equipment. Excavation assistants also helped the total station operator in setting up the station and in the positioning of the prism pole in target areas. Excavation assistants were Frankie Britain, Josh Earhart, Terry Etsitty, Mike Foster, Marty Homer, and Jonelle Vlosich.

Pre-Excavation Site Preparation

When preparing for archaeological site excavation, the first priority of the data recovery crew was to locate and mark the Area of Potential Effect (APE), the highway right-of-way within site boundaries, and archaeological buffer zones.

Establishing and Marking APE, Rights-of-Way, and Buffer Zones

On each site, the APE was 81 m (265 ft) wide. The APE consisted of the highway right-of-way, which was 60.9 m (200 ft) wide, bordered on each side by a 10 m (33 ft) wide buffer zone. The first crew located the highway right-of-way center line—initially staked by NMDOT-contracted survey personnel—and added additional wooden stakes and flagging as needed for prominent visibility. The crew also measured and flagged the edges of the highway right-of-way and its buffer zones, based on perpendicular distance to the center line. Different colors of flagging tied to wooden stakes differentiated boundary types.

Establishing Geo-Spatial Referencing Controls

A second crew was responsible for locating the site datum, surface archaeological features, and artifacts. The crew inventoried in transects along the APE across the site at 3 m (10 ft) intervals, pin-flagging artifacts and archaeological features exposed on the surface. Previously recorded features were relocated using Global Positioning System or tape-and-compass measurements referring to site survey maps. These features retained numbers assigned to them when first recorded. Newly identified features were assigned sequential numbers based on the last previously recorded feature number. The crew relocated the site datum using a GPS and flagged it for future reference. Subsequently, a total station was set up on the site datum and control points were placed in locations that provided good visibility across large areas of the site. Control point positions were recorded with reference to the site datum. Control Point 1 (CP 1) was arbitrarily assigned the Cartesian grid coordinates 500 North/500 East and an elevation of 100 m (328 ft).

Excavation Strategies

The Data Recovery Plan outlined several excavation strategies to be used to investigate the sites: block excavation, by hand; and mechanical excavation, including backhoe trenching, surface blading, and dune removal. Hand excavation block grids and sub-datums were placed after the APE was staked, the surface artifacts and features flagged, and the mapping control points established. Mechanical excavation procedures were also initiated at this point.

Archaeological Zones 1, 2, and 3

Mechanical and hand excavation locations were defined by the presence or absence of archaeological materials on the surface. The Research Design and Data Recovery Plan established three horizontally defined archaeological zones for each site along the highway corridor. On each site, the placement and extent of excavation blocks, backhoe trenches, and surface-stripped areas were partially determined by the horizontal area occupied by each zone designation.

Zone assignations were determined by the quantity of archaeological material on the surface, such as charcoal-stained sediment, fire-cracked rock concentrations, or artifacts. Zone 3 was assigned to areas having little or no archaeological deposits on the surface. Zone 3 included areas with substantial sand dune development; areas heavily disturbed by road construction, pipeline construction, or oil exploration related activities; and areas with topography unlikely to support intact archaeological deposits. Zone 2 was assigned to areas with dispersed or obviously disturbed archaeological deposits. The Zone 1 designation was given to areas with distinct concentrations of archaeological materials on the surface and intact features.

Establishing Excavation Blocks

The first excavation grids were staked in Zone 1 areas encompassing previously and newly identified archaeological features and dense artifact concentrations. Subsequently, excavation blocks were placed in Zone 2 areas to investigate portions of the site with sparsely distributed, surface artifact concentrations as well as obviously disturbed cultural deposits, as identified in the Data Recovery Plan. Finally, after mechanical excavation had commenced, crews began placing excavation blocks in Zone 3 areas with archaeological materials exposed by these activities.

Excavation block grid coordinates were determined, via total station reference, by a number of control points. At least two corners of each excavation block were determined by total station; the remaining corners were located using tape measures. Grid coordinates of the southwest corners of the blocks were the reference corners. Provenience coordinates—excavation units, point proveniences, etc.—from each block were based on the increase in distance north and east from the southwest reference corner. Sub-datum stakes were placed around the periphery of the blocks as needed. Grid coordinates and elevations of sub-datums were recorded by total station; elevations were expressed in terms of the distance in meters above or below the elevation of the control point referenced by the total station. Excavation crew members wrote sub-datum elevations on flagging tape tied to the datum stakes and recorded these elevations in the block notebook.

Surface Collecting

After Zone 1 blocks and sub-datums were established, crews began excavating, leaving the total station available for point-provenience of the surface collection. A three-person crew collected and bagged the previously flagged surface artifacts.

A 100 percent collection of lithic, ground stone, and ceramic artifacts was made. Artifacts were individually point-provenienced with the total station in low-density areas and provenienced in 2 by 2 m collection units in areas with higher artifact density. The artifacts were simultaneously tagged and entered into the Field Specimen Log.

Hand Excavation Strategies

Although the prescribed methods could be adjusted to facilitate faster and more efficient excavation according to field conditions, the general protocol for the hand excavation aspect of the mitigation strategy was as follows: excavation blocks were subdivided into 2 by 2 m excavation units; the southwest corner grid coordinates of each 2 by 2 m unit became the unit designations; the grid coordinates were labeled on the southwest corner stake of each unit; the 2 by 2 m units were subdivided into 1 by 1 m quadrants designated SW, NW, NE, or SE; units were excavated by individual quadrants; and artifacts and samples were collected by quadrant.

The first excavated level of each unit brought the unit down to the elevation of its lowest initial corner. Successive levels were excavated in arbitrary 10 cm levels within strata. Level designations began with Level 1, preceded by the Arabic stratum number. All subsequent 10 cm levels within the same stratum were assigned successive level numbers until a stratigraphic break was encountered. At stratum changes, the level was discontinued. The next level was assigned a different stratum number, and the level number sequence started over again with Level 1. When it became necessary to remove noncultural overburden in order to expose the cultural layer, levels were excavated by entire stratum, rather than in 10 cm levels. Adjoining units were excavated in phases, resulting in a flat, uninterrupted surface for coherent analysis of the strata and cultural matrices. Units were terminated upon completion of two 10 cm levels of culturally sterile fill or upon exposure of the carbonate horizon.

Hand auger sampling was sometimes used in lieu of excavating two completely sterile levels in every unit when the occasional random artifact was recovered from otherwise noncultural deposits; the artifacts may have been displaced by bioturbation. The method served as a time-saving measure when prolonged hand excavation resulting in almost no artifact recovery threatened to continue over the expanse of a large block. Hand auger sampling was also used to test the bottom of each block to ascertain whether cultural deposits continued below two sterile levels.

Stratum elevations, level elevations, feature elevations, and point provenience elevations were recorded in centimeters below datum. These elevations were determined by using one of two methods. In most cases, elevation measurements were made by pulling a string-and-line level attached to the datum stake and measuring the distance from the string to the surface to be recorded. Alternately, a laser level, set up over a control point and left in place throughout the day, provided a quick and effective means of elevation measurement. Each morning, the crew measured the height of the revolving laser eye above the control point on the ground (height of instrument), then measured the distance between the laser mark on the tape measure and the surface to be recorded. The difference between the two measurements was then added to, or subtracted from, the control point elevation in order to obtain the relative elevation of the surface in question.

More than 90 percent of hand-excavated sediments were screened. Unless microdebitage recovery was high, one quadrant from each 2 by 2 m unit was screened through ⅛-inch mesh hardware cloth and the three remaining quads were screened through at ¼ inch. In areas with a high yield of microdebitage, 100 percent ⅛-inch screen sifting was conducted. Deposits within a 2 m (6.5 ft) radius of features were screened at ⅛ inch.

Occasionally, artifacts such as complete ground stone tools or lithic tools were discovered *in situ*. These types of discoveries were point-provenienced. Excavators kept track of each level on standard OAS grid excavation forms, recording observations about soil or sediment matrix characteristics, stratigraphic boundaries, emergent cultural features, elevations, and type and quantity of artifacts recovered. When fire-cracked rock and burned caliche were present, excavators recorded the count, weight, and size range in the narrative portion of the grid excavation forms. Percent of total matrix, by volume of colluvial materials present in each level, was estimated and also recorded in the narrative description.

Field directors and excavators used standard OAS stratum recording forms for tracking observations about sediments, soils, stratigraphy, and feature matrices. Notes about Munsell colors, boundary characteristics, matrix attributes, structure, texture, and inclusions were recorded. The forms were also used for recording stratigraphy exposed in backhoe trenches.

Upon completion of an excavation block, field directors or excavators recorded block summary data on standard OAS block summary forms. The information included observations about the location of the block on the site, the reasons for block placement, the quantity and type of cultural features discovered, class and quantity of artifacts recovered, stratigraphy, overall depth of excavation, and conclusions as to whether or not excavation of the block addressed research questions as intended.

Feature Recovery Protocol

Archaeological features were treated as independent study units and were numbered consecutively from the last previously assigned feature number. Samples collected from features—such as flotation, charcoal, or pollen samples—were assigned a single FS number unique to that feature. Field specimen numbers assigned to features were recorded in the FS Log and in the Feature Log. Also recorded in the Feature Log were the block numbers in which the feature was discovered, the grid coordinates of the excavation unit or units encompassing the feature, and the feature function or type. Each feature was photographed and mapped to scale in plan view.

As potential features were encountered during block excavation, the 1 by 1 m grid units adjacent to and encompassing the potential features were brought down in sequence to a level that exposed the feature's entire upper surface. The top of the feature was photographed and mapped to scale in plan view. The feature was then bisected across its inferred long axis and one half of it was excavated. Depending on the volume, either the entire half of the feature or 2 liters of feature fill was collected as a flotation sample. Next, the exposed profile was mapped to scale and photographed. The remaining half of the feature matrix not sampled was screened through ⅛-inch mesh screen. A post-excavation view of the feature was drawn and photographed, as was a post-excavation transverse profile—a cross-sectional view perpendicular to the bisection profile.

Samples collected from all types of features included flotation, pollen, ^{14}C, and macrobotanical. Pollen samples were preferentially collected from ground stone or other rock around the feature periphery. Pollen sample locations were also point-provenienced.

Charcoal samples for radiocarbon dating were collected, when possible, from areas of the feature with the most intact context.

Vertical and horizontal provenience, morphology, matrix characteristics, observations regarding the integrity of feature context, and information pertaining to sampling units from features were recorded on standard OAS feature records. Narrative descriptions providing details about feature matrices were recorded on stratum description forms. Excavators also noted observations pertaining to archaeological features and artifacts recovered in the immediate vicinity, with respect to possible cultural or temporal associations.

Other samples collected during the course of excavation included minerals, pigment, phytolith, and fire-cracked rock lipid samples. Shinnery-oak acorn samples were collected for the purpose of conducting nutritional analyses of the acorn nuts. Molly S. Toll and Pamela McBride collected non-archaeological botanical samples for potential comparative analysis with botanical remains anticipated from archaeological features.

All artifacts and archaeological samples collected were assigned a Field Specimen (FS) Number. The associated provenience information was recorded in the Field Specimen Log. Field specimen numbers began with number 1 and continued sequentially. Each site had its own FS Log.

A block map was kept current, illustrated and labeled with Cartesian grid coordinates, surface elevations, sub-datum locations and elevations as well as feature locations and elevations for each block.

Mechanical Blading and Trenching Procedures

Areas to be bladed, backhoe trenched, or subjected to dune removal were selected to help determine—through stratigraphic exposure—the extent of intact cultural deposits not visible on the surface. The techniques were used to help identify areas on the sites requiring more or less intensive, hand excavation strategies. Mechanical excavation activities proved very useful in helping crews refocus efforts into areas where intensive excavation was needed, rather than spending extra effort in proving that certain areas had a low probability of retaining intact archaeological deposits. At each site, the location and extent of mechanically excavated areas was partially determined by the percentage of surface area occupied by each of the three archaeological zones as predetermined by the DRP.

The backhoe was equipped with a 30-inch bucket. Trenches were excavated down to culturally sterile strata, such as the carbonate horizon, or gypsum. An archaeological monitor was present at all times during excavation. Archaeological features or strata exposed during mechanical excavation were flagged by the monitor. Overburden was mechanically removed to an elevation immediately above the cultural deposits. These areas were selected for block excavation to such extent as was necessary to sample the features and define the surrounding context. Archaeological and stratigraphic attributes revealed in the backhoe trenches were recorded using photo documentation, stratigraphic profile mapping, and written descriptions. Representative 2 to 3 m long trench sidewall profiles were drawn and photographed by a field director or by excavation crew members. Backhoe trenches on each site were numbered sequentially from one. When the excavation of blocks and trenches was sufficiently underway to afford a thorough view of stratigraphy, the sites were visited by geomorphologist Dr. Steve Hall, who examined trench profiles, discussed observations with the project director and a field director, and collected Optically Stimulated Luminescence (OSL) samples for dating the deposits.

Dune Removal Procedures

There were three primary research objectives of mechanical dune removal. Areas subject to dune removal were selected to determine the extent of archaeological deposits covered by dunes, to observe how the dune removal process affected the contextual integrity of archaeological features and other deposits, and to observe the impact of dune-forming processes on archaeological deposits. Early in the project, on LA 129216, a road grader was effectively used to remove smaller sand dunes, but a large front-end loader proved to be the most effective machine for dune removal and was used on all sites with extensive dune development. As with the trenches, an archaeologist monitored all dune removal activities and flagged cultural deposits when uncovered. The loader operator then moved over from the flagged areas, continuing to expose a broader horizontal area. After dune removal, exposed archaeological features were shovel-skimmed until feature outlines were well defined. Excavation grids were then set in areas encompassing the features, in preparation for hand excavation.

Mapping and Photography

Three techniques were used to map sites: hand-held GPS; electronic total station; and tape and compass. GPS-generated and hand-drawn maps were used for reference and planning during the data recovery process. GPS-generated maps were also provided to OAS managerial personnel as visual aids for progress updates. Raw total station data was recorded as future reference for the production of computer-assisted design maps. All three types of mapping data sets were used in the field to cross-check mapping accuracy and completeness. The maps recorded highway rights-of-way, archaeological buffer zones, site boundaries, location of excavation blocks, datums, features, mechanically excavated areas, landforms, roadways, fences, utility lines, and other landmarks.

Photography played an integral role in comprehensively documenting all phases of the data recovery process, with 35 mm cameras shooting black-and-white and color-slide film, as well as digital cameras, recording pre- and post-excavation images of data recovery blocks and archaeological features. Profiles of excavation block walls and backhoe trench walls, which were stratigraphically mapped, were also photographed. Photographs were taken of excavation crew members at work, often featuring prominent landscape features at the site.

7 ⊻ LA 113042, Front Ridge Site

Regge N. Wiseman and Donald E. Tatum

Site Description

LA 113042 is a large, multicomponent site that begins on the top of the front ridge and extends down an east slope to the west edge of the Nash Draw Valley (Figs. 7.0–7.2). The term "front" refers to the position of this ridge relative to Nash Draw, which lies to the east. The "back ridge," upon which LA 129214 sits, lies behind or west of the front ridge and away from the Nash Draw Valley. Like the back ridge, the front ridge is a remnant of Quaternary alluvial and bolson deposits. The summit of the front ridge is 917 m (3,008 ft) above mean sea level and 15 m (49 ft) above the flats to the east and south.

Environment

At LA 113042, the east facing slope of the ridge is covered with sheet sand and 1 to 3 m high, stabilized coppice dunes crowned by mesquite shrubs. The dunes, or hillocks, are interspersed with deflation depressions or "blowouts" within which burned-rock features and artifacts are exposed. Discontinuous outcrops of caliche are visible across the ridgetop and here and there along the east slope. In addition to the dominant mesquite, on-site vegetation includes crucifixion thorn, four-wing saltbush, creosote, acacia, dropseed grass, broom snakeweed, grama, yucca elata, and some prickly pear cactus (OAS 2006).

LA 113042 measures 420 m (1,377 ft) north–south along the ridge and 460 m (1,509 ft) east–west from the top of the ridge down the east slope. Total site area is approximately 26.95 acres (10.91 ha), 11.44 acres (4.63 ha) (42.5 percent) of which lies within project limits. However, the densest concentrations of features and cultural materials, identifiable from surface indications prior to commencement of excavations, lay outside the existing and proposed rights-of-way for NM 128. Both rights-of-way transect the site.

The site was initially recorded by Gibson (1996) of Western Cultural Resource Management, Inc., (WCRM) for an El Paso Natural Gas pipeline. Additional information was recorded by TRC Associates (2000) as part of a cultural resource inventory for the current construction project of the New Mexico Department of Transportation (NMDOT). A reassessment of the construction project conducted by SWCA in 2006 did not include LA 113042.

Originally, 28 surface survey features were identified across the site by TRC (2000) and the 1996 SWCA survey. These included 17 burned caliche and ash-stained middens, nine burned caliche and burned-rock concentrations, one burned caliche ash-stained concentration, and one ash stain found by WCRM (TRC 2000:Table 6.1; OAS 2006:36).

Surface artifacts identified during the TRC 2000 survey included chipped stone debitage (including biface flakes), 42 shaped chipped stone artifacts, 58 mano and metate fragments, five hammerstones, and 16 pottery sherds. The pottery included brown ware and one red-slipped brown ware sherd. The paucity of diagnostic artifacts recovered during site recording, probably the result of decades of artifact collecting by locals, made problematic the estimation of occupation dates. However, occupations dating from the Archaic, Formative, and possibly the Historic periods were thought to be represented (OAS 2006).

Surface Features

The initial survey of LA 113042 by TRC (2000) and the 2006 assessment by OAS identified a total of three surface survey features (1, 2, and 3) within the new project limits. However, at the initiation of data recovery at the site in October 2006, actual measurements from NMDOT center line stakes indicated that the new project alignment had shifted to the south. Therefore, Surface Survey Features 8, 9, 15, 21, 22, and 24 (TRC Associates 2000) were brought into the construction zone. In addition, Surface Survey Feature 20 (TRC Associates 2000) lay imme-

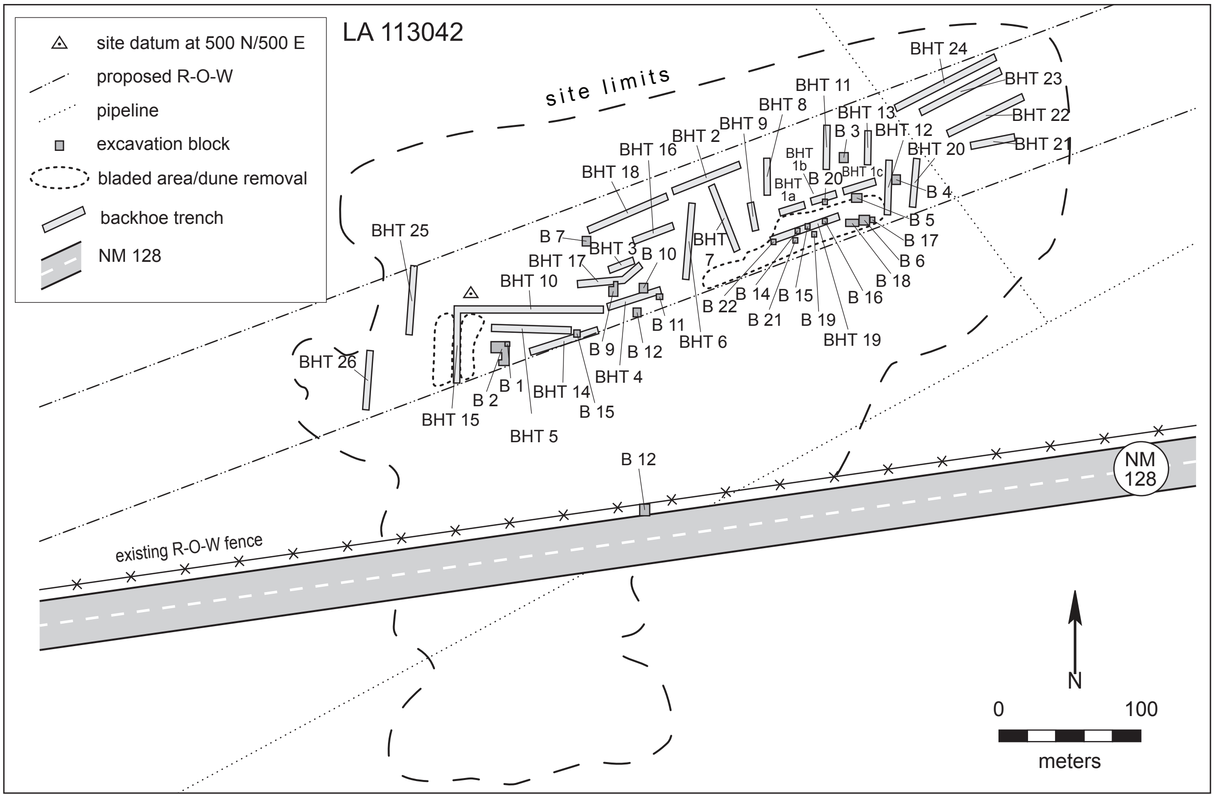

Figure 7.0. LA 113042, front ridge site, site map.

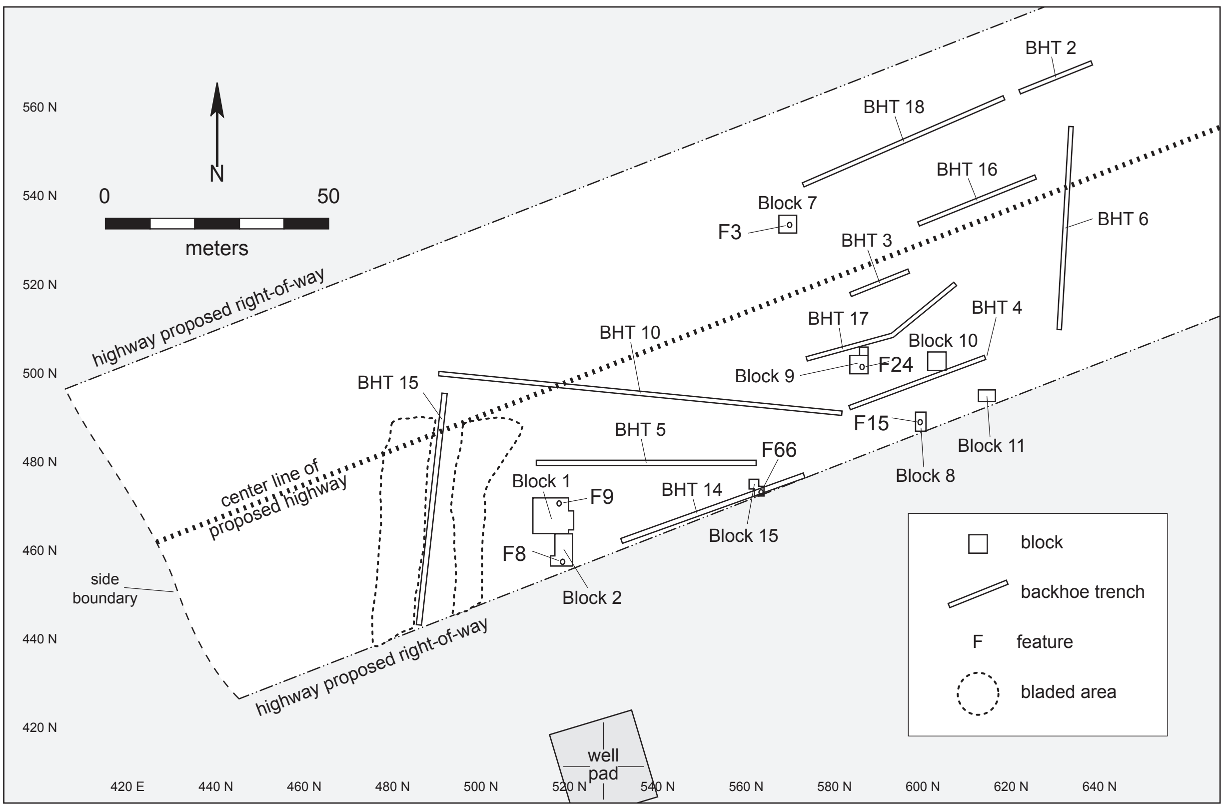

Figure 7.1. LA 113042, site map, detail of west half.

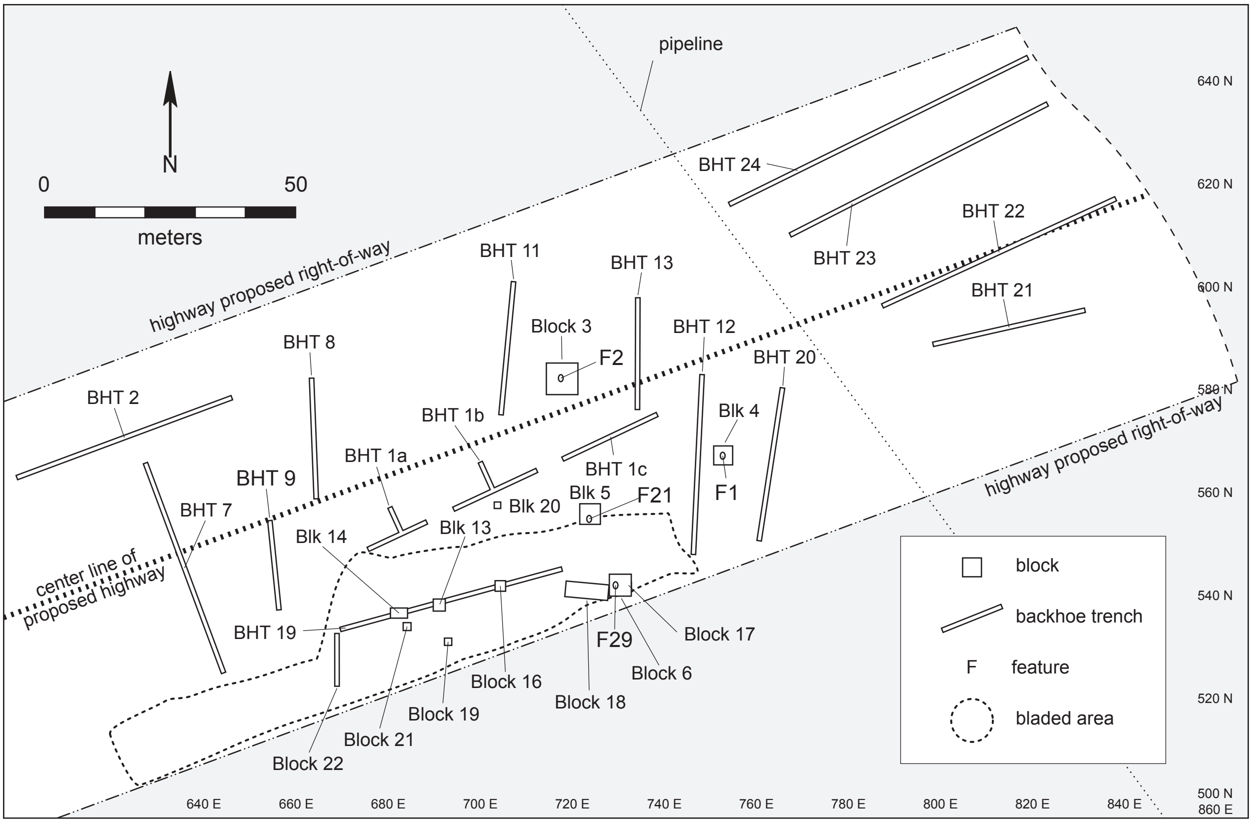

Figure 7.2. LA 113042, site map, detail of east half.

diately outside the north limit of the old NM 128 right-of-way. Thus, a total of 10 surface survey features at LA 113042 required treatment (Table 7.1).

Prior to the commencement of data recovery at LA 113042, surface indications and evaluations of the project right-of-ways, both new and old, suggested that few archaeological remains would require investigation. Furthermore, these manifestations (originally Features 1, 2, and 3) were recorded as being small. Therefore, relatively limited time was allotted for work at this site. Much of that work was to focus on the observable surficial remains and the excavation of a number of backhoe trenches. As noted above, a southward shift in the project center line brought several more surface features into the area of effect, thereby enlarging the amount of work to be done.

Grids for 22 excavation blocks, most of them quite small compared to those at LA 129214, were eventually established to investigate surface features and all subsurface features discovered during work at the site. Many of those features were discovered only after heavy equipment was brought in to scrape some parts of the site surface and to dig trenches. One hundred seventy-one 2 by 2 m units and five 1 by 1 m units were hand-excavated to depths between 10 to 100 cm below present ground surface. Excavation was discontinued when the calcrete layer was encountered or when culturally sterile levels were achieved.

Fifty subsurface features were discovered and excavated. These include more than 40 thermal features, six pits, three postholes, and one cache. One of the thermal features actually consists of two or more intersecting pits that could not be individually defined.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

Site LA 113042 occupies a small, southeast-trending ridge formed by a series of south and east-facing steppes descending from the north-trending Quahada Ridge, 3.21 km (2 mi) to the northwest. It is separated from Site LA 113214 by a south-

Table 7.1. *LA 113042, features that lay within or immediately adjacent to NM 128.*

SURVEY FEATURE (TRC 2000)	FEATURE TYPE	DIMENSIONS (M) (TRC 2000)	OAS EXCAVATION BLOCK
Surface Survey Features within the New NM 128 Right-of-way			
1	burned caliche concentration	2 x 2	4
2	burned caliche concentration	2 x 2	3
3	burned caliche concentration	1 x 1	7
8	burned caliche and ash midden	20 x 10	2
9	burned caliche and ash concentration	1 x 1	1
15	burned caliche and ash midden	15 x 10	8
21	burned caliche and ash midden	1 x 1	5
22	burned caliche concentration	6 x 3	6
24	burned caliche and ash midden	1 x 1	9
Surface Survey Features adjacent to the Old NM 128 Right-of-way			
20	burned caliche and ash midden	? x 10	12

Site data from TRC Associates 2000.

trending drainage basin to the west. The site occupies three distinct geomorphic landforms. The western portion lies on a long north–northwest trending ridge bisected by the old NM 128 right-of-way. The central part occupies the east-facing slope of the ridge. The east side of the site is made up of gently sloping terrain along the west edge of a southeast-trending drainage basin leading from the terraced slopes to the north.

Archaeological Surface Sediment Zone Distribution

Twenty-six backhoe trenches and two surface-bladed areas were excavated to explore relationships between surface visibility of archaeological materials and subsurface cultural and geomorphic deposits in surface sediment Zones 1, 2, and 3 (Fig. 7.3a). Most of the ridgetop terrain on the west end of the corridor crossing consisted of archaeological Zone 2 surface deposits. One small area was designated as Zone 1 at the east edge of the ridge along the southern boundary of the corridor crossing. Trenches 5, 10, 15, 20, 25, and one overburden removal area were excavated on the ridge.

The sloping terrain on the east side of the ridge was predominantly classified as archaeological Zone 3, with the exceptions of two Zone 1 areas at the north and south edges of the corridor crossing. Eight trenches (BHTs 3–5, 10, 14, and 16–18) were placed on the slopes above the drainage. One overburden removal area was excavated along the southeast portion of the gentle slopes west of the drainage. The east side of the corridor crossing at the edge of the drainage basin was occupied by Zones 1 and 3. Ten trenches (BHTs 1, 11–13, and 19–24) were excavated along the edge of the drainage basin.

Soils, Stratigraphy, and Lithology of Trenches and Bladed Areas

Soils on the ridge consisted of Pajarito loamy fine sand, of both alluvial and eolian parentage. The loamy fine sand grades into fine sandy loam with depth. Soils on the sloping terrain east of the ridgetop were of the Potter-Simona complex. The Potter is a shallow alluvial soil developing on terrain with slopes between 5 to 25 percent. Simona is a shallow, sandy soil derived from mixed alluvial and/or eolian sources. It exists on terrain with 5 to 10 percent slopes. The Pajarito loamy fine sand was the predominant soil along the drainage basin. Pajarito and Potter-Simona soils are associated with the Gypsiorthid-Torriorthent-Gypsum Land thermic soil complex of loam, clay loam, and gypsiferous material derived from weathered gypsum (USDA-NRCS 2009; Maker et al. 1978).

Most of the site was capped by coppice dune deposits that were partially stabilized by vegetation, and by a loose, unconsolidated sandy eolian deposit of varying thickness, though usually less than 10 cm. The fine- to medium-grained sand forming the shallow surface deposit was locally derived through erosion and deflation of the substrate. Plentiful inclusions of organic clastic material, such as rodent and rabbit feces, and vegetative matter in-

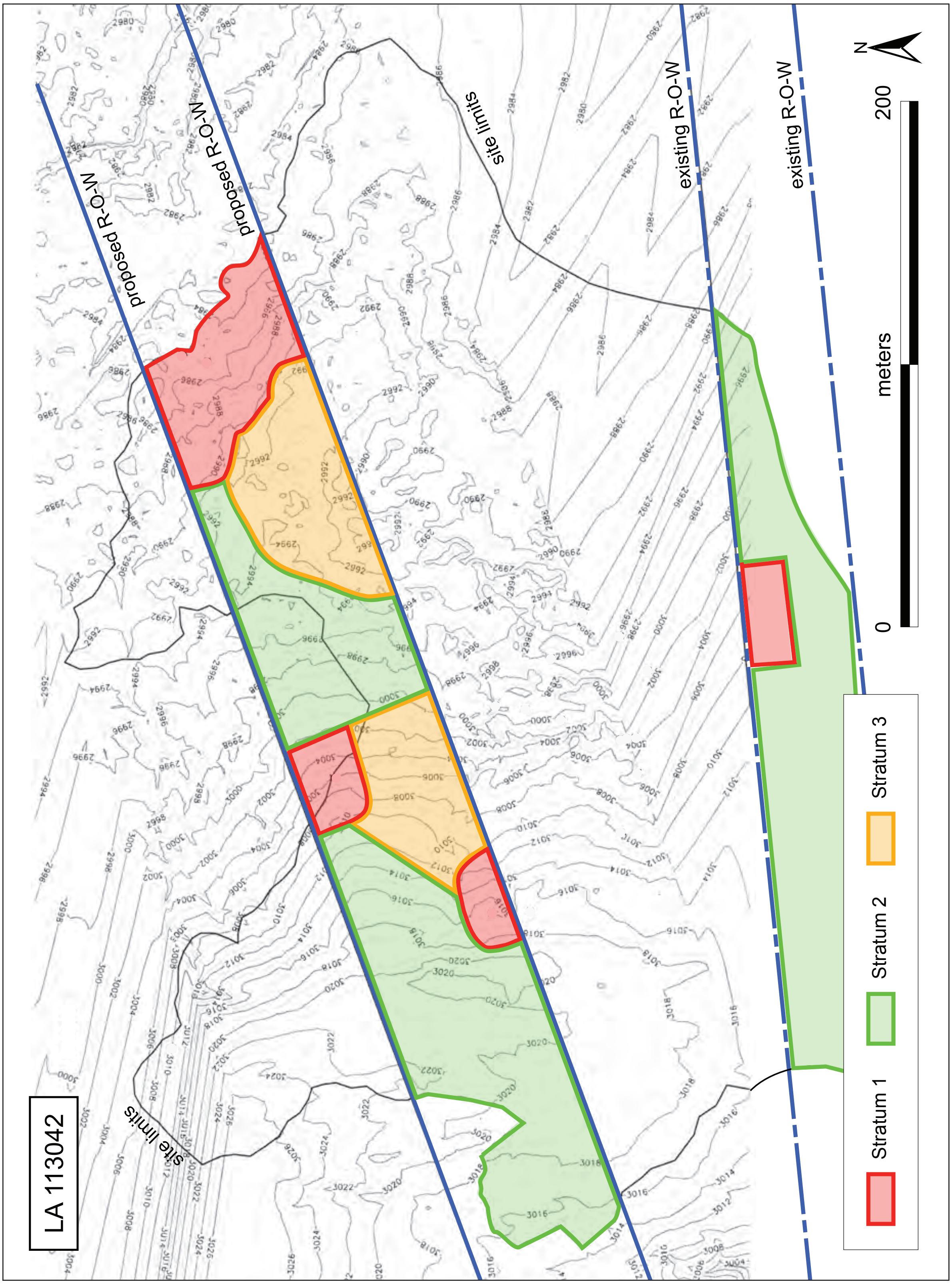

Figure 7.3a. LA 113042, map showing distribution of surface sediment zones.

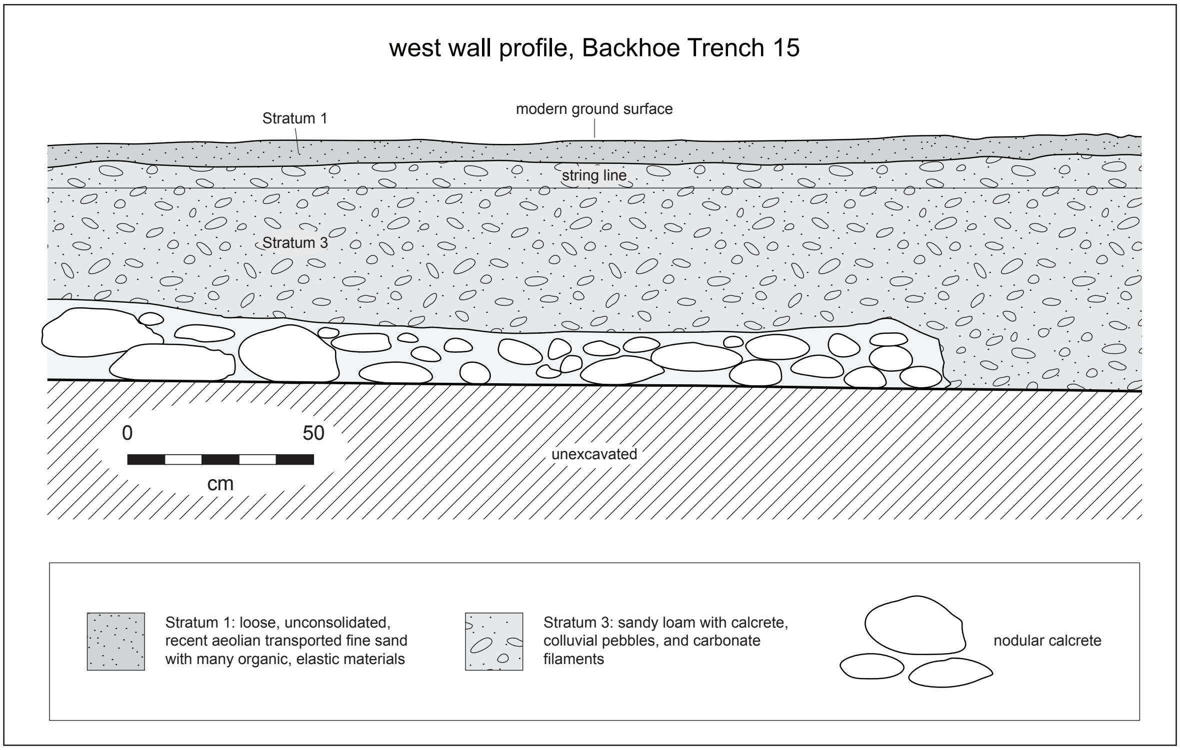

Figure 7.3b. LA 113042, BHT 15, west wall, profile.

corporated into the eolian deposit indicate recent reworking and deposition. The boundary of the eolian sand was irregular and abrupt because of erosion and bioturbation.

Across much of the corridor crossing, the eolian deposit was immediately underlain by a Bw horizon consisting of grayish-brown fine sand. Where cultural deposits were present, the Bw was sometimes locally infused with anthrosol-forming carbon deposits derived from thermal features. Occasionally, inclusions of ceramic fragments, fire-cracked rock, ground stone fragments, lithic debitage, and charcoal fragments were also present. Bioturbation was prevalent in this stratum, the result of roots, rodents, and insects drawn to the organic nutrient-enhanced soil.

The Bw/Bk horizon boundary was accompanied by gradually increasing amounts of clay development and carbonate precipitate in the soil that imparted a stronger structure, paler coloration, weak sand-grain cementation, and carbonate precipitate in the yellowish-brown, fine- to medium-sandy matrix. The Bk was underlain by a Ck horizon, indicated by a sharp increase in percentage by volume of highly weathered and fragmented, rounded to sub-rounded caliche granules, pebbles, and cobbles derived from the calcrete of the Mescalero Paleosol. This concentration of weathered carbonate colluvial and alluvial material, in a shallow depositional horizon across the site, indicated a period of erosion and deflation that occurred prior to, or early in the first stages of deposition of the eolian sand. Excavation of the trenches ceased at the calcrete.

The profiles of mechanical excavations on top of the ridge near the west end of the corridor crossing revealed shallow, heavily eroded and deflated deposits nearly devoid of soil development (BHTs 15 and 26; Figs. 7.3b and 7.3c). Reworked eolian deposits of loose, fine sand comprised the first few centimeters of sediment. The eolian deposits were underlain by a Ck horizon composed of abundant, highly weathered and fragmented carbonate colluvium derived through the chemical and mechanical weathering of the underlying calcrete deposits of the K-horizon forming Mescalero Paleosol (Hall 2002; Henderson 2006). Trenching and overburden removal were terminated at the calcrete. No archaeological deposits were revealed in these mechanically excavated areas.

Trenches 4, 5, and 14 were excavated along the eastern slope of the ridge near the southern part of the corridor crossing (Fig. 7.3a). They were closer to

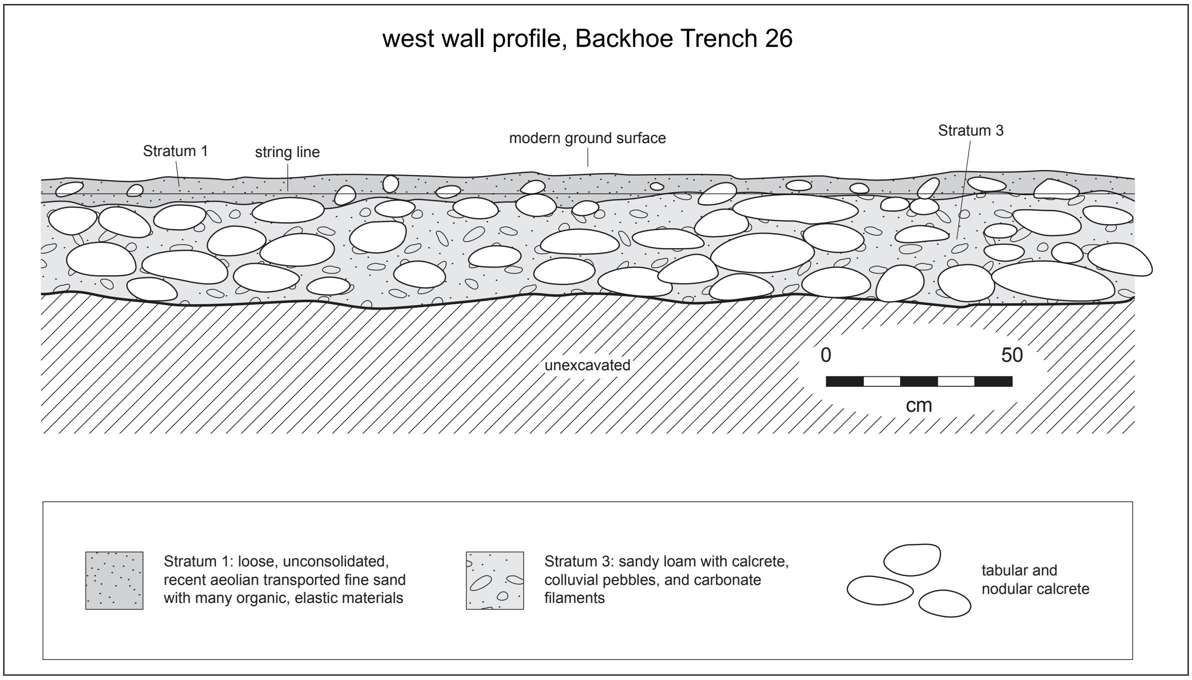

Figure 7.3c. LA 113042, BHT 26, west wall, profile.

the main concentration of cultural material on the surface, which was south of the corridor crossing. Stratigraphic profiles in these trenches had shallow surface deposits of recent eolian sand that was intermittently underlain by residual Bw horizon, Bk horizon, and Ck horizon soils (Figs. 7.3d, 7.3e). Four thermal pit features and one storage pit feature were excavated in Block 15, near the east end of BHT 14, where Feature 66 was discovered.

Seven backhoe trenches were placed in Zone 2 along the west side of the coppice dune terrain bordering the drainage basin to the west (Fig. 7.3a). Sediments and soils revealed in Trenches 2, 6, 7, 8, 9, and 11 showed shallow deposits of loose, unconsolidated eolian sand immediately underlain by sandy Bk horizon soils with enhanced clay development and fine carbonate filaments, films, and granules. The Bk was underlain by a highly weathered and fragmented Ck horizon derived from the Mescalero Paleosol. In BHT 2, the east end of the trench exposed a bank of reddish-hued C horizon derived from the Permian-aged Rustler Formation (Fig. 7.3f). No cultural deposits were revealed in these trenches.

Trench 19, excavated in Zone 3 in the southern part of the corridor, showed the surface eolian deposit underlain by the Bw soil that abruptly transitioned into a thin Bk horizon with dense deposits of highly weathered and fragmented carbonate pebbles (Ck horizon) underlain by the Mescalero Paleosol. Four thermal pit features (Features 62, 63, 68, and 71) were exposed during the excavation of BHT 19. Obscured by extensive mesquite-covered coppice dunes, the area surrounding BHT 19 was subjected to dune removal. Ten thermal pit features were revealed at the contact between the eolian sand and the cultural deposit-bearing layer.

Trenches 1, 12, 13, and 20 were excavated in Zone 3 along the west side of the coppice dune terrain bordering the drainage basin to the west (Fig. 7.3a). Profiles revealed the shallow surface deposit of loose, unconsolidated eolian sand, underlain by weakly cemented Bk horizon sand with plentiful inclusions of carbonate filaments, granules, and pebbles derived from weathered calcrete. The degree of carbonate development gradually increased with depth. The Bk was underlain by a massive reddish sand deposit, a C horizon derived from the Permian-aged Rustler Formation. This deposit had inclusions of red and yellow ochre, sandstone fragments, and caliche pebbles (Fig. 7.3g). No cultural materials or features were discovered in these trenches.

Backhoe Trenches 21 through 24 were placed along the drainage basin at the east end of the corridor crossing (Fig. 7.3a). The thin layer of eolian sand

Figure 7.3d. LA 113042, BHT 4, north wall, profile. Recently redeposited eolian sand occupies the upper 3 to 5 cm, underlain by heavily eroded Bk horizon loamy sand and then the eroded Mescalero Paleosol Ck horizon.

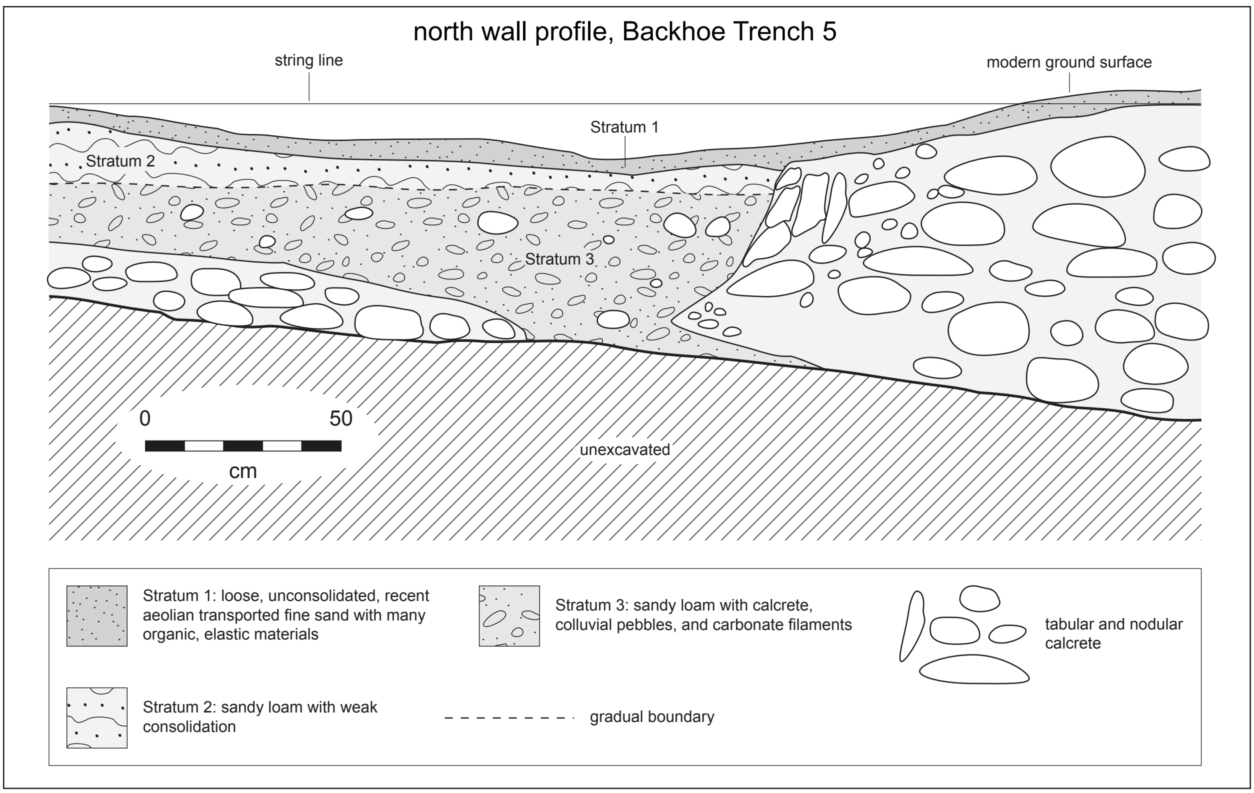

Figure 7.3e. LA 113042, BHT 5, north wall, profile.

Figure 7.3f. LA 113042, BHT 2, north wall. Recently redeposited eolian sand occupies the upper 3 to 5 cm, underlain by Bk horizon loamy sand and then the eroded Mescalero Paleosol Ck horizon.

Figure 7.3g. LA 113042, BHT 1, south wall, profile. Recently redeposited eolian sand occupies the upper 3 to 5 cm, underlain by Bk horizon loamy sand.

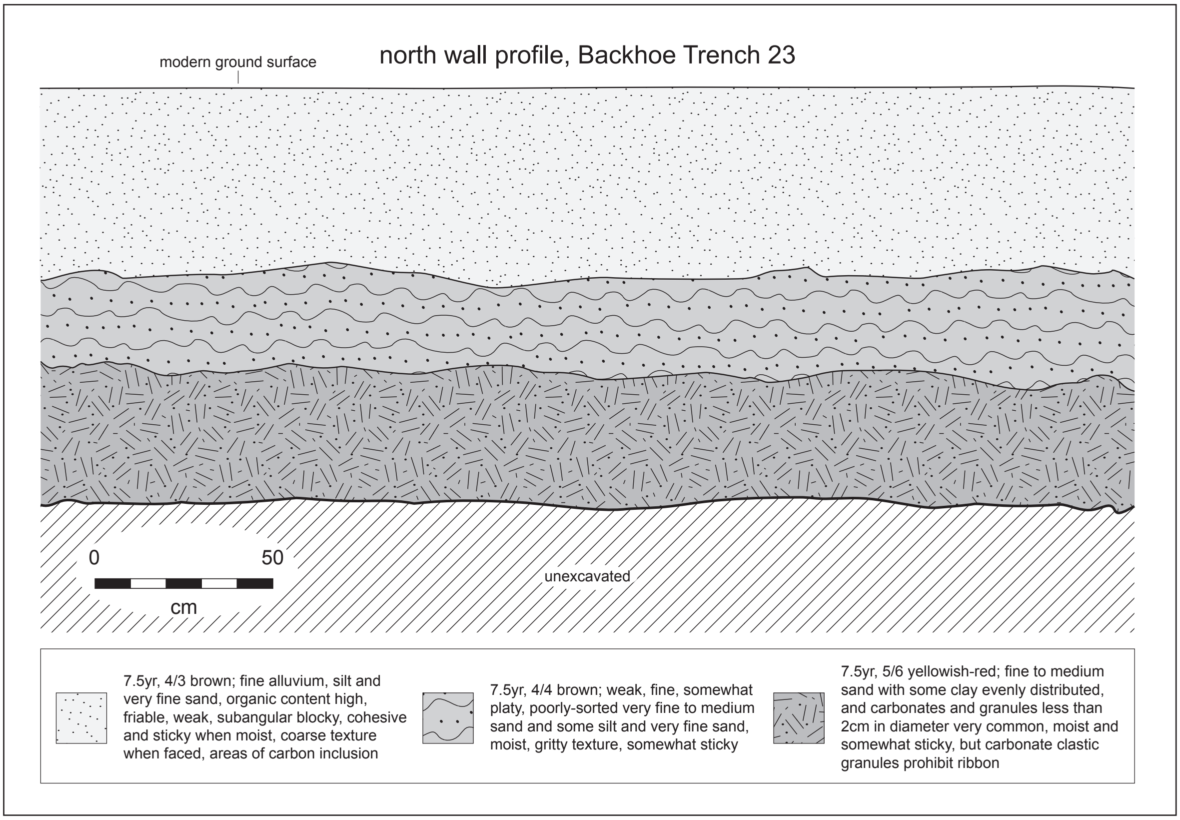

Figure 7.3h. LA 113042, BHT 23, north wall, profile.

was immediately underlain by varied deposits of fine silty alluvium and fine organic matter alternating with layers of fine to very fine sand. These sediments were deposited in the drainage during flood events. Terrestrial gastropod shells were discovered in a fine alluvium deposit in BHT 23 (Hall 2006, this report). The boundaries of the deposits were abrupt and wavy. The concentrations of fine organic particulate matter gradually diminished with depth; clay development and concentrations of carbonate inclusions gradually increased with depth (Fig. 7.3h). No cultural deposits or features were present in these trenches.

Chronology Discussion

The main stratum of archaeological importance on LA 113042 was the Unit 1 eolian sand. Optically Stimulated Luminescence (OSL) samples collected in BHT 6 at 12 cm below surface (below the recent shallow eolian deposits) and 44 cm below surface (directly above the Mescalero Paleosol) chronometrically dated to 2320 years and 5560 years BP, respectively, providing a range of dates for the deposition of the Unit 1 sand at this location (Hall this report). The sample from 12 cm below surface post-dated the Unit 1 deposition as recorded during previous geochronology studies conducted in northeast Eddy County. The sample collected from 44 cm below surface yielded a date that was contemporaneous with dates established for deposition of the Unit 1 eolian sand during the aforementioned studies (Hall 2002, this report). Eight features discovered during the mechanical excavations were chronometrically dated. Five features (Features 63, 68, 74, 80–82) originated in the Bw horizon and terminated in the Bk. These features yielded a range of dates between AD 760 and AD 80. Features 73, 75, and 78 originated in the Bk horizon. They yielded a range of dates between AD 610 and AD 80.

Conclusions

Examination of stratigraphy exposed in backhoe trenches and surface-stripped areas at the site revealed that the main concentration of archaeological deposits, including artifacts, features, and associated discrete anthrosols was limited to the southern part of the corridor crossing. Seventeen archaeological features, including thermal and non-thermal pit features, were discovered in backhoe trenches and surface-stripped areas excavated in the southern part of the corridor. None of the mechanical excavations in the central or northern parts of the corridor revealed archaeological deposits. None of the trenches excavated in archaeological Zone 1 revealed cultural features or deposits. The discovery of abundant intact subsurface cultural deposits in mechanically excavated areas of Zones 2 and 3 shows no correlation between surface visibility of archaeological deposits and the extent of related subsurface deposits.

Strata exposed in the backhoe trenches included a widespread, recent eolian surface deposit. In the heavily eroded and deflated western portion of the corridor crossing (ridgetop setting), the surface eolian deposit was immediately underlain by Bk horizon sands. In the central part of the corridor crossing, the surface deposit was sometimes underlain by an isolated, horizontally limited anthrosol. With depth, the Bw gradually transitioned into a sandy Bk horizon that was immediately underlain by the Ck horizon derived from the calcrete of the Mescalero Paleosol. In the eastern end of the corridor crossing, the anthrosol and associated cultural deposits were almost non-existent. Instead, stratigraphy in backhoe trenches placed in this part of the corridor crossing consisted of fine alluvial deposits.

Hand Excavation: Block Descriptions

Block 1 (66 sq m)

Block 1 (Fig. 7.4) was established to investigate Surface Survey Feature 9 (TRC Associates 2000). Excavations in Block 1 varied in depth from 50 to 100 cm.

The fill consisted mostly of Strata 1 and 3 sediments. Stratum 2 sediments were rarely encountered, with all examples generally lacking appreciable staining and charcoal and having been found in the southern half of the block. The Stratum 2 sediments, as well as those squares in which Stratum 1 sediments changed directly into Stratum 3 sediments, occurred mainly in Levels 3 through 5 (or between 30 to 50 cm below modern surface), with the majority of cultural materials (lithic debitage, pottery sherds, etc.) and features occurring in Levels 1 through 3, or between the modern surface and 30 cm below.

Table 7.2. LA 113042, Block 1, artifact and sample summary.

ARTIFACT TYPE/ SAMPLE	TOTAL
Lithic debitage	**444**
Pottery sherd	**36**
Mano and metate	**6**
Hammerstone	**2**
Polishing stone	**3**
Animal bone	**3**
Mussel shell	**19**
Earthy red mineral	**63**
Pigment	**19**
Earthy blue mineral	**5**
Historic artifact	**1**
Flotation sample	**2**
Pollen sample	**1**
Total	**604**

Nine features were exposed and excavated in Block 1. Features 28, 34, 35/38, 40–41, and 49 are thermal features (Figs. 7.5 through 7.10). Feature 35/38 may actually have been two separate but superimposed thermal pits. Feature 53 is a large storage pit, and Feature 32 is a posthole. Feature 44 appears to be a cache of large, unmodified calcrete rocks that might have been stockpiled for use as hearth stones (Figs. 7.11 and 7.12).

A variety of artifacts and samples was recovered from the area within Block 1 (Table 7.2). Chipped lithic debitage, pottery sherds, ground stone fragments, hammerstones, and polishing stones constituted an average of 7.4 items per square meter of the excavated area.

Block 2 (28 sq m)

Block 2 adjoined the east end of the south line of Block 1 (Figs. 7.4, 7.13, 7.14). It was established to investigate survey Surface Survey Feature 8 (TRC Associates 2000).

Excavations in Block 2 varied in depth from 50 to 90 cm. The fill included all three strata. Stratum 1 sediments were restricted to Level 1 (0 to 10 cm below surface). Stratum 2 sediments usually comprised Levels 2 and 3 (10 to 30 cm below surface). Stratum 3 sediments typified the remainder of the levels starting with Level 4 (30 to 40 cm below surface). Rodent intrusion was evident throughout many parts of most levels, down to the bottom of

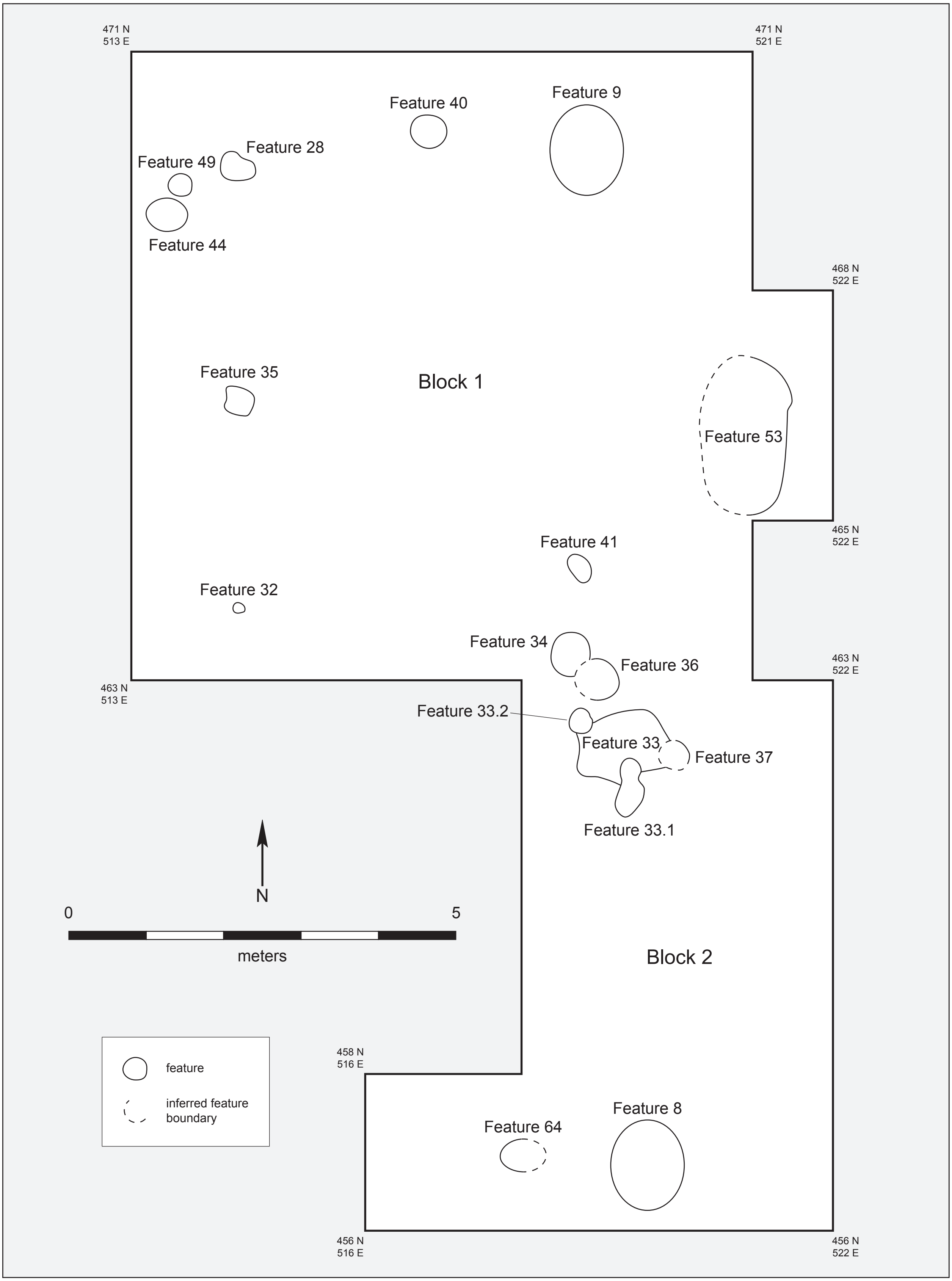

Figure 7.4. LA 113042, Blocks 1 and 2, plan.

Figure 7.5. LA 113042, Block 1, Thermal Feature 38, pre-excavation, showing lightness of fill.

Figure 7.6. LA 113042, Block 1, Thermal Feature 38, excavated.

Figure 7.7. LA 113042, Block 1, Thermal Feature 38.

Figure 7.8. LA 113042, Block 1, Thermal Feature 40, pre-excavation, showing darker fill.

Figure 7.9. LA 113042, Block 1, Thermal Feature 40, excavated.

Figure 7.10. LA 113042, Block 1, Thermal Feature 40, profile.

Figure 7.11. LA 113042, Block 1, rock cache, Feature 44, pre-excavation.

Figure 7.12. LA 113042, Block 1, rock cache, Feature 44, excavated.

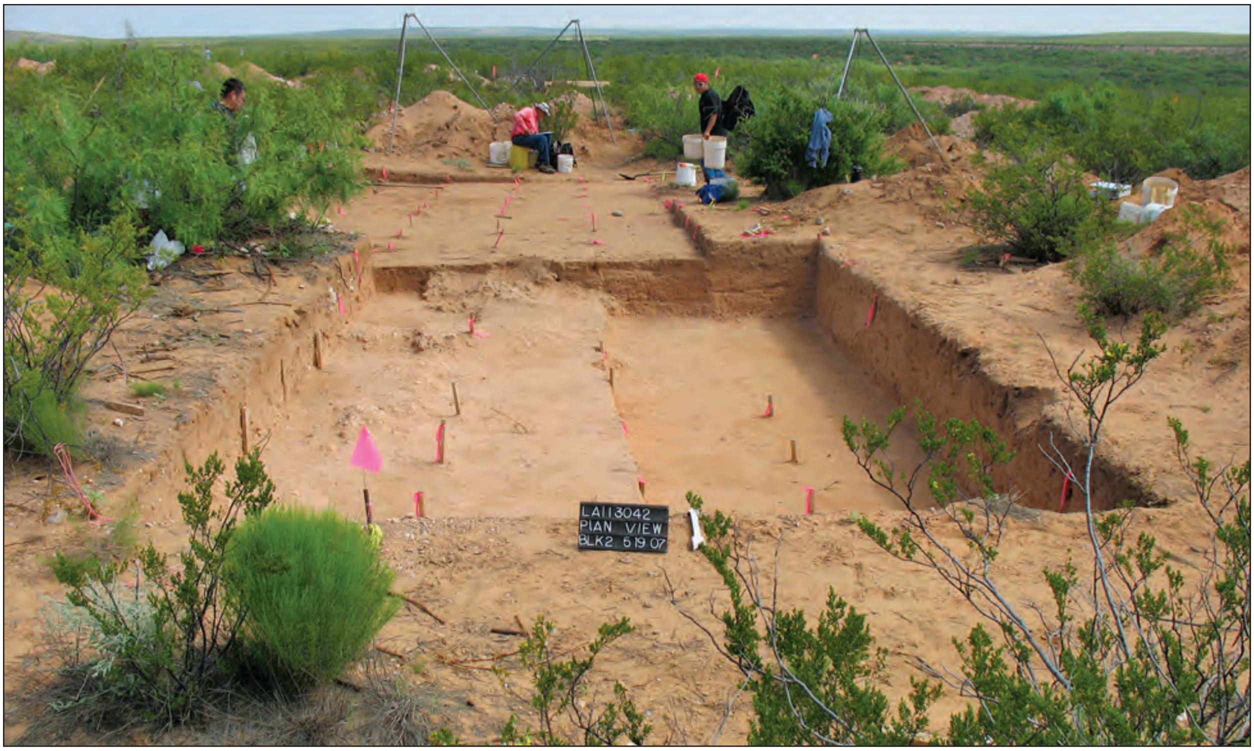

Figure 7.13. LA 113042, Block 2, at termination of excavation.

the excavations. In some units, calcrete bedrock was encountered as shallow as 50 cm, but in others it was not struck until 80 to 90 cm.

Thermal Features 33, 36, 37, and 64, were exposed and excavated in Block 2.

The combined numbers of chipped lithic debitage, pottery sherds, ground stone fragments, hammerstones, projectile points, polishing stones, lithic tools, a mano, and a scraper constituted an average of 20.0 items per square meter of excavated area (Table 7.3).

Table 7.3. LA 113042, Block 2, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	445
Pottery sherd	88
Ground stone	13
Mano and metate	7
Projectile point	2
Lithic tool	2
Scraper	1
Polishing stone	2
Mussel shell	21
Mineral	1
Earthy red mineral	64+
Lithic for pollen wash	1
Clay pigeon fragment	5
C-14 sample	5
Flotation sample	9
Pollen sample	6
Total	**672+**

Block 3 (36 sq m)

Block 3 was established to investigate survey Surface Survey Feature 2 (TRC Associates 2000) (Figs. 7.15 and 7.16) All excavations in Block 3 were carried through Level 4, approximately 40 cm below surface. Fill included all three strata in attenuated form. Stratum 1 sediments were restricted to Level 1 (0 to 10 cm below surface), Stratum 2 sediments usually to Level 2 (10 to 20 cm below surface), and Stratum 3 to Levels 3 and 4 (20 to 30 cm below surface). At 40 cm below surface, calcrete bedrock appeared as "islands" of various sizes, configurations, and depths, especially in the 729E squares. Three features were found and excavated in the area of Block 3. Feature 48 is a large storage pit, Feature 50 is a possible thermal pit, and Feature 52 is a posthole. Most artifacts were recovered from Strata 1 and 2 (Table 7.4), and many of those (n = 56) came from Stratum 2, Level 2 (10 to 20 cm below surface) in

Figure 7.14. LA 113042, Block 2, profile, east face of excavation.

Unit 579N/729E. The excavation notes suggest that this concentration may have been the result of a flintknapper's work at this locus. The combined numbers of chipped lithic debitage, a chopper, and a lithic tool produced an average of 2.1 items per square meter of excavated area.

Table 7.4. LA 113042, Block 3, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	72
Lithic tool	1
Chopper	1
Animal bone	1
Mollusk shell	3
Pecos Valley diamond	1
Flotation sample	5
Pollen sample	1
Soil sample	1
Total	**86**

Block 4 (16 sq m)

Block 4 was established to investigate Surface Survey Feature 1 (TRC Associates 2000). All excavations in Block 4 were carried through Level 2, approximately 20 cm below surface. The fill transitioned directly from Stratum 1 to Stratum 3, with no Zone 2 (anthrosol staining) encountered in the unit. The lower part of all second levels displayed high gravel and pebble content, indicating nearness to decomposing calcrete. No features were found in Block 4. The one piece of chipped lithic debitage produced an average of 0.06 items per square meter of excavated area (Table 7.5).

Table 7.5. LA 113042, Block 4, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	1
Total	**1**

Block 5 (16.5 sq m)

Block 5 was established to investigate Surface Survey Feature 21 (TRC Associates 2000) (Figs. 7.17, 7.18, and 7.19).

All excavations in Block 5 were carried through Level 2, approximately 20 cm below surface. Over most of the block, the fill transitioned directly from Stratum 1 to Stratum 3, with limited exposures of a faint Stratum 2 (anthrosol staining) encountered mainly in the southwest corner of the block (i.e., in Unit 554N/734E). The lower part of all second levels displayed high gravel and pebble content, indicating nearness to decomposing calcrete. Calcrete was encountered only in the northwest (Square 557N/734E) and southwest corners (Square 565N/734E) of the block.

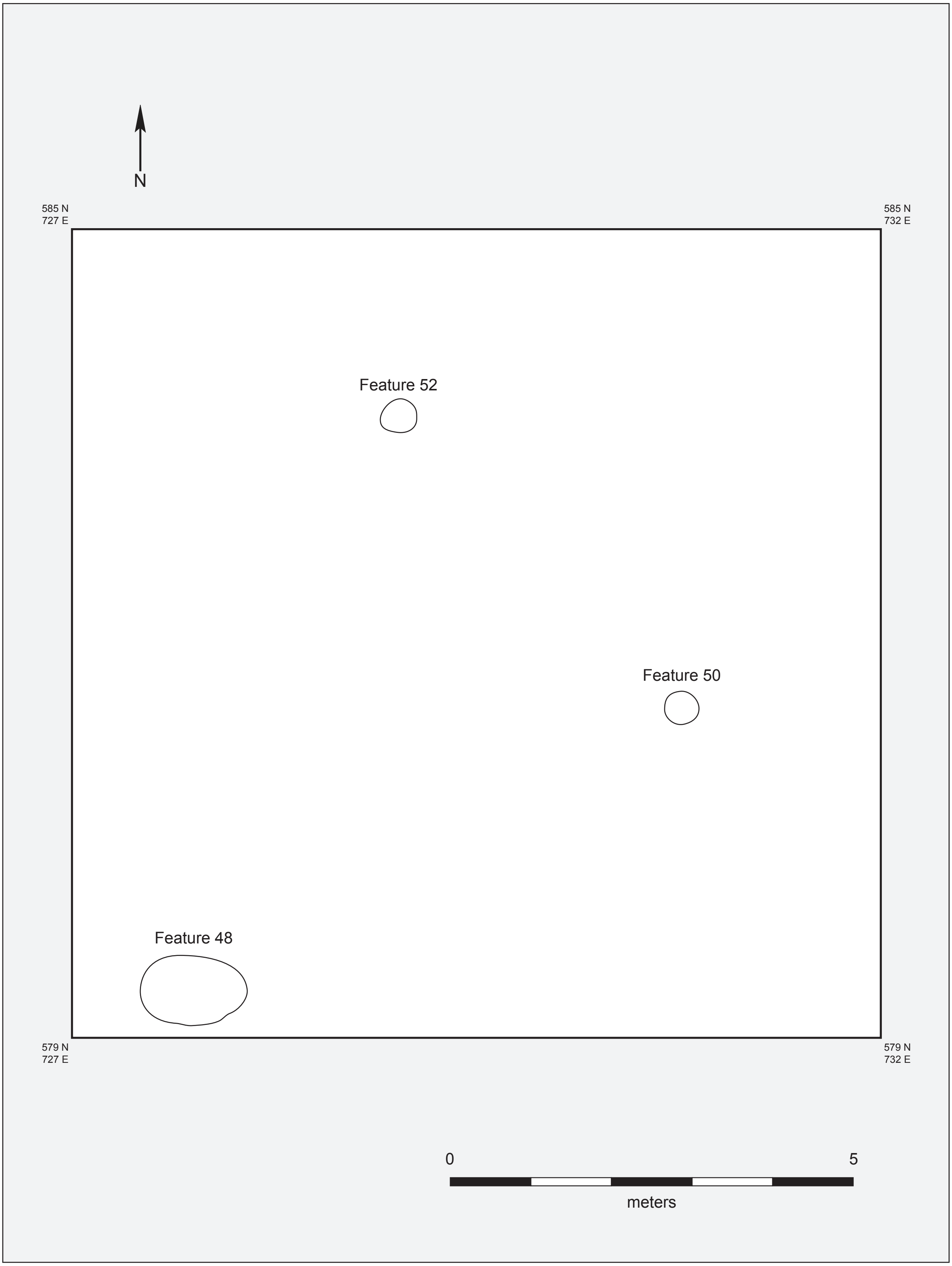

Figure 7.15. LA 113042, Block 3, plan.

Figure 7.16. LA 113042, Block 3, at termination of excavation.

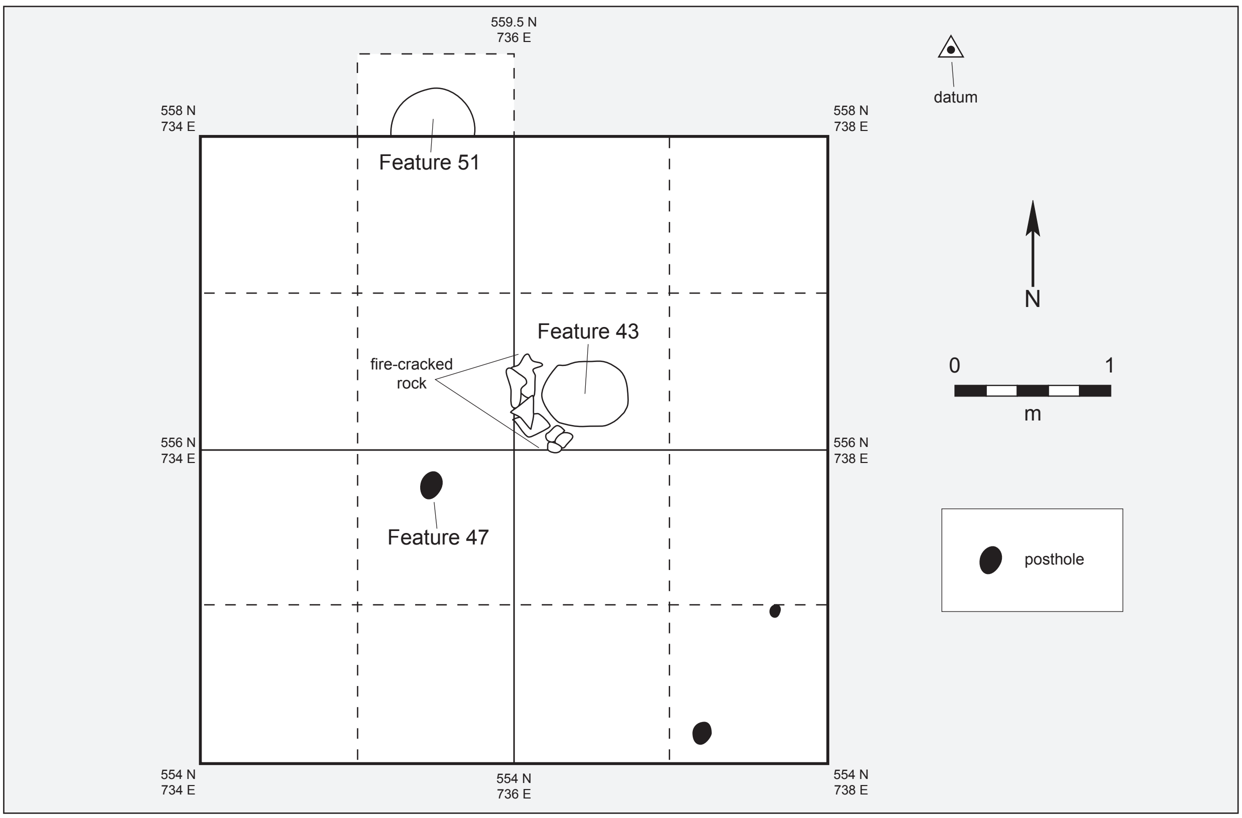

Figure 7.17. LA 113042, Block 5, plan.

Figure 7.18. LA 113042, Block 5, at termination of excavation.

Figure 7.19. LA 113042, Block 5, profile, west face of excavation.

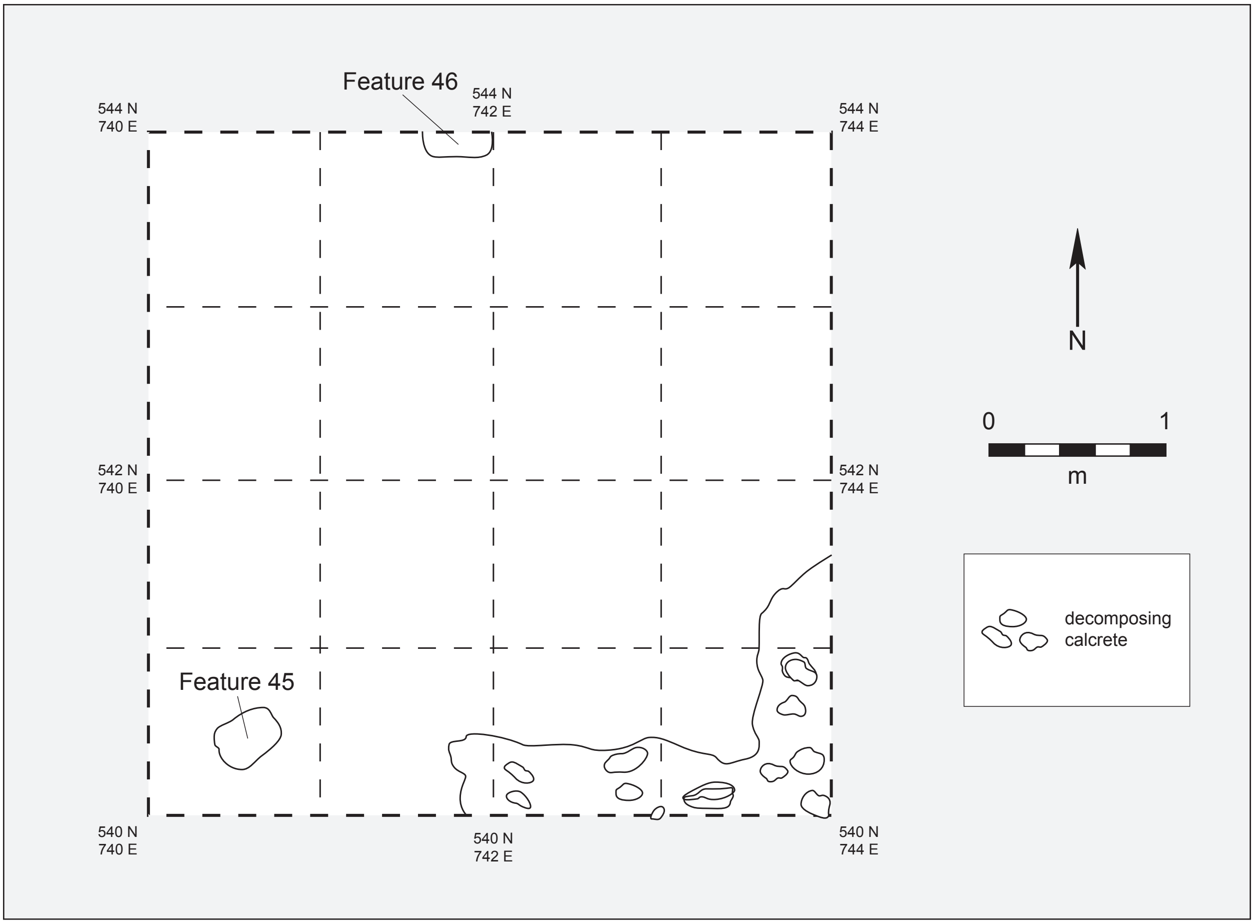

Figure 7.20. LA 113042, Block 6, plan.

Three features were associated with Block 5. Two were thermal pits, 43 and 51, and one was a posthole, 47.

The one flake and one potsherd produced an average of 0.12 items per square meter of excavated area (Table 7.6).

Table 7.6. LA 113042, Block 5, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	1
Pottery	1
C-14 sample	1
Flotation sample	3
Pollen sample	1
Total	**7**

Block 6 (16 sq m)

Block 6 was established to investigate Surface Survey Feature 22 (TRC Associates 2000) (Figs. 7.20 and 7.21). All excavations in Block 6 were carried through Level 3, from surface to approximately 30 cm below the surface. Over most of the block, fill was present in all three zones with Stratum 2 (anthrosol) being faint and only 5 to 10 cm thick. Calcrete was encountered mainly in the southeast corner of the block. Thermal Features 45 and 46 were exposed and excavated in Block 6. The 16 lithics and potsherds produced an average of one item per square meter of excavated area (Table 7.7).

Block 7 (16 sq m)

Block 7 (Fig. 7.22) was established to investigate Surface Survey Feature 3 (TRC Associates 2000).

The west half of this block was excavated through Level 3, from surface to approximately 30 cm below the surface. The east half was excavated through Level 1, from surface to about 10 cm below the surface. Across the block, the fill directly transitioned from Stratum 1 to Stratum 3 sediments in the first 10 cm below the surface. No Stratum 2

Figure 7.21. LA 113042, Block 6, at ready for excavation, showing vegetation density.

Figure 7.22. LA 113042, Block 7, top of Surface Survey Feature 3, showing that it is natural, not cultural.

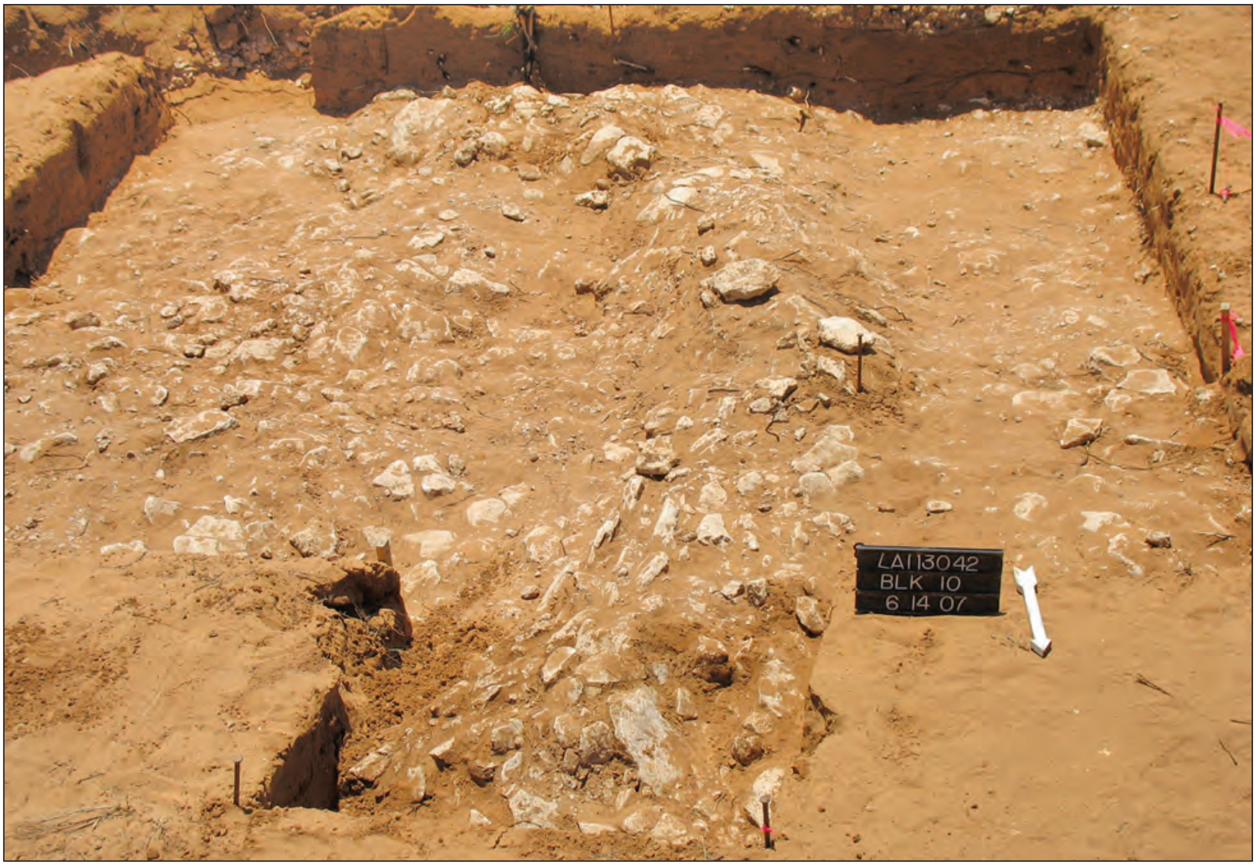

Figure 7.23. LA 113042, Block 10, at termination of excavation.

sediments (anthrosol) were identified in the block. Calcrete bedrock was not encountered anywhere in the block, but the lowest part of all excavated levels contained ample gravels, indicating its presence not far below. No features were located in Block 7. The one piece of lithic debitage (Table 7.8) recovered from Block 7 produced an average of 0.06 items per square meter of excavated area.

Table 7.7 LA 113042, Block 6, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	6
Pottery	10
Mussel shell	6
Total	**22**

Table 7.8. LA 113042, Block 7, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	1
Total	**1**

Block 8 (8 sq m)

Block 8 was established to investigate Surface Survey Feature 15 (TRC Associates 2000). The two 2 by 2 m units of this block were excavated through six to seven levels, 0 to 70 cm. All three strata were encountered in both units, but neither unit struck the underlying calcrete. No features were located in Block 8. Artifacts were fairly numerous considering the limited exposure of this block (Table 7.9). The lithic debitage, ground stone, and single projectile point combined to produce an average of 7.3 items per square meter of excavated area.

Block 9 (16 sq m)

Block 9 was established to investigate Surface Survey Feature 24 (TRC Associates 2000). The two 2 by 2 m units of this block were excavated through Levels 1 and 2, 0 to 20 cm. Only Strata 1 and 3 were encountered in both units, but neither unit struck the underlying calcrete. However, calcrete was present at the surface in some parts of the block, and gravels and pebbles were numerous in all excavated fill, indicating proximity of solid calcrete. No features were located in Block 9. Artifacts were fairly numerous considering the limited exposure of this block (Table 7.10) and the shallowness of Stratum 1 sediments, 2 to 4 cm. The lithic debitage, the only cultural materials recovered, produced an average of 1.5 items per square meter of excavated area.

Block 10 (18 sq m)

Block 10 was established to investigate a surficial lithic scatter that had not been assigned a surface survey feature number by TRC. The four 2 by 2 m units of this block were excavated through Level 3 (0 to 30 cm), with one excavated through Level 5 (0 to 50 cm).

Two additional 1 by 1 m units were excavated as single full-cuts to a depth of 30 cm below the surface. Strata 1 through 3 were encountered in all units, but no dark staining (anthrosol) or charcoal was noted in the Stratum 2 sediments. Calcrete appeared discontinuously in most units (Fig. 7.23). No features were located in Block 10. Artifacts were fairly numerous considering the limited exposure of this block (Table 7.11) and the shallowness of Stratum 1 sediments, 2 to 4 cm. The lithic debitage and potsherds combined to produce an average of 5.7 items per square meter of excavated area.

Block 11 (16 sq m)

Block 11 was established to investigate a section of site surface that evidently was not defined by previous work at the site, yet displayed scattered burned-rocks and stained soil on the surface (Figs. 7.24 and 7.25).

The four 2 by 2 m units of this block were excavated through Level 2, 0 to 20 cm. Strata 1 through 3 were encountered in all units, with dark staining (anthrosol) and some charcoal flecks restricted to the surface and few centimeters below, in some places. Calcrete appeared at the base of Level 2 in most places. Thermal Features 54, 55, and 56 were exposed and excavated in Block 11. Artifacts were fairly numerous considering the limited exposure of this block (Table 7.12) and the shallowness of sediments.

Table 7.9. LA 113042, Block 8, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	**54**
Ground stone	**3**
Projectile point	**1**
Total	**58**

Table 7.10. LA 113042, Block 9, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	**24**
Total	**24**

Table 7.11. LA 113042, Block 10, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	**104**
Pottery sherds	**2**
Total	**106**

Table 7.12. LA 113042, Block 11, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	**40**
Pottery sherds	**2**
Projectile point	**1**
Manos and metates	**1**
C-14 sample	**3**
Flotation sample	**3**
Pollen sample	**3**
Total	**53**

All but the ground stone fragment were recovered from Level 1 (0 to 10 cm).

Lithic debitage, potsherds, and individual fragments of a projectile point and a ground stone item combined to produce an average of 2.8 artifacts per square meter of excavated area.

Block 12 (36 sq m)

Block 12 was established to investigate Surface Survey Feature 20 (TRC Associates 2000) (Fig. 7.26).

Of the seven 2 by 2 m units of this block, one

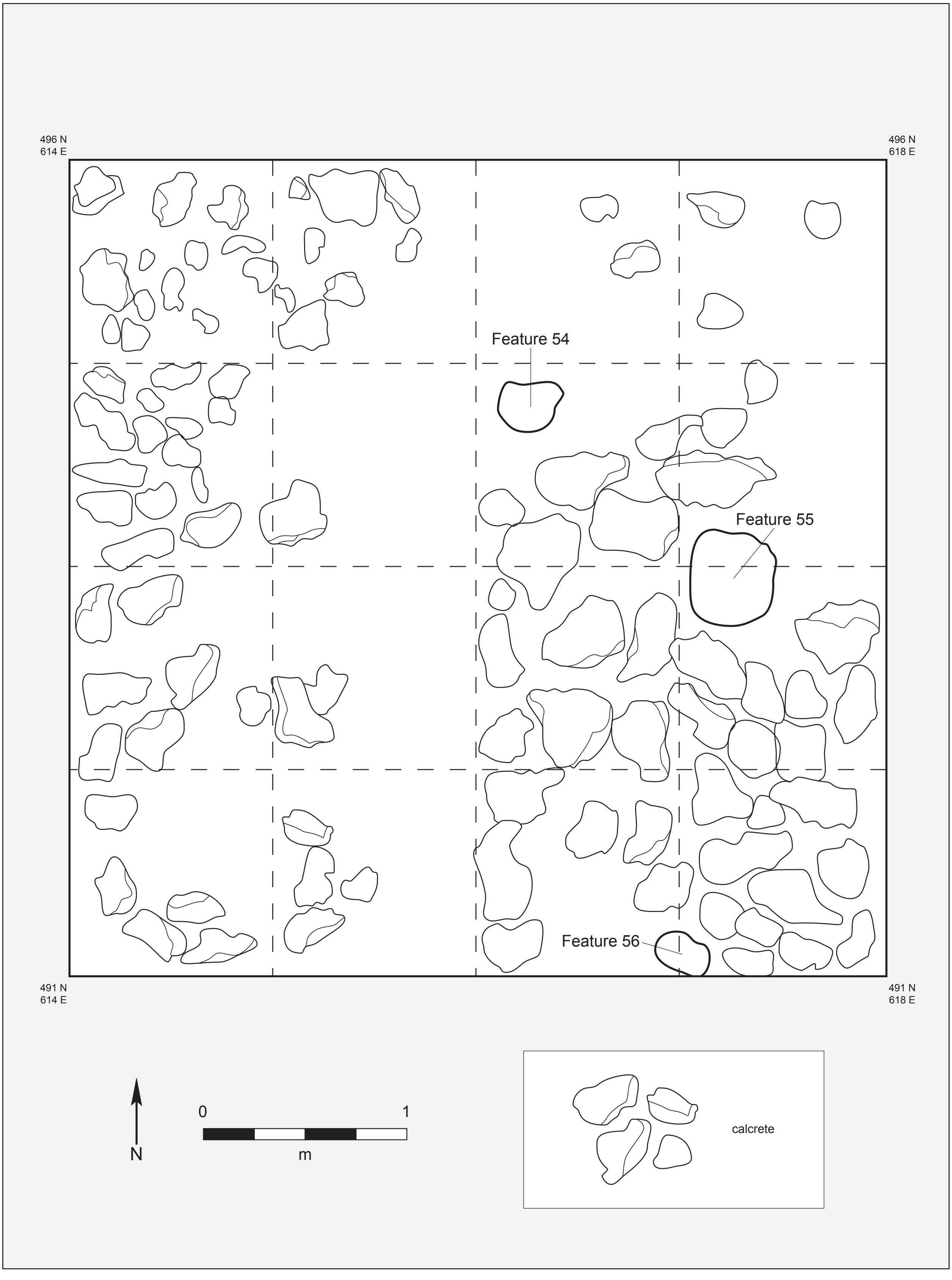

Figure 7.24. LA 113042, Block 11, plan.

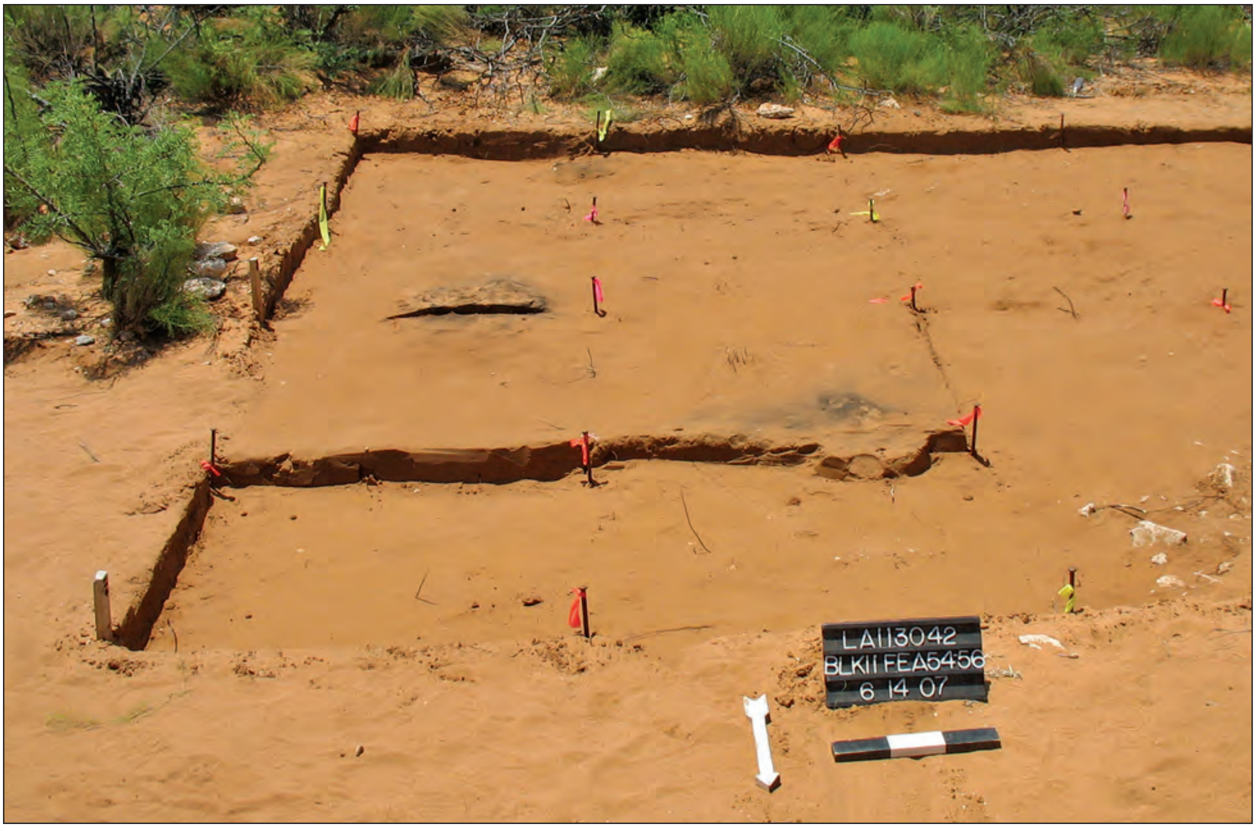

Figure 7.25. LA 113042, Block 11, Thermal Features 54 and 56, at ready for excavation.

unit was excavated through Level 2 (0 to 20 cm), three units through Level 3 (0 to 30 cm), and three units through Level 4 (0 to 40 cm).

The shallow unit was terminated because calcrete was encountered. Strata 1 through 3 were encountered in all units (except the shallow one), with dark staining (anthrosol) and some charcoal flecks restricted to the surface and few centimeters below, in some places. Calcrete appeared at the base of Level 2 in most places.

Thermal Features 57, 58, 59, 60, 61, 65, and 67 and one small pit, 72, were exposed and excavated in Block 12.

Artifacts were fairly numerous considering the limited exposure of this block (Table 7.13). Lithic debitage, potsherds, ground stone fragments, a projectile point, a biface, and stone tools combined to produce an average of 3.4 artifacts per square meter of excavated area.

Table 7.13. LA 113042, Block 12, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	91
Pottery sherds	15
Manos and metates	11
Projectile point	1
Biface	1
Lithic tool	2
Animal bone	3
Mollusk shell	3
Earthy blue mineral	3
C-14 sample	5
Flotation sample	7
Pollen sample	3
Total	**145**

Block 13 (4 sq m)

Block 13 was established to investigate Feature 62, a thermal pit discovered during the excavation of Backhoe Trench 19. The single 2 by 2 m unit of this block was excavated through Level 2, 0 to 20 cm. Strata 1 and 2 were encountered in all units; dark staining (anthrosol) and charcoal were lacking. Calcrete was not encountered anywhere in this block, though its presence was documented deeper down in the BHT 19.

Thermal Feature 62 was exposed and excavated

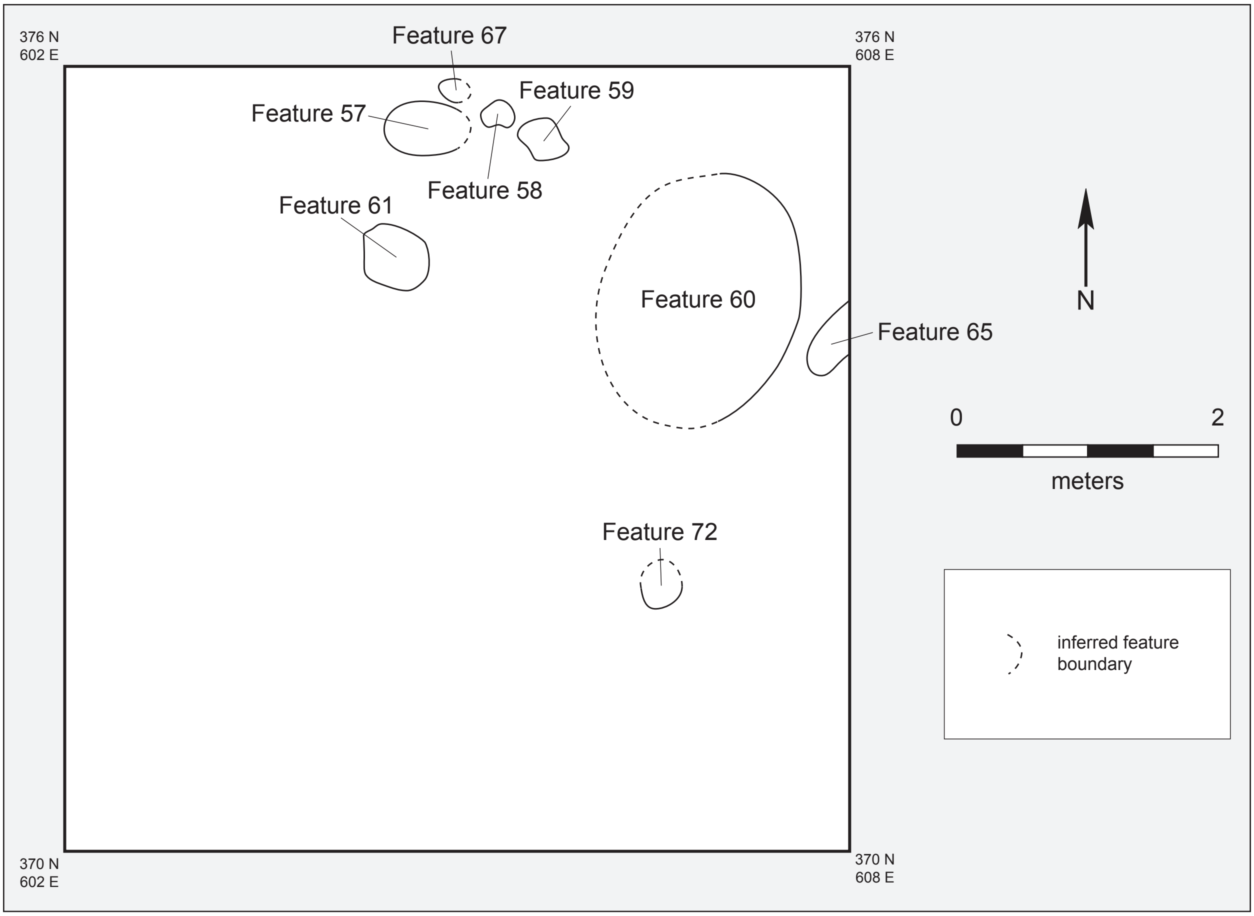

Figure 7.26. LA 113042, Block 12, plan.

in Block 13. No artifacts were recovered during the excavation of Block 13. However, fill samples were retrieved from the feature (Table 7.14).

Block 14 (6 sq m)

Block 14 was established to investigate Feature 63, a thermal pit discovered during the excavation of Backhoe Trench 19.

The 2 by 2 m unit of this block was excavated through Level 4, 0 to 40 cm. The 1 by 2 m unit was excavated only through Level 2 (0 to 20 cm). Strata 1 and 2 were encountered in all units; dark staining (anthrosol) and charcoal, however, were lacking. Calcrete was not encountered anywhere in this block, though its presence was documented deeper down in BHT 19. Thermal Feature 63 was exposed and excavated in Block 14.

A piece of mussel shell is the only cultural item recovered from this block (Table 7.15). No artifacts were recovered during the excavation of Block 14.

Table 7.14. LA 113042, Block 13, artifact and sample summary.

SAMPLE TYPE	TOTAL
Flotation	1
Pollen	1
Total	**2**

Table 7.15. LA 113042, Block 14, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Mussel shell	1
Flotation sample	1
Pollen sample	1
Total	**3**

Block 15 (7 sq m)

Block 15 was established to investigate Feature 66, a storage pit discovered during the excavation of Backhoe Trench 14 (Fig. 7.27). The units of this block

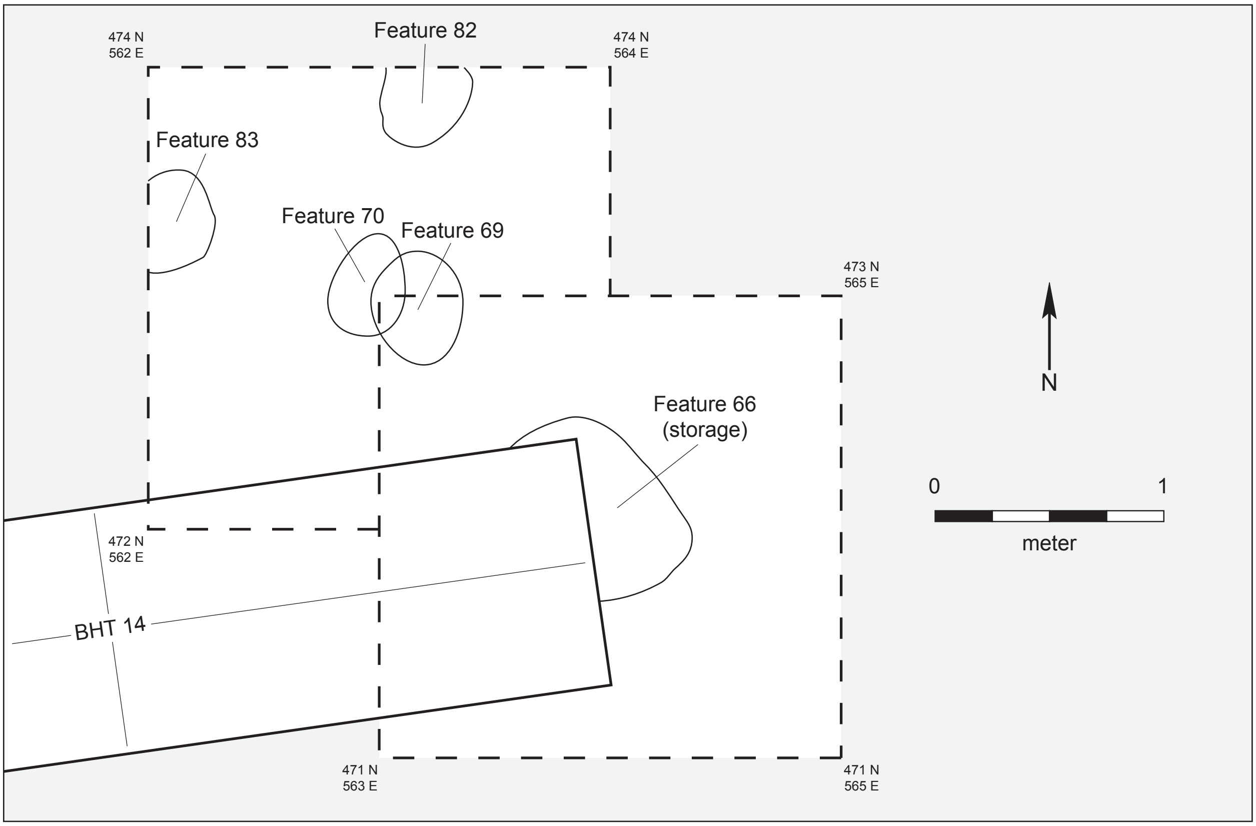

Figure 7.27. LA 113042, Block 15, plan.

were excavated through Levels 1 and 2, 0 to 20 cm. Strata 1 and 2 were encountered in both units. Dark staining (anthrosol) and charcoal were lacking, except in the immediate vicinities of the several features ultimately defined in this block.

Calcrete was not encountered anywhere in this block, though its presence was documented deeper down in BHT 14. Thermal Features 69, 70, 82, and 83 and one storage pit, 66, were exposed and excavated in Block 14. The only artifacts recovered were lithic debitage, with an average of 1.9 items per square meter of excavated area (Table 7.16).

Table 7.16. LA 113042, Block 15, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	**13**
C-14 sample	**1**
Flotation sample	**5**
Pollen sample	**4**
Total	**23**

Block 16 (4 sq m)

Block 16 was established to investigate Feature 68 that was discovered during the excavation of Backhoe Trench 19 (Fig. 7.28).

Table 7.17. LA 113042, Block 16, artifact and summary sample.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	**4**
C-14 sample	**1**
Flotation sample	**1**
Pollen sample	**2**
Total	**8**

The units of this block were excavated through Level 3, 0 to 30 cm. Strata 1 and 2 were encountered in both units, but dark staining (anthrosol) and charcoal were generally absent from this block. Calcrete was not encountered in this block, though its presence was documented deeper down in BHT 19. Thermal Features 68 and 71 were exposed and excavated in Block 16. Feature 68 appears to be bell shaped, a configuration that could be the result of precise superimposition of two pits (Fig. 7.29). The only artifacts

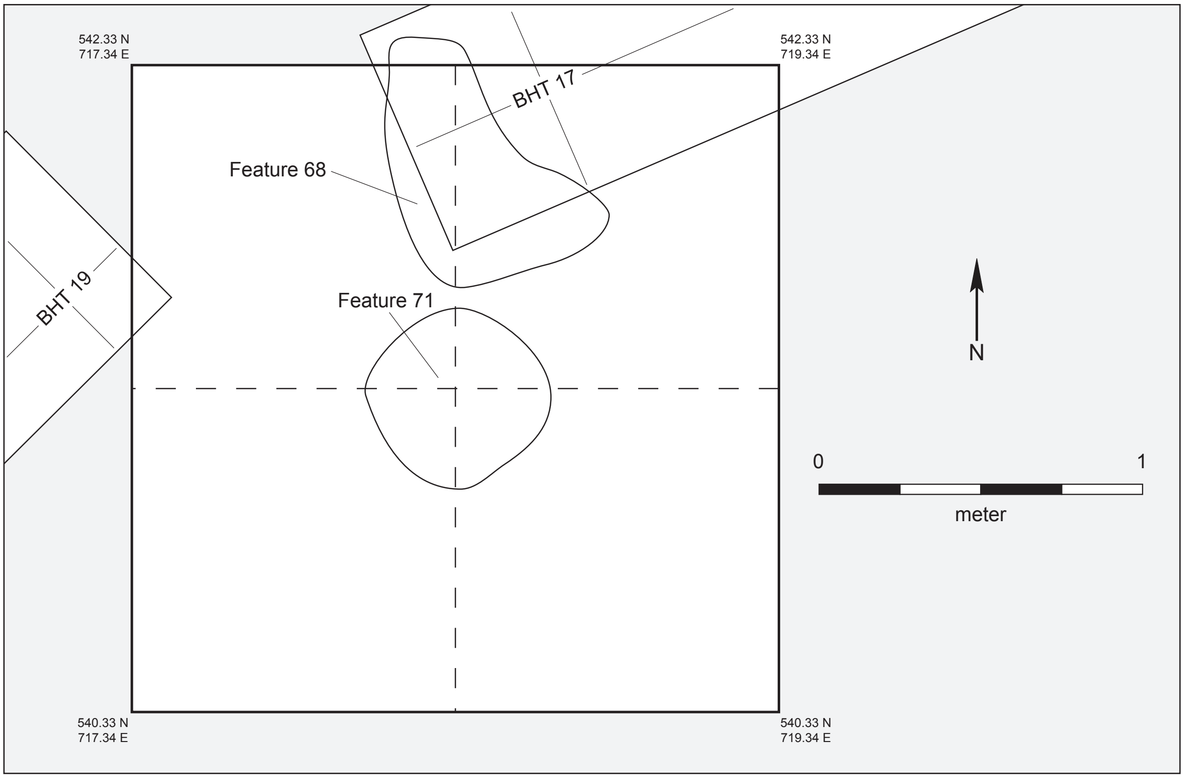

Figure 7.28. LA 113042, Block 16, plan.

Figure 7.29. LA 113042, Block 16, Thermal Feature 68, excavated (bell-shaped).

Table 7.18. LA 113042, Block 17, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
C-14 sample	1
Flotation sample	1
Pollen sample	1
Total	**3**

Table 7.19. LA 113042, Block 18, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
Lithic debitage	3
C-14 sample	5
Flotation sample	4
Pollen sample	5
Total	**17**

Table 7.20. LA 113042, Block 19, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
C-14 sample	1
Flotation sample	1
Pollen sample	1
Total	**3**

Table 7.21. LA 113042, Block 20, artifact and sample summary.

SAMPLE	TOTAL
Pollen sample	1
Total	**1**

recovered were lithic debitage, with an average of one item per square meter of excavated area (Table 7.17).

Block 17 (1 sq m)

Block 17 was established to investigate Feature 73 located just outside the east limit of Block 6. Thermal Feature 73 was exposed and excavated in Block 17.

No artifacts were recovered in this block, but several fill samples and materials were recovered from the feature (Table 7.18).

Block 18 (24 sq m)

Block 18 was established immediately next to the west edge of Block 6. Its purpose was to excavate four features exposed by surface scraping using a front-end loader. No hand excavation of individual 2 by 2 m units was undertaken.

Thermal Features 74, 75, 76, and 77 were exposed and excavated in Block 18 (Fig. 7.30). A few pieces of lithic debitage and several fill samples and materials were recovered from the features in this block (Table 7.19). The lithic debitage constituted a recovery density of 0.1 items per square meter.

Block 19 (1 sq m)

Block 19 was established within the mechanical-scrape area in the east half of this site. Its purpose was to excavate one feature exposed by the surface scraping using a front-end loader. No hand excavation of individual 2 by 2 m units took place.

Thermal Feature 78 was exposed and excavated in Block 19 (Figs. 7.31 and 7.32). No artifacts were recovered in this block, but several fill samples and materials were recovered from the feature (Table 7.20).

Block 20 (1 sq m)

Block 20 was established in the east half of the site between Backhoe Trench 1B and the mechanical scrape area to excavate one feature exposed by human means during the project. No hand excavation of individual 2 by 2 m units was undertaken.

Thermal Feature 79 was exposed and excavated in Block 20. No artifacts were recovered in this block, but a fill sample was obtained from the feature (Table 7.21).

Block 21 (1 sq m)

Block 21 was established within the mechanical-scrape area in the east half of this site. Its purpose was to excavate one feature exposed by the surface scraping using a front-end loader. No hand excavation of the unit was undertaken.Thermal Feature 80 was exposed and excavated in Block 21.

No artifacts were recovered in this block, but several fill samples and materials were recovered from the feature (Table 7.22).

Block 22 (10 sq m)

Block 22 was established within the mechanical scrape area in the eastern half of the site. Its purpose

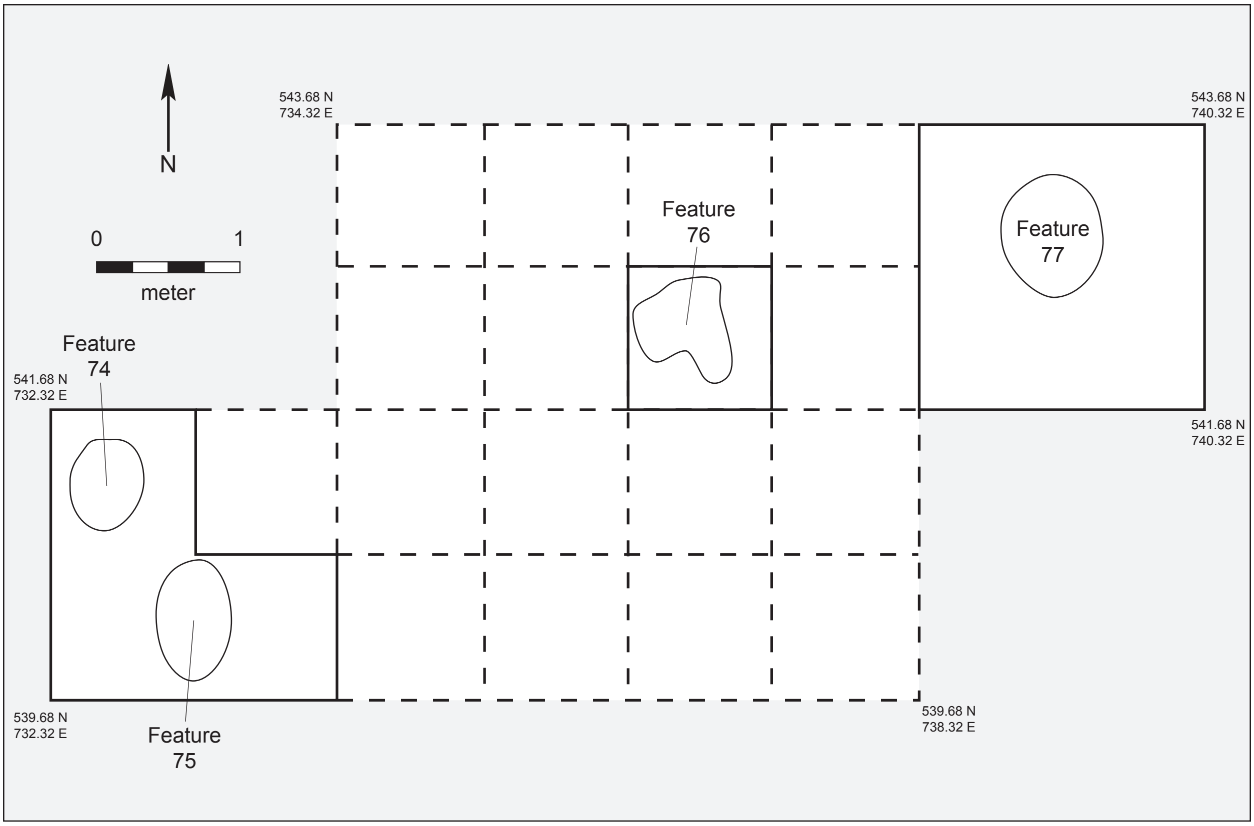

Figure 7.30. LA 113042, Block 18, plan.

Figure 7.31. LA 113042, Block 19, at ready for excavation.

Figure 7.32. LA 113042, Block 19, Thermal Feature 78, excavated (rock-type).

was to locate and excavate features that had been exposed by the surface scraping using a front-end loader.

Hand excavation of the 1 by 10 m unit was undertaken to remove the loose fill left over from mechanical scraping. Thermal Feature 81 was exposed and excavated in Block 22.

No artifacts were recovered in this block, but several fill samples and materials were recovered from the feature (Table 7.23).

Block Summary

A summary of findings for all blocks can be found in Table 7.24.

Table 7.22. LA 113042, Block 21, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
C-14 sample	1
Dendro sample	2
Pollen sample	4
Total	**7**

Table 7.23. LA 113042, Block 22, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	TOTAL
C-14 sample	2
Flotation sample	2
Pollen sample	2
Total	**6**

Hand Excavation: Feature Descriptions

Feature 28: Thermal pit, non-rock, deep, and medium
Provenience: Block 1, 469N/514E
Elevation and Stratum: 99.00–98.76 m; Stratum 3
Size and Shape: Irregular oval, 44 by 36 by 24 cm
Definition: Fair
Fill: Moderate charcoal infusion
Bioturbation: Rodent, roots
Artifacts: Six lithics
Samples: Flotation, pollen, ochre
Dates: Intercept cal AD 1000 (Beta 258894)

Table 7.24. LA 113042, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURE/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	66	9	7	–	1	1	7.4
2	28	4	4	–	–	–	20
3	36	3	–	–	1	2	2.1
4	16	0	–	–	–	–	<0.1
5	16.5	3	2	–	–	1	0.1
6	16	2	2	–	–	–	1
7	16	0	–	–	–	–	<0.1
8	8	0	–	–	–	–	7.3
9	16	0	–	0	–	–	1.5
10	18	0	–	–	–	–	5.7
11	16	3	3	–	–	–	2.8
12	36	8	7	–	1	–	3.4
13	4	1	1	–	–	–	0
14	6	1	1	–	–	–	0
15	7	5	4	–	1	–	1.9
16	4	2	2	–	–	–	1
17	1	1	1	–	–	–	0
18	24	3	3	–	–	–	0.1
19	1	1	1	–	–	–	0
20	1	1	1	–	–	–	0
21	1	1	1	–	–	–	0
22	10	1	1	–	–	–	0
Total	**347.5**	**49**	**41**	**0**	**4**	**4**	–

Features 29, 30, 31: voided

Feature 32: Posthole?
Provenience: Block 1, 463N/514E
Elevation and Stratum: 98.93–98.77; Stratum 2
Size and Shape: Oval, 15 by 11 by 16 cm
Definition: Good
Fill: Heavy charcoal infusion
Bioturbation: Rodent intrusion near bottom
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 33: Paired thermal pits (both rock) interconnected by clean-out deposit; both rock
Provenience: Block 2, 461–462N/518-519E
Elevation and Stratum: 98.88–98.73, Stratum 1
Size and Shape: 33.1: large elongate irregular, 68 by 44 by 10 cm; 33.2: oval, 44 by 40 by 10 cm
Definition: Good
Fill: 33.1: Dark gray to black; 33.2: light gray
Bioturbation: Rodents, roots
Artifacts: Three lithic debitage
Samples: Two flotations, radiocarbon
Dates: Intercept cal AD 1020 (Beta 258895)

Feature 34: Thermal pit, non-rock, shallow, large
Provenience: Block 1, 463N/518E
Elevation and Stratum: 98.86–98.81; Strata 2-3
Size and Shape: Irregular oval, 64 by 50 by 5 cm
Definition: Fair to good
Fill: Light charcoal presence, some oxidation
Bioturbation: Some rootlets
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 35/38: Thermal pit, non-rock, shallow, and small
Provenience: Block 1, 466N/514E
Elevation and Stratum: 98.89–98.73, Strata 2-3
Size and Shape: Nearly square, 36 by 28 by 16 cm
Definition: Good
Fill: Dark, organically stained
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation
Dates: None

Feature 36: Thermal pit, rock, shallow, medium
Provenience: Block 2, 461-462N/519E
Elevation and Stratum: 98.90–98.76, Stratum 2 into Stratum 3
Size and Shape: Oval, 65 by 57+ by 14 cm (not fully exposed)
Definition: Good
Fill: Dark brown with pieces of charcoal
Bioturbation: Fairly good with some disturbance of west end
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1020 (Beta 258896)

Feature 37: Uncertain, thermal pit, rock
Provenience: Block 2, 462N/518-519E
Elevation and Stratum: 98.85–98.73, Stratum 2 into Stratum 3
Size and Shape: Oval, 45+ by 40+ by 12 cm (not fully exposed)
Definition: Good, with oxidized sides and bottom
Fill: Dark grayish-brown with pieces of charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1030 (Beta 258897)

Feature 38: Thermal pit; part of Feature 35

Feature 39: Voided; not a feature

Feature 40: Thermal pit (bell-shaped), non-rock, deep, medium
Provenience: Block 1, 469N/515E
Elevation and Stratum: 98.72–98.45, Stratum 3
Size and Shape: Circular, 51 by 50 by 24 cm
Definition: Good
Fill: Dark grayish-brown with pieces of charcoal
Bioturbation: Roots, insect
Artifacts: None
Samples: Flotation, pollen, dendro
Dates: Intercept cal 920 BC (Beta 258898)

Feature 41: Thermal pit, non-rock, shallow, small
Provenience: Block 1, 463N/518E
Elevation and Stratum: 98.79–98.71
Size and Shape: Elongate oval, 31 by 20 by 8 cm
Definition: Relatively intact
Fill: Dark brown with infused charcoal dust
Bioturbation: Rodent
Artifacts: Possible stone tool
Samples: Flotation, pollen
Dates: Intercept cal AD 1040 (Beta 258899)

Feature 42: Voided

Feature 43: Thermal pit, rock, shallow, medium
Provenience: Block 5, 556N/736E
Elevation and Stratum: 90.03–89.90
Size and Shape: Oval, 45 by 33 by 13 cm
Definition: Relatively intact
Fill: Very dark gray center with charcoal pieces; lighter gray around periphery
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 44: Rock cache in pit
Provenience: Block 1, 468N/513E
Elevation and Stratum: 99.09–98.81
Size and Shape: Oval, 72 by 53 by 28 cm
Definition: Intact collection of tabular carbonate rocks in a pit; pit boundaries not obvious
Fill: Rocks with minimal interstitial dirt
Bioturbation: None specifically noted
Artifacts: None other than the rocks
Samples: Pollen
Dates: None

Feature 45: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 540N/740E
Elevation and Stratum: 90.74–90.64
Size and Shape: Nearly circular, 39 by 36 by 10 cm
Definition: Clearly defined
Fill: Heavily charcoal infused upper, lighter-colored lower
Bioturbation: Rodent burrowing
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1160 (Beta 258900)

Feature 46: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 542N/744E
Elevation and Stratum: 90.62–90.47
Size and Shape: Oval, 40 by 26 by 15 cm
Definition: Mostly distinct but upper part diffuse
Fill: Charcoal infused and some larger pieces
Bioturbation: Slight diffusion of bottom

Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 690 (Beta 258901)

Feature 47: Posthole
Provenience: Block 5, 555N/736E
Elevation and Stratum: 89.98–89.84
Size and Shape: Circular, 9 by 9 by 10 cm
Definition: Good
Fill: Fine sand with some charcoal
Bioturbation: None evident
Artifacts: None
Samples: Flotation
Dates: None

Feature 48: Pit
Provenience: Block 3, 579N/727E
Elevation and Stratum: 88.77–88.25, Strata 3 and 4
Size and Shape: Oval basin, 88 by 55 by 52 cm
Definition: Well-defined
Fill: Unstratified, brown, medium to coarse grained
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation
Dates: None

Feature 49: Thermal pit, non-rock, shallow, small
Provenience: Block 1, 469N/513E
Elevation and Stratum: 98.48–98.42
Size and Shape: Circular, 23 by 21 by 6 cm
Definition: Fairly discrete
Fill: Brown sandy loam with a few pieces of charcoal
Bioturbation: Rodent, insect
Artifacts: Mussel shell fragment
Samples: Flotation, pollen
Dates: Intercept cal AD 660 (Beta 258902)

Feature 50: Thermal pit, non-rock, shallow, and small
Provenience: Block 3, 581N/731E
Elevation and Stratum: 88.73–88.65, Strata 2 and 3
Size and Shape: Circular, 20 by 20 by 8 cm
Definition: Diffuse boundary
Fill: Medium- to dark-brownish red with charcoal flecks
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 51: Thermal pit, non-rock, shallow, small
Provenience: Block 5, 558N/735E
Elevation and Stratum: 90.08–89.93
Size and Shape: Circular, 56 by 55 by 15 cm
Definition: Fairly discrete
Fill: Slightly darker than surrounding sediment; some charcoal
Bioturbation: Roots
Artifacts: None
Samples: Flotation
Dates: None

Feature 52: Posthole
Provenience: Block 3, 583N/729E
Elevation and Stratum: 88.52–88.32, Stratum 3
Size and Shape: Circular, 10 by 10 by 20 cm
Definition: Clear boundaries
Fill: Slightly darker than surrounding sediment; some charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 53: Large storage pit, with one end later used as a rock thermal pit?
Provenience: Block 1, centerpoint at 466N/521E
Elevation and Stratum: 98.75–98.28, top of Stratum 2 into 3
Size and Shape: Elongate, 196 by 64 by 47 cm
Definition: Boundaries defined by subtle color variation
Fill: Well-sorted fine sand with slight organic coloration
Bioturbation: Fine root and insect larvae intrusions
Artifacts: One lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 54: Thermal pit, non-rock, shallow, medium
Provenience: Block 11, 493N/616E
Elevation and Stratum: 92.80–92.69
Size and Shape: Irregular oval, 40 by 33 by 11 cm
Definition: Good
Fill: Black
Bioturbation: Roots
Artifacts: One lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 55: Thermal pit, non-rock, shallow, medium
Provenience: Block 11, 493N/616E
Elevation and Stratum: 92.80–92.69, Strata 2 and 3
Size and Shape: Oval, 51 by 40 by 12 cm
Definition: Good
Fill: Dark gray to black
Bioturbation: Rodent
Artifacts: One lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1030 (Beta 258903)

Feature 56: Thermal pit, non-rock, shallow, small
Provenience: Block 11, 493N/616E
Elevation and Stratum: 93.40–93.32
Size and Shape: Circular, 25 by 24 by 8 cm
Definition: Good
Fill: Sandy, mottled with charcoal
Bioturbation: Small roots
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 1030 (Beta 258904)

Feature 57: Uncertain, thermal pit, non-rock
Provenience: Block 12, 375N/604E
Elevation and Stratum: 92.41–92.27
Size and Shape: Oval, 42+ by 37 by 14 cm
Definition: Fairly well defined boundaries
Fill: Central part possessed heavy charcoal stain, periphery less so
Bioturbation: Minor
Artifacts: None
Samples: Flotation, radiocarbon
Dates: None

Feature 58: Thermal pit, non-rock, shallow, and small
Provenience: Block 12, 375N/605E
Elevation and Stratum: 92.26–92.17
Size and Shape: Oval, 25 by 23 by 9 cm
Definition: Good; sides slightly oxidized
Fill: Very dark gray to black with charcoal in center
Bioturbation: Minimal root penetration
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 570 (Beta 275121)

Feature 59: Thermal pit, non-rock, shallow, medium
Provenience: Block 12, 375N/606E
Elevation and Stratum: 92.36–92.19
Size and Shape: "Amorphous," 50 by 47 by 17 cm
Definition: Fair
Fill: Gray with black mottles and charcoal flecks
Bioturbation: Rodent disturbance to edges, especially on one end
Artifacts: Chipped stone tool
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 60: Intersecting group of thermal pits
Provenience: Block 12, 374N/606E
Elevation and Stratum: 93.22–92.97
Size and Shape: Irregular oval, 182 by 168 by 25 cm
Definition: Irregular boundaries
Fill: Heavily charcoal laden
Bioturbation: Significant rodent, root, and insect larvae
Artifacts: One each lithic debitage, potsherd, and shell fragment
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 61: Thermal pit, non-rock, very deep, medium
Provenience: Block 12, 474N/604E
Elevation and Stratum: 92.67–92.21
Size and Shape: "Amorphous," 46 by 46 by 46 cm
Definition: Fairly well defined by slightly darker color and slightly harder edges
Fill: Black
Bioturbation: Some disturbance by rodents and fine roots
Artifacts: None
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 62: Thermal pit, rock, very deep, medium
Provenience: Block 13 (BHT 11), 538N/707E
Elevation and Stratum: 91.04–90.68; Stratum 3
Size and Shape: Oval, 48 by 15+ by 36 cm (not fully exposed)
Definition: Good
Fill: Very dark gray to black color
Bioturbation: Slight from small roots
Artifacts: None
Samples: Flotation
Dates: None

Feature 63: Thermal pit (bell-shaped), rock, very deep, very large
Provenience: Block 14 (BHT 19), 536N/698E
Elevation and Stratum: 91.20–90.86; from near top of Stratum 2, through Stratum 3 to calcrete
Size and Shape: oval, 135 by 110+ by 35 cm (not fully exposed)
Definition: Good, as sides and bottom consisted of calcrete
Fill: Very dark gray to black
Bioturbation: Minimal
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 140 (Beta 258906)

Feature 64: Thermal pit, non-rock, shallow, medium
Provenience: Block 2, 456N/518E
Elevation and Stratum: 98.89–98.75; Stratum 3
Size and Shape: Oval, 56 by 34+ by 14 cm (not fully exposed)
Definition: Clear, abrupt, and distinct
Fill: Organic content slightly darker than surrounding sediment
Bioturbation: Rootlet, insect
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 540 (Beta 258905)

Feature 65: Double thermal pit, non-rock
Provenience: Block 12, 374N/605E
Elevation and Stratum: 92.21–92.05; Stratum 2
Size and Shape: upper part (oval): 49 by 26 by 4 cm; lower part (circular): 12 by 12 by 12 cm
Definition: Good; both chambers lightly oxidized
Fill: Dark brown sand mottled with charcoal
Bioturbation: Rodent, rootlets
Artifacts: None
Samples: Flotation
Dates: None

Feature 66: Large pit
Provenience: Block 15, 471N/563E
Elevation and Stratum: 95.93–95.63
Size and Shape: D-shaped, 86 by 46+ by 30 cm (not fully exposed)
Definition: Good
Fill: Brown mottled with charcoal flecks
Bioturbation: Rodent
Artifacts: Three lithic debitage, one stone tool
Samples: Flotation, pollen
Dates: None

Feature 67: Thermal pit, non-rock, shallow, small
Provenience: Block 12, 375N/604E
Elevation and Stratum: 92.17–92.00
Size and Shape: Nearly circular, 29 by 28 by 17 cm
Definition: Good, with oxidized and stained sides
Fill: Dark gray with charcoal flecks
Bioturbation: Rodent?, root, insect
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 640 (Beta 258907)

Feature 68: Thermal pit (bell-shaped), non-rock, very deep, medium
Provenience: Block 16 (BHT 19), 540N/717E
Elevation and Stratum: 91.76–91.17
Size and Shape: Oval, 65 by 40+ by 59 cm (not fully exposed)
Definition: Good
Fill: Dark gray to black
Bioturbation: Fine rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 130 (Beta 258908)

Feature 69: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 472–473N/562–563E; partly overlapped by Feature 70
Elevation and Stratum: 95.93–95.81, Stratum 2
Size and Shape: Elongate oval, 66 by 24 by 12 cm
Definition: Clear boundaries
Fill: Dark gray-brown, with charcoal
Bioturbation: Root
Artifacts: One lithic debitage, one potsherd, one polishing stone
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 70: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 472–473N/562–563E; partly overlaps Feature 69
Elevation and Stratum: 96.31–96.19
Size and Shape: Oval, 60 by 56 by 12 cm
Definition: Good
Fill: Dark gray to black
Bioturbation: Rodent, root

Artifacts: One lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 71: Thermal pit, rock, shallow, medium
Provenience: Block 16, 541N/718E
Elevation and Stratum: 91.40–91.29
Size and Shape: Oval, 48 by 44 by 11 cm
Definition: Good boundaries
Fill: Dark gray, grading to a lighter color with depth
Bioturbation: Rootlet
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 72: Pit
Provenience: Block 12, 372N/606E
Elevation and Stratum: 92.12–91.98; Strata 2 and 3
Size and Shape: Oval, 43 by 37 by 14 cm
Definition: Subtle
Fill: Pit first located as cluster of three sandstone rocks at top of fill, followed by definition of sides and bottom based on differences in sediment grain size, texture, and color
Bioturbation: None noted
Artifacts: Three ground stone items
Samples: Flotation, pollen
Dates: None

Feature 73: Thermal pit, rock, shallow, medium
Provenience: Block 17, 542N/743E
Elevation and Stratum: 90.78–90.67, Strata 2 and 3
Size and Shape: Oval, 56 by 54 by 11 cm
Definition: Good, except for upper part, this was disturbed by dune removal
Fill: Dark brown with gray center with dark gray-brown margins
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: Intercept cal AD 650 (Beta 258909)

Feature 74: Thermal pit, rock, shallow, large
Provenience: Block 18, 540N/732E
Elevation and Stratum: 91.20–91.04, Stratum 2
Size and Shape: Elongate oval, 70 by 53 by 16 cm
Definition: Good, except for upper part this was disturbed by dune removal
Fill: Dark brown with some charcoal dust but no obvious pieces of charcoal
Bioturbation: None noted
Artifacts: Two lithic debitage
Samples: Flotation, pollen
Dates: None

Feature 75: Thermal pit, rock, shallow, large
Provenience: Block 18, 539N/733E
Elevation and Stratum: 91.16–91.02, Strata 2 and 3
Size and Shape: Oval, 90 by 60 by 14 cm
Definition: Good, except for upper portion that was disturbed by dune removal
Fill: Dark gray to black
Bioturbation: None noted
Artifacts: Four lithic debitage
Samples: Flotation, pollen, macro-botanical, burned rock, radiocarbon
Dates: Intercept cal AD 690 (Beta 258912)

Feature 76: Thermal pit, non-rock, shallow, and large
Provenience: Block 18, 542N/735E
Elevation and Stratum: 91.09–90.95
Size and Shape: Irregular, 70 by 60 by 14 cm
Definition: Good, except upper limits that were smeared during dune removal
Fill: Dark brownish gray
Bioturbation: Rodent, rootlet, insect
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 77: Thermal pit, rock, shallow, large
Provenience: Block 18, 541N/737E
Elevation and Stratum: 91.08–90.94, Strata 2 and 3
Size and Shape: Roughly oval, 88 by 72 by 14 cm
Definition: Good, except upper limits that were disturbed during dune removal
Fill: Dark brownish gray with pieces of charcoal
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: Intercept cal AD 610 (Beta 275122)

Feature 78: Thermal pit, rock, shallow, medium
Provenience: Block 19, 531N/706E

Elevation and Stratum: 91.43–91.29, Stratum 2 into Stratum 3
Size and Shape: Circular, 54 by 52 by 14 cm
Definition: Good, though some of upper part disturbed during dune removal
Fill: Dark gray with charcoal; burned rocks around north end
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 210 (Beta 258910)

Feature 79: Thermal pit, non-rock, shallow, and medium
Provenience: Block 20, 557N/717E
Elevation and Stratum: 91.18–91.04
Size and Shape: Nearly circular, 52 by 50 by 14 cm
Definition: Upper part smeared by dune removal; lower part good
Fill: Dark gray-brown with charcoal flecks and pieces
Bioturbation: Rodent, northeastern edge
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 80: Thermal pit, rock, shallow, large
Provenience: Block 21, 531N/699E
Elevation and Stratum: 90.97–90.80, Strata 2 and 3 to calcrete
Size and Shape: Octagonal, 90 by 52 by 17 cm
Definition: Upper part smeared by dune removal; otherwise clear and distinct
Fill: Dark brownish gray to black
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, burned rock, radiocarbon
Dates: Intercept cal AD 140 (Beta 258913)

Feature 81: Thermal pit, non-rock, deep, medium
Provenience: Block 22, 522N/684E
Elevation and Stratum: 90.51–90.07, intrusive into Stratum 3
Size and Shape: Steep-sided oval, 60 by 55 by 44 cm
Definition: Upper part smeared by dune removal; otherwise clear and distinct
Fill: Charcoal infused sediment with pieces of charcoal common
Bioturbation: Rodent, insect
Artifacts: None
Samples: Flotation, pollen, fire-cracked rock, radiocarbon
Dates: Intercept cal AD 670 (Beta 258914)

Feature 82: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 473N/563E
Elevation and Stratum: 95.93–95.63
Size and Shape: Oval, 42 by 32 by 10 cm
Definition: Upper part: diffuse; lower part: well-defined
Fill: Dark brown with moderate infusion of charcoal/organic dust
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 660 (Beta 258911)

Feature 83: Thermal pit, non-rock, deep, medium
Provenience: Block 15, 473N/562E
Elevation and Stratum: 95.98–95.76, Stratum 2
Size and Shape: Oval, 49 by 30+ by 22 cm
Definition: Clear boundaries, but only half exposed
Fill: Black
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

8 ⩡ LA 129214, Back Ridge Site

Regge N. Wiseman and Donald E. Tatum

Site Description

LA 129214, the back ridge site, is a multicomponent site that begins on the top of the western or back ridge and extends down the east slope to a small south-trending drainage (Fig. 8.0). East of that drainage lies the eastern or front ridge, the location of the front ridge site (LA 113042). The terms "back" and "front" refer to the positions of these two ridges relative to Nash Draw, which lies to the east of the front ridge. Both ridges are remnants of Quaternary alluvial and bolson deposits; their summits are 917 m (3,008 ft) above mean sea level and 15 m (49 ft) above the flats to the south and east, respectively.

Environment

At LA 129214, the east-facing slope of the back ridge is covered with stabilized coppice dunes from 1 to 3 m (3 to 10 ft) high crowned by mesquite shrubs (Fig. 8.1). Sand dunes or hillocks are interspersed with deflation depressions or "blowouts" within which burned-rock features and artifacts are exposed (Fig. 8.2). Discontinuous outcrops of caliche are visible across the ridgetop along the east slope. In addition to the dominant mesquite, on-site vegetation includes crucifixion thorn, four-wing saltbush, creosote, acacia, dropseed grass, broom snakeweed, grama, and prickly pear cactus (OAS 2006).

LA 129214 measures 504 m (1,653 ft) north–south along the ridge and 256 m (839 ft) east–west from the top of the ridge down the slope to the drainage. Total site area is approximately 20.5 acres (8.3 ha), 4.44 acres (1.8 ha) (21.7 percent) of which lies within the project limits. Both the existing and proposed rights-of-way for NM 128 transected the site.

The site was initially recorded during a cultural resource inventory for the New Mexico Department of Transportation (TRC Associates 2000). A reassessment was conducted by SWCA in 2006. Originally, 34 features were identified by TRC. These included 23 burned caliche and ash-stained midden deposits, one burned caliche midden, four burned caliche and burned-rock concentrations, five burned caliche scatters, and one possible aboriginal roomblock structure. The 2006 reassessment identified four additional burned caliche concentrations (Table 8.1).

Surface artifacts identified during the 2000 and 2006 surveys included chipped stone debitage (including biface-thinning and pressure flakes), 41 shaped chipped stone artifacts, mano and metate fragments, five hammerstones, and 25 pottery sherds.

The pottery included undifferentiated brown ware, a pinched El Paso rim sherd, a Jornada Red-on-brown sherd, and a probable Playas Red Incised sherd. The paucity of diagnostic artifacts recovered during site recording, probably the result of decades of artifact collecting by locals, made problematic the estimation of occupation dates. Infrequency of pottery and dominance of chipped stone debitage in the artifact assemblage suggested an Archaic occupation with minor Formative period reuse between AD 500 and 950 (OAS 2006).

Surface Features

The initial (TRC Associates 2000) as well as subsequent surveys of LA 129214 (SWCA 2006; OAS 2006) identified 17 features (5–8, 10–11, 18–21, 32–38) lying within the project limits. Feature 18, a burned caliche ash midden, was believed to be outside the right-of-way by TRC and inside the right-of-way by SWCA. Our investigation concurred with TRC. We could not relocate Feature 21. We did, however, relocate Feature 38, a 1 by 1 m burned caliche concentration, but determined that it was a scatter of rocks displaced by the road cut on the north side of the existing NM 128.

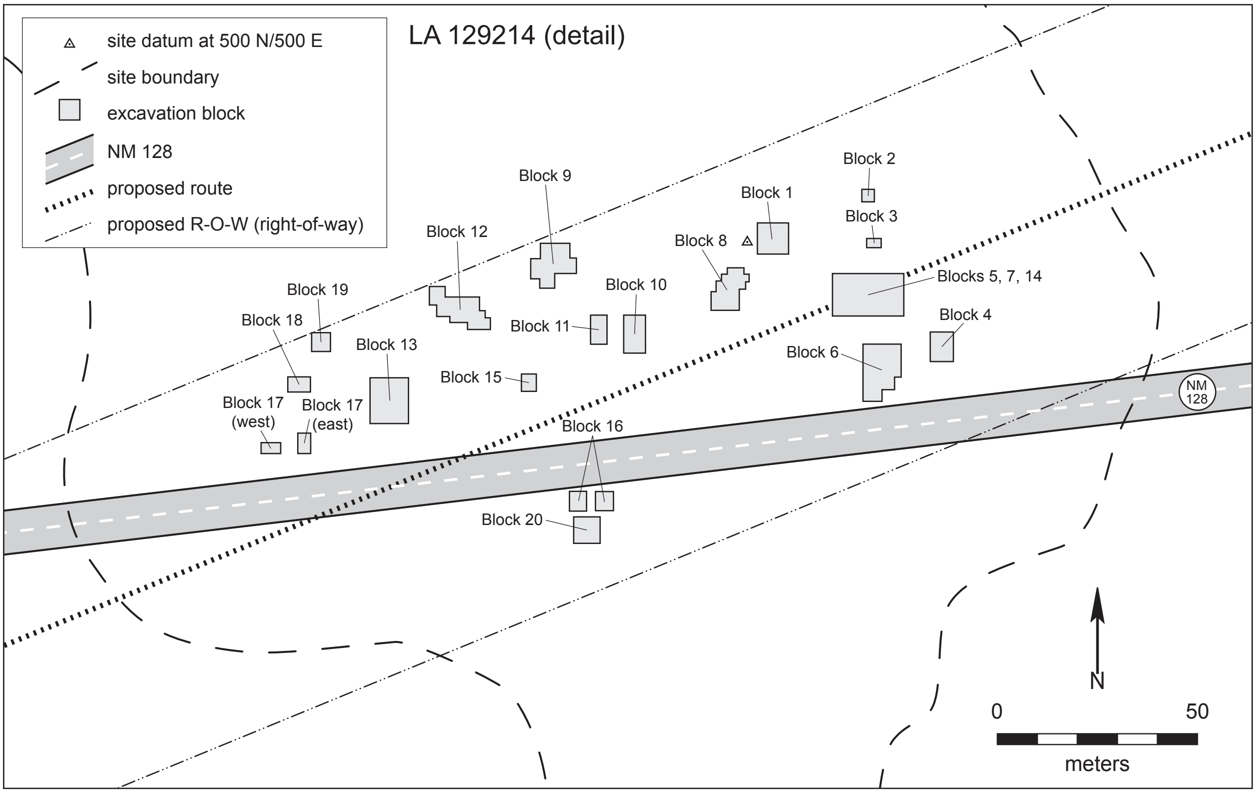

Figure 8.0. LA 129214, back ridge site, site map.

Grids for 13 excavation blocks were established to investigate all but one of the surface survey features identified within the highway project. A total of 933 1 by 1 m units were hand-excavated to depths from 10 to 120 cm below the present ground surface. Excavation was discontinued when the calcrete layer appeared or when culturally sterile levels were achieved. A total of 156 subsurface features were discovered and excavated. These included 138 thermal features, 14 postholes, one cobble post-support, and three calcrete features that appear to have been components of two different structures. Another calcrete feature possibly might have been the natural outlet for a water spring.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

Site LA 129214 occupies a small, northeast-trending ridge formed by a series of south and east-facing steppes descending from the north-trending Quahada Ridge, 2 miles to the northwest.The western and central portion of the site lies among a series of rolling coppice dunes punctuated by blowout depressions. The eastern part of the site lies along a gradually descending, east-facing slope that forms the west side of a broad, southeast-trending wash originating from the incised, terraced slopes along the east flanks of Quahada Ridge. The NM 128 relocation corridor crosses the center of the site.

Archaeological Surface Sediment Zone Distribution

Fourteen backhoe trenches and two surface-bladed areas were excavated to explore relationships between surface visibility of archaeological materials and subsurface cultural and geomorphic deposits in surface sediment Zones 1, 2, and 3. Zone 1 deposits occupied most of the northwest quadrant, parts of the northeast quadrant, and the south-central edge of the corridor crossing. These areas comprised roughly 40 percent of the corridor crossing. Backhoe Trenches 1, 2, 10, and 13 were excavated in Zone 1 areas. Zone 2 deposits comprised about

Figure 8.1. Overview looking southeast from Block 19, with Block 12 in the foreground. Highway disappears over ridge upon which LA 113042 is situated. Livingston Ridge forms the distant horizon.

Figure 8.2. LA 129214, example of a high, mesquite-covered dune on site.

Table 8.1. LA 129214, features that lay within or immediately adjacent to NM 128.

SURVEY FEATURE NO.	OAS BLOCK NO.	FEATURE TYPE	DIMENSIONS (M) TRC 2000, SWCA (2006)
5	15	burned caliche and ash midden	10 x 12
			not considered by SWCA; subsumed by OAS Feature 34
6	12	burned caliche and ash midden	15 x 15
			26 x 12
7	8	burned caliche and ash midden	8 x 8
			10 x 8
8	10 and 11	burned caliche and ash midden	4 x 4
			7 x 14
9	9	burned caliche and ash midden	15 x 15
			not considered by SWCA
10	16 West	burned caliche and ash midden	6 x 10
			12 x 4
11	16 East	burned caliche and ash midden	10 x 12
			2 x 1
19	16 East	burned caliche and ash midden	10 x 12
			SWCA - no data
20	20	burned caliche and ash midden	10 x 12
			10 x 12
32	18	possible roomblock structure	6 x 7
			4 x 5
33	13	burned caliche and ash midden	10 x 20
			10 x 20
34	15	burned caliche and ash/ charcoal midden	6 x 9
			10 x 2
35	6	burned caliche concentration	14 x 16 (OAS)
36	17	burned caliche concentration	2 x 2 (OAS)
37	17	burned caliche concentration	3 x 3 (OAS)

Data from TRC Associates 2000.

15 percent, occupying the northeast corner and half of the southwest quadrant. Trenches 3, 7, 8, and 9 were excavated in Zone 2 areas. Zone 3 occupied the southeast quadrant, most of the central core, and parts of the northeast and northwest quadrants, for the remaining 45 percent of the corridor crossing. BHTs 4, 5, 6, 11, 12, and 14 were excavated in Zone 3 (Fig. 8.3a).

Soils, Stratigraphy, and Lithology of Trenches and Bladed Areas

Soils on the site consist of Tonuco loamy sand, an eroded soil derived from mixed alluvium and/or eolian sand occurring on alluvial fans and plains. The Tonuco is a Gypsiorthid-Torriorthent-Gypsum Land-associated thermic soil complex of loam, clay loam, and gypsiferous material derived from weathered gypsum (USDA-NRCS 2009; Maker et al. 1978).

A general description of the pedology and lithology of six backhoe trenches (BHT 1, 2, 10, and 12–14) are as follows. Most of the site was capped by coppice dune deposits that were partially stabilized by vegetation, and by a loose, unconsolidated sandy eolian deposit of varying thickness, though usually less than 10 cm. The fine- to medium-grained sand forming the shallow surface deposit was locally derived through erosion and deflation of the substrate. Plentiful inclusions of organic clastic material such as rodent and rabbit feces, and vegetative matter incorporated into the eolian deposit indicate recent reworking and deposition. The boundary of the eolian sand was irregular and abrupt because of erosion and bioturbation.

Across much of the corridor crossing, the eolian deposit was immediately underlain by a weak B horizon (Bw) consisting of grayish-brown, fine-grained sand. Throughout the core of the site, the Bw

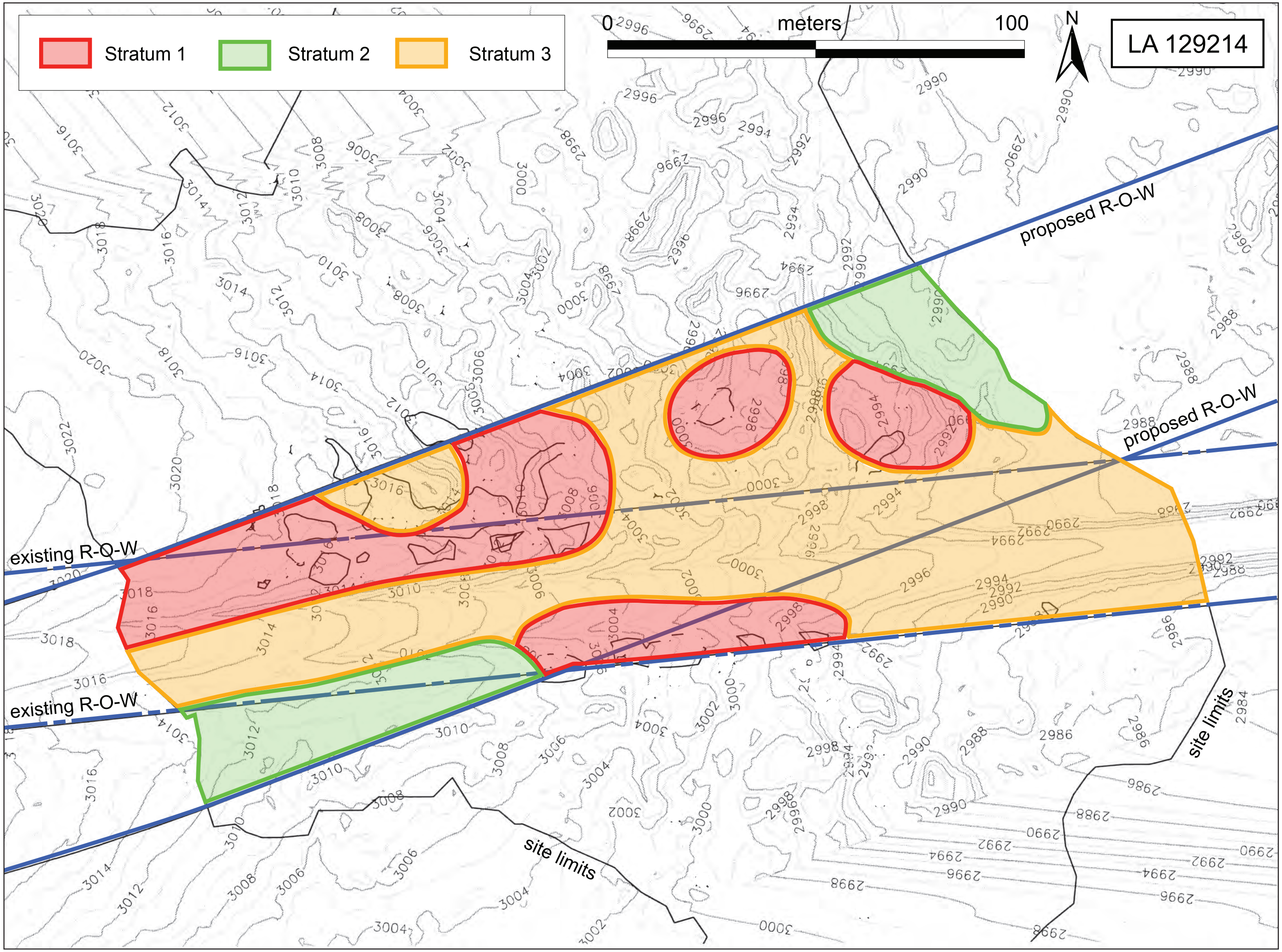

Figure 8.3a. LA 129214, map showing distribution of surface sediment zones.

Figure 8.3b. LA 129214, BHT 10, showing loose surface sand underlain by anthrosol, Bk horizon, and Ck horizon derived from Mescalero Paleosol at base.

was infused with human-derived organic matter, forming an anthrosol (Figs. 8.3b and 8.3c). The anthrosol had widely distributed, but sparsely concentrated, inclusions of ceramic fragments, fire-cracked rock, ground stone fragments, lithic debitage, and charcoal fragments. Bioturbation was prevalent in this stratum, the result of roots, rodents, and insects drawn to the organic nutrient-enhanced soil. Preceded by a diffuse boundary, the underlying Bk horizon was accompanied by gradually increasing clay development and carbonate precipitate in the soil that imparted a stronger structure, paler coloration, weak sand-grain cementation, and carbonate filament development in the reddish-brown, fine to medium sandy matrix.

The Bk was underlain by a Ck horizon, indicated by a sharp increase in percentage by volume of highly weathered and fragmented, rounded to subrounded caliche granules, pebbles, and cobbles derived from the underlying calcrete of the Mescalero Paleosol. This concentration of weathered carbonate colluvial and alluvial material in a shallow depositional horizon across the site indicated a period of erosion and deflation that occurred prior to, or early in the stage of, deposition of eolian sand. Excavation of the trenches ceased at the calcrete when it was present.

Thermal Features 187, 188, and 189 were discovered in BHT 10 (Figs. 8.3b through 8.3e). Two thermal features (Features 184, 202) were discovered in BHT 12 (Fig. 8.3f). Two thermal features were discovered in the lower trench profile of BHT 14. Feature 197 originated and terminated in the Bw; Feature 198 originated in the Bw and terminated on calcrete.

Four backhoe trenches (BHTs 3–6; Fig. 8.3g) were excavated in Zones 2 and 3 at the east edge of the corridor crossing along the edge of the broad, shallow, southeast-trending wash that bordered the site to the east (Fig. 8.3a). Upper stratigraphic profiles showed two discrete deposits of weakly consolidated fine alluvium consisting of yellowish-red, fine sand abruptly underlain by brown, well-sorted fine sand. In the wall of BHT 6, a clear glass painted label soda bottle was exposed in the lower layer, indicating recent massive sedimentation during major runoff events, possibly during the old NM 128 corridor construction. The boundary of the lower fine alluvium deposit was smooth and clear; the underlying Bw horizon consisted of well sorted, fine and very fine sand with some clay development,

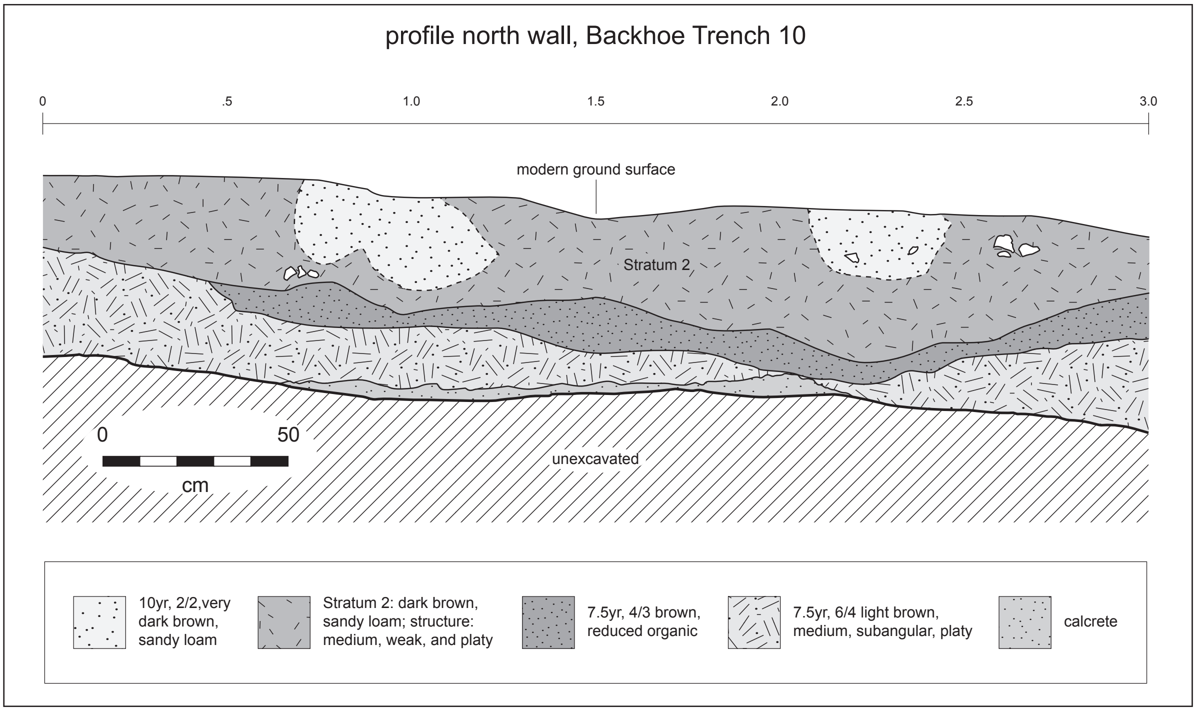

Figure 8.3c. LA 129214, BHT 10, north profile with Thermal Feature 152 and anthrosol.

imparting weak structure and cohesion. The Bw horizon was underlain by Bk horizon forming reddish-yellow clay-rich sand. The Bk had fine carbonate precipitate inclusions such as filaments, granules, and ped slips. After exposure to air and subsequent dehydration, carbonate efflorescence became visible on the lower trench walls. Trench excavation was discontinued at the Bk. A large buried hearth (Feature 201) was exposed in the B horizon of BHT 4.

Trenches 7, 8, and 9 were excavated in Zone 2 deposits in the southwest part of the corridor crossing (Fig. 8.3a). Stratigraphic profiles revealed recent shallow surface deposits of eolian sand underlain by reddish-brown Bw horizon-forming sand with slight clay development, and an underlying Bk horizon terminating at the Mescalero Paleosol. Two thermal pit features were exposed in the profile of BHT 7. Feature 199 originated in the Bw and was intrusive into the underlying Bk horizon. Feature 200 originated in the Bw and terminated at the calcrete substrate.

Backhoe Trench 11 was excavated in Zone 3 near the center of the northern APE boundary (Fig. 8.3a). The trench bisected an area with well developed coppice dunes. The entire trench profile was punctuated by numerous mesquite roots. The west and east profiles of BHT 11 showed surface eolian deposits underlain by Bw horizon anthrosol with plentiful charcoal fleck inclusions and more sparsely distributed inclusions of fire-cracked rock, ceramic fragments, and patchy, oxidized sediments (Figs. 8.3d and 8.3e). Seven thermal pit features (Features 152, 156, 158, 165, 193, 194, and 196,) and eight postmolds (Features 168, 169, 170, 195, 203, 204, 205, and 207) were discovered during trench excavation.

The boundary of the anthrosol was gradual. It had irregularities indicative of root growth and rodent/insect burrowing activities. The anthrosol was underlain by a transitional B/Bk horizon, indicated by gradually increasing quantities of carbonate granules, filaments, and slips along ped faces, which imparted weak cementation to the Bk. The Bk boundary was abrupt and irregular, terminating at the highly fragmented and weathered nodular calcrete Ck horizon derived from the underlying Mescalero Paleosol.

In the northwest quadrant of the corridor crossing, an area encompassing about 100 sq m of Zone 1 was selected for mechanical dune and overburden removal in order to help define the horizontal limits of archeological deposits discovered in Block 13, adjacent to the east (Fig. 8.3a). Several small, mesquite-covered coppice dunes were exca-

Figure 8.3d. LA 129214, BHT 11, north profile with Thermal Feature 152 and associated features.

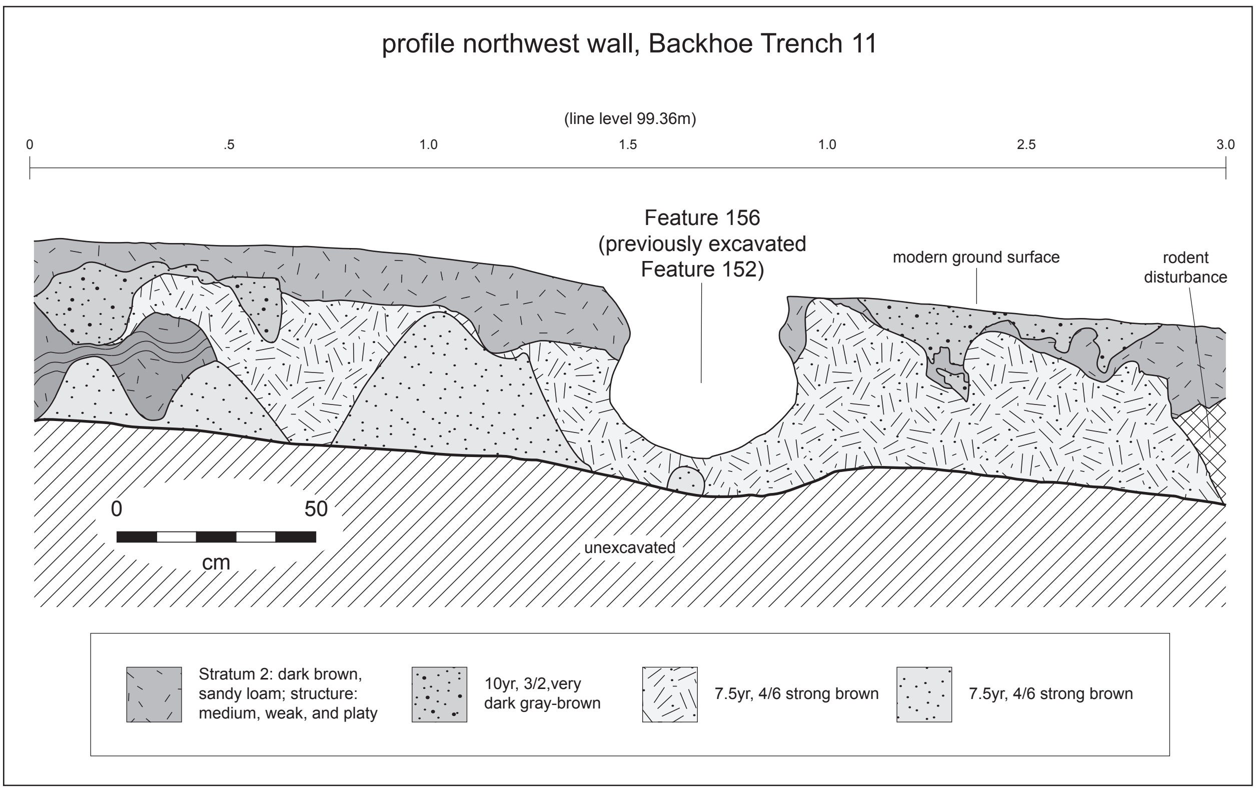

Figure 8.3e. LA 129214, BHT 11, north profile with Thermal Feature 152 and associated features.

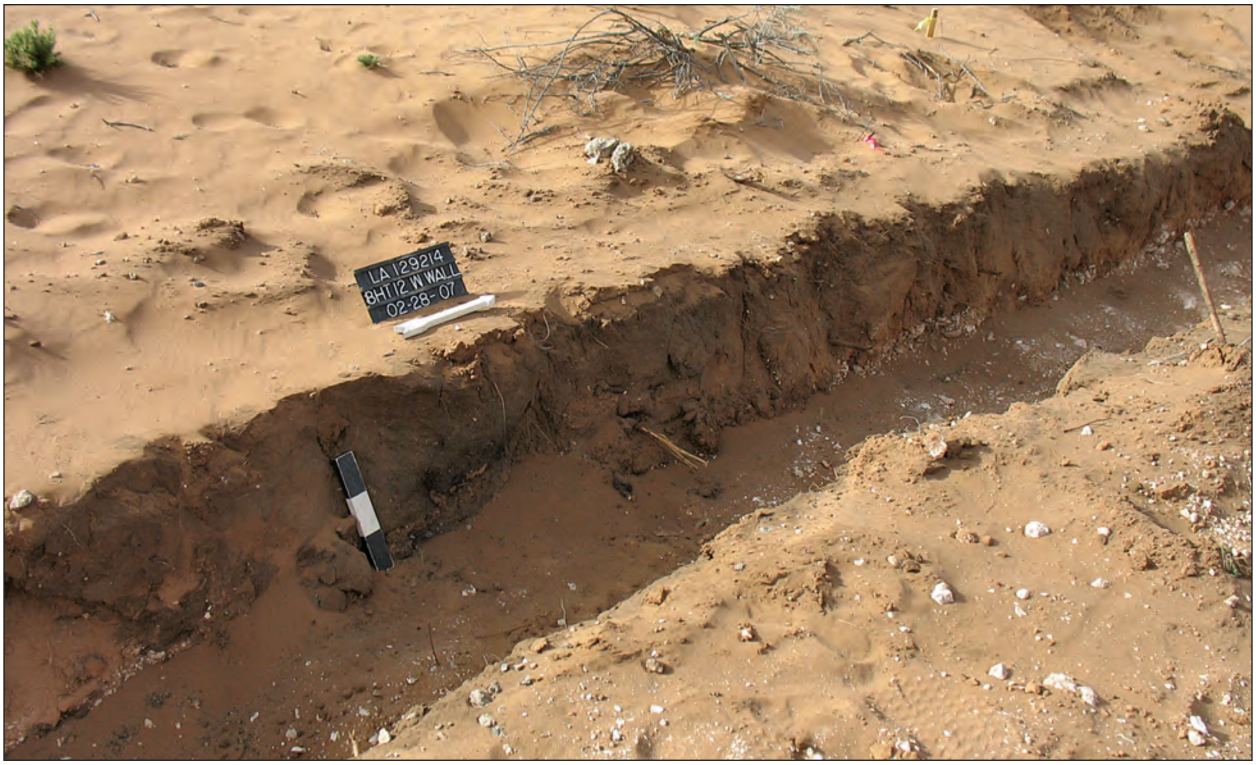

Figure 8.3f. LA 129214, BHT 12, west profile, showing loose surface sand underlain by anthrosol, Bk horizon, and Ck horizon derived from Mescalero Paleosol at base.

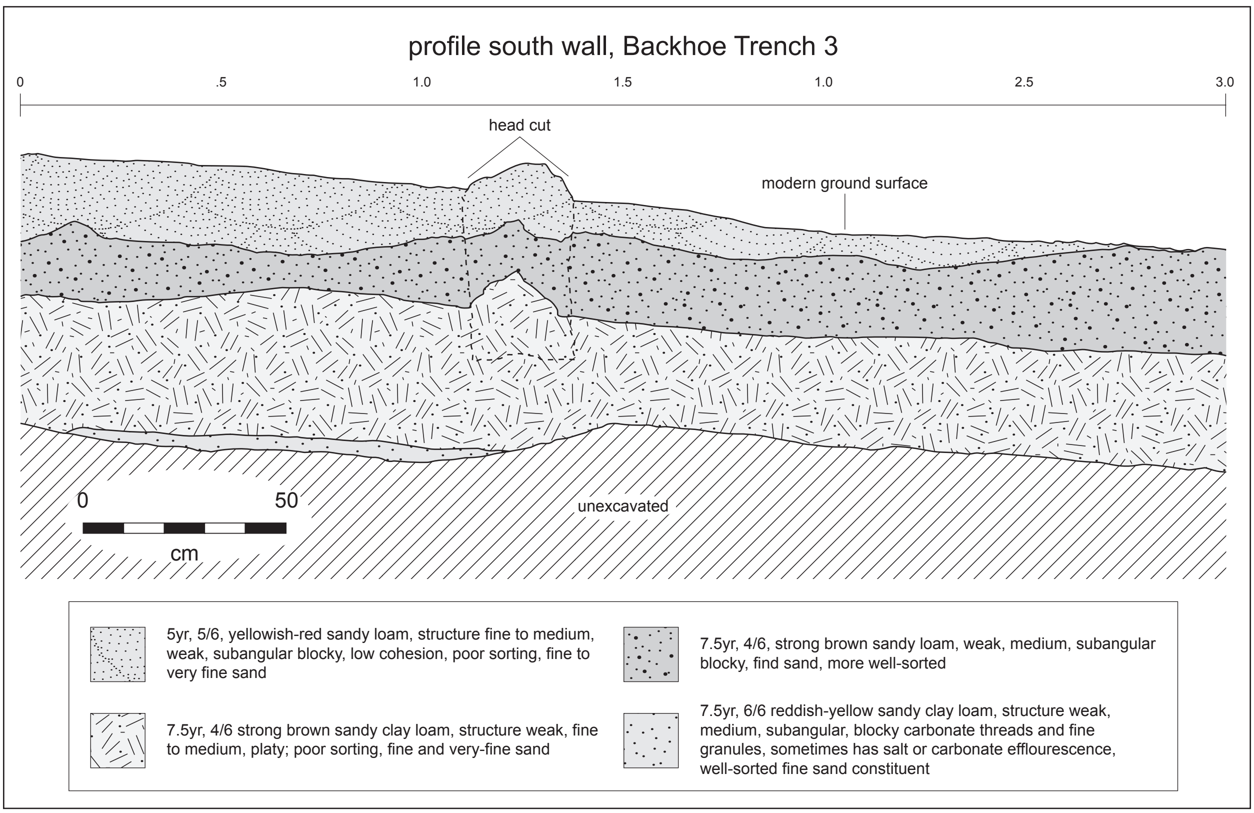

Figure 8.3g. LA 129214, BHT 3, south profile with fine alluvial deposits (weak B horizons) and Bk in lower profile.

vated with a backhoe and the surrounding eolian surface deposit was removed with a bucket loader. The surface scrape excavation revealed shallow eolian surface deposits underlain by patchy deposits of faintly anthropogenic soils originating in Bk horizon sands. The Bk abruptly terminated on calcrete. Two thermal pit features (Features 139, 141) and one non-thermal feature (Feature 140) were discovered in the bladed area. All of the features originated and terminated in the Bk.

Chronology Discussion

The majority of archaeological features discovered during the LA 129214 data recovery originated in the Bw sand and terminated in the Bk or directly on top of the Mescalero Paleosol. One feature discovered during the mechanical excavations, which originated in the Bw sand and was intrusive into the Bk was chronometrically dated. Feature 152 was discovered in BHT 11; it yielded a date of AD 600 to AD 680. Features 156 and 158, also discovered in BHT 11, originated and terminated in the Bw anthrosol, directly on top of Feature 152. They yielded a range of dates between AD 650 and AD 880. One thermal pit feature (Feature 141) discovered during mechanical overburden removal in the northwest quadrant of the site was chronometrically dated to AD 650 to 770.

Conclusion

Fourteen backhoe trenches and one surface-bladed area were excavated to explore relationships between areas with archaeological materials exposed at the ground surface and subsurface cultural and geomorphic deposits in archaeological Zones 1, 2, and 3. Examination of stratigraphy exposed in backhoe trenches and surface-stripped areas on the site revealed subsurface archaeological deposits in archaeological Zones 1, 2, and 3, including artifacts, features, and an associated anthrosol. The discovery of subsurface archaeological deposits in areas both with and without archaeological materials exposed on the surface indicates that the presence or absence of such materials does not accurately predict presence or absence of intact subsurface archaeological deposits.

Strata exposed in the backhoe trenches included a widespread, recent eolian surface deposit and low, poorly developed coppice dunes partially stabilized by vegetative growth. The surface eolian deposits were immediately underlain by an anthrosol originating in Bw horizon sands. With depth, the Bw gradually transitioned into a sandy Bk horizon, which was immediately and unconformably underlain by the calcrete of the Mescalero Paleosol. The sand constituent for the Bw and Bk horizons was derived from the Unit 1 eolian sand deposit.

Three of the thermal pit features discovered during mechanical excavation originated in the Bw horizon sand and were chronometrically dated, yielding a range of dates between AD 600 and AD 880. One thermal pit feature discovered during mechanical excavation originated in the Bk horizon and was chronometrically dated, yielding a date of AD 600 to AD 680.

Hand Excavation: Block Descriptions

Block 1 (91 sq m)

Block 1 (Fig. 8.4) was established to investigate several possible rock alignments/concentrations that did not receive surface survey feature numbers from any of the survey companies. The block is situated on the lower slope of the ridge at the east end of the site. The alignments/concentrations were subsequently assigned feature numbers 40, 41, and 42.

Excavations in Block 1 are defined in two sections by depth attained. The southern two-thirds of the block were excavated through Levels 2 and 3, 20 to 30 cm deep. Thus, Stratum 1 and Stratum 2 sediments were removed, but calcrete, other than that exposed in Features 40, 41, and 42, was not generally encountered. The northern third of squares was excavated only through Level 1, up to 10 cm deep, meaning that only Stratum 1 sediments were removed. Artifacts were sparse in the block, with the majority recovered from the southern third, fewer in the middle third, and the fewest in the northern third.

Ten or possibly 11 features were excavated in Block 1. Rock alignments/concentrations, Features 40, 41, and possibly 42, are interpreted as anchors for windbreaks, a subject discussed in some detail in a later chapter (Fig. 8.5). Features 39, 43, 58, 59, 83, 85, 88, and 89 are thermal features.

Very few artifacts were recovered from Block 1 (Table 8.2). Chipped lithic debitage, pottery sherds,

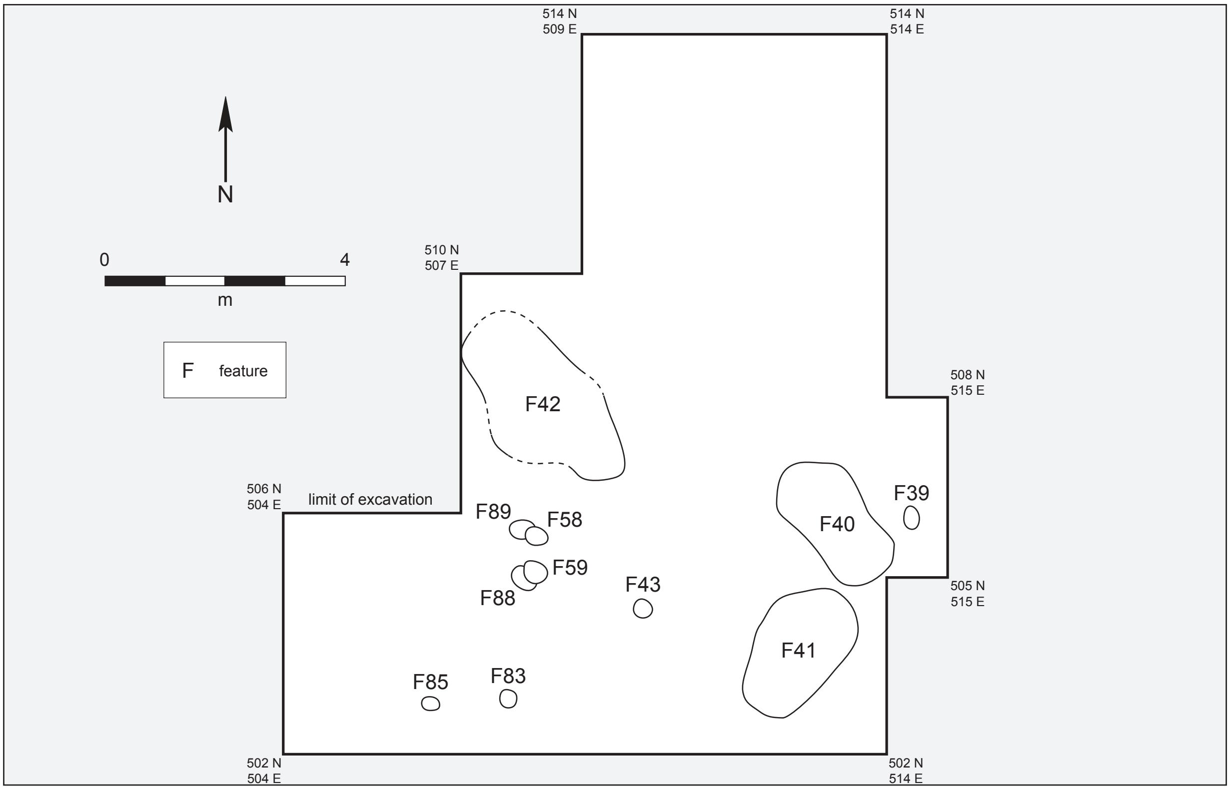

Figure 8.4. LA 129214, Block 1, plan.

Figure 8.5. LA 129214, Block 1, excavated. Features 41, 40, and 42, from left to right.

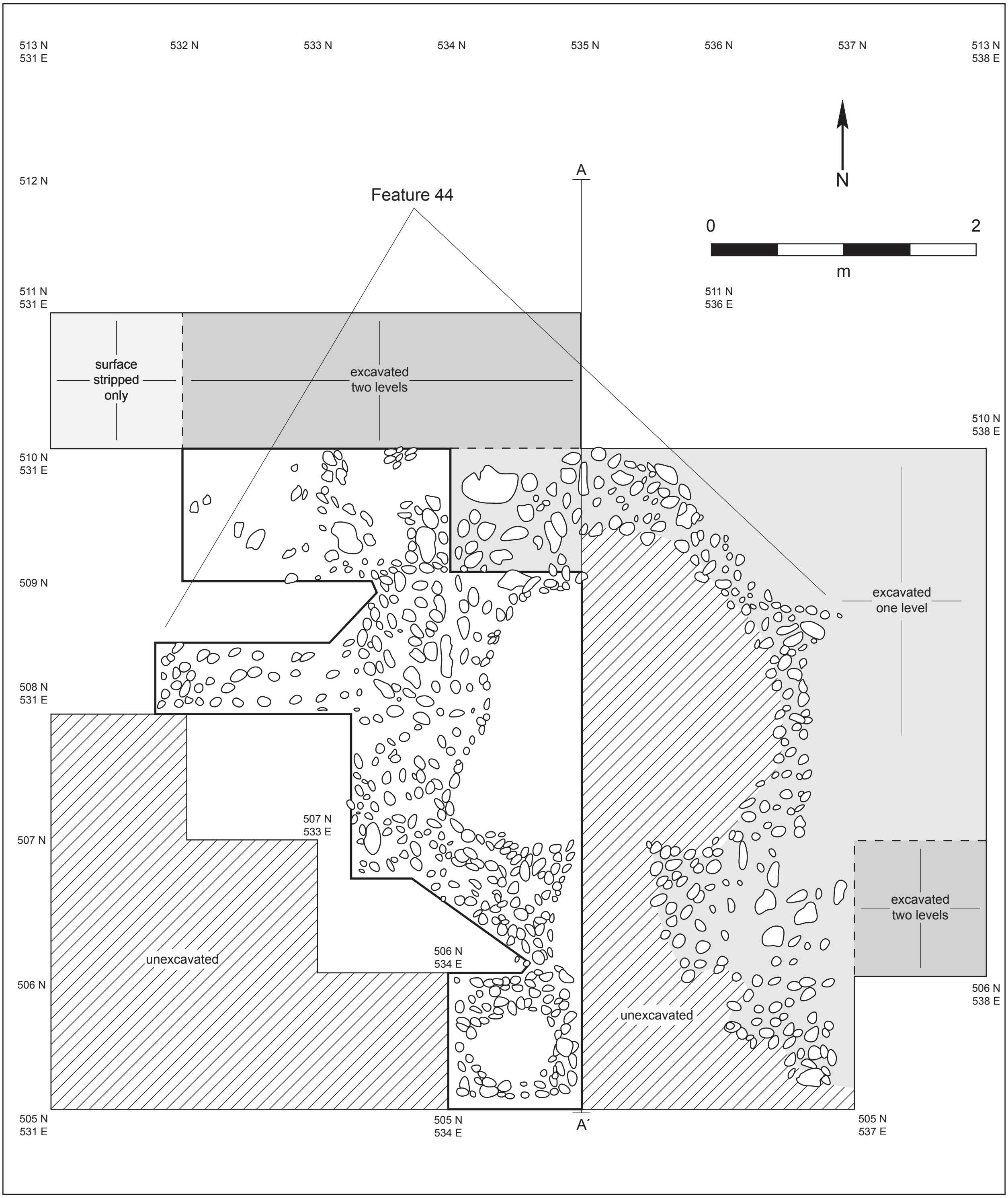

Figure 8.6a. LA 129214, Block 2, Feature 44, plan.

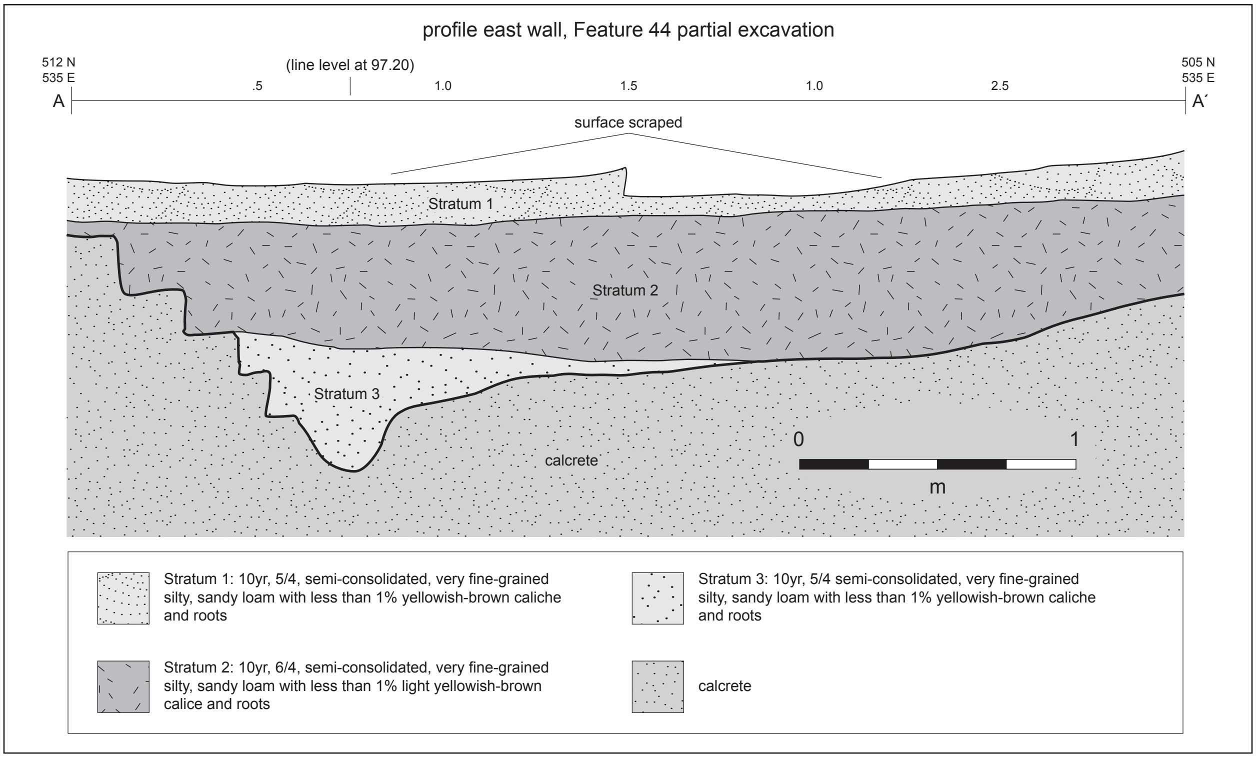

Figure 8.6b. LA 129214, east wall, profile, Feature 44, partial excavation.

and ground stone fragments constituted an average of 1.1 items per square meter of the excavated area.

Block 2 (36 sq m)

Block 2 was established on a Stratum 2 surface at the northeast end of the site to investigate a rock alignment that had the appearance of a pueblo-style roomblock (Feature 44). Feature 44 is *not* the same one noted by TRC and SWCA as a possible roomblock structure; the TRC/SWCA possible roomblock is Feature 32 in Block 18 at the western end of the site.

After removal of surface materials, Feature 44 was found to be circular, not linear, and had significant sediment deposition in the middle (Fig. 8.6a). Although a few artifacts were recovered from the deposits in the middle, it was ultimately determined that Feature 44 (Fig. 8.6b) was probably a solution cavity in the calcrete and not cultural in origin. A projectile point and two pieces of lithic debitage recovered from the two uppermost excavation levels were believed to have been naturally redeposited. At this point, excavations in Block 2 ceased. No cultural features were discovered in this block.

Almost no artifacts were recovered from Block 2 (Table 8.3). The two pieces of chipped lithic deb-

Table 8.2. LA 129214, Block 1, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	67
Pottery sherds	32
Manos and metates	3
Animal bone	2
Pecos Valley diamonds	11
Mineral	1
Earthy red mineral	3
Pigment	1
C-14 sample	5
Flotation sample	13
Pollen sample	3
Total	**141**

Table 8.3. LA 129214, Block 2, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	2
Manos and metates	8
Earthy red mineral	1
Sediment sample	3
Total	**14**

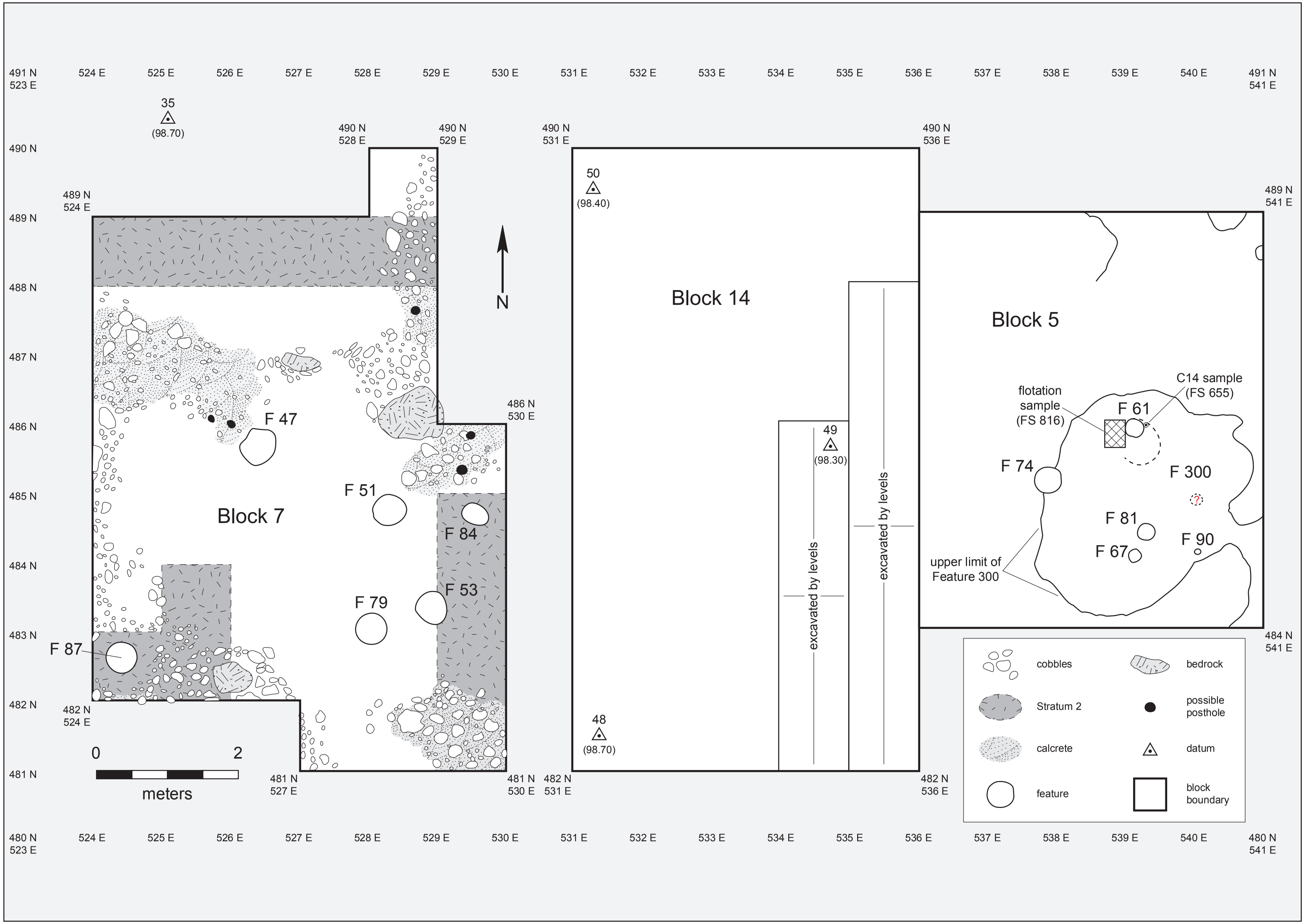

Figure 8.7. LA 129214, Block 5, 7, and 14, plan.

Table 8.4. LA 129214, Block 3, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	14
Pottery sherds	9
Manos and metates	1
Total	**24**

Table 8.5. LA 129214, Block 4, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	38
Pottery sherds	3
Animal bone	2
Total	**43**

itage constituted an average of 0.3 items per square meter of excavated area.

Block 3 (18 sq m)

Block 3 was positioned at the boundary of horizontal Zone 2 and Zone 3 surfaces. Level 1 (0 to 10 cm) was excavated across the entire block. All but one of the artifacts recovered from the block came from this level. Stratum 2 sediments were exposed at the base of Level 1, as were discontinuous exposures of calcrete. Five squares were excavated to examine them for depth. In these squares, solid calcrete was encountered at an average depth of 15 cm from ground surface, and only one flake was recovered. Excavations ceased at this point.

No features were designated in this block. However, a circular, 30 cm diameter carbon stain exposed at the bottom of Level 1 in Square 496N/533E may have been a small thermal feature, but it was not excavated.

Chipped lithic debitage, pottery sherds, and a ground stone fragment were recovered from Block 3 (Table 8.4), averaging 1.3 items per square meter of excavated area.

Block 4 (29 sq m)

Block 4 was established next to the drainage at the eastern end of the site. Originally designed to investigate Surface Survey Feature 35, a scatter of burned rock/caliche recorded by TRC (2000), we discovered that Feature 35 actually lay within our Block 6 and that the burned rock/caliche scatter in Block 4 was a new discovery. The block was originally established as a 6 by 9 m rectangle (54 sq m), but in the end, only 29 sq m were excavated.

The fill of Block 4 consisted of Stratum 1 sediments lying directly on stream gravels and calcrete. Furthermore, the presence of fragments of bottle glass, asphalt, and metal, along with 29 pieces of chipped stone, 3 pottery sherds, and 1 ground stone item, demonstrated that the deposits were mixed, and excavations were terminated.

No features were uncovered in this block.

Chipped lithic debitage, pottery sherds, and a ground stone fragment were recovered from Block 4 (Table 8.5), averaging 1.4 items per square meter of excavated area.

Block 5 (30 sq m)

Block 5 was established to investigate a previously unrecognized burned rock/caliche scatter. Block 5 is located at the east end of a contiguous group of blocks that includes Blocks 7 and 14. The three blocks (5, 7, and 14) were surrounded on the north, east, and west by high dunes (Figs. 8.7 and 8.8).

Excavations revealed the presence of the calcrete layer a short distance below the ground surface and all across the block.

A circular break in the calcrete, in the approximate center of the block, constitutes Feature 300, a small habitation structure. All but one of the small features exposed in this block—61, 67, 81, and 90—were in the structure floor and belong to that occupation. Feature 74, a thermal feature partly within the interior edge of the rock ring, does not belong to the same occupation as the structure as it was above the floor and dates later.

Artifacts recovered from Block 5 constitute one of the largest assemblages recovered from the LA 129214. Interestingly, nearly 40 percent of the items are pottery sherds, an unusually high percentage for this site. The chipped lithic debitage, pottery sherds, and ground stone fragments recovered from the block (Table 8.6) average 9.7 items per square meter of excavated area.

Block 6 (98 sq m)

Block 6 was established to investigate Surface Survey Feature 35, described as a burned caliche concen-

Figure 8.8. LA 129214, Block 5, 7, and 14, overview, at end of excavation.

tration by OAS archaeologists. The block is situated at the east end of the site on the lower slope of the ridge and just south of combined Blocks 5, 7, and 14.

Excavations in Block 6 can be divided into three sections, the main area and extensions to the east and south (Fig. 8.9).

In the main section excavations were carried through Stratum 2. Two 10 cm levels were excavated in most of these squares with a couple going as deep as three levels.

For the most part, anthrosol staining was most obvious in the immediate vicinity of a cluster of thermal features. Stratum 2 sediments rested directly on the calcrete in most places. Most features occur in the main section, but artifacts were fairly common throughout.

Excavations in the north end and in the east section averaged one 10 cm level where Stratum 2 sediments usually appeared. Artifacts were less common in both areas. Only one square, located in the south section, was excavated to calcrete across the entire square in the fourth 10 cm level. Stratum 2 sediments in this square contained a few charcoal flecks. No actual anthrosol staining was noted.

Table 8.6. LA 129214, Block 5, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	174
Pottery sherds	115
Manos and metates	2
Mussel shell	25
Clay sample	1
Mineral	1
Earthy red mineral	11
Metal	1
C-14 sample	4
Flotation sample	6
Pollen sample	2
Total	**342**

Thermal Features 46, 48–50, 52, 54–57, 62–63, 65–66, and 68 were exposed and excavated in Block 6. All features—with the exception of 46, 48, 49, and 66—were located in the main section of the block (Fig. 8.10).

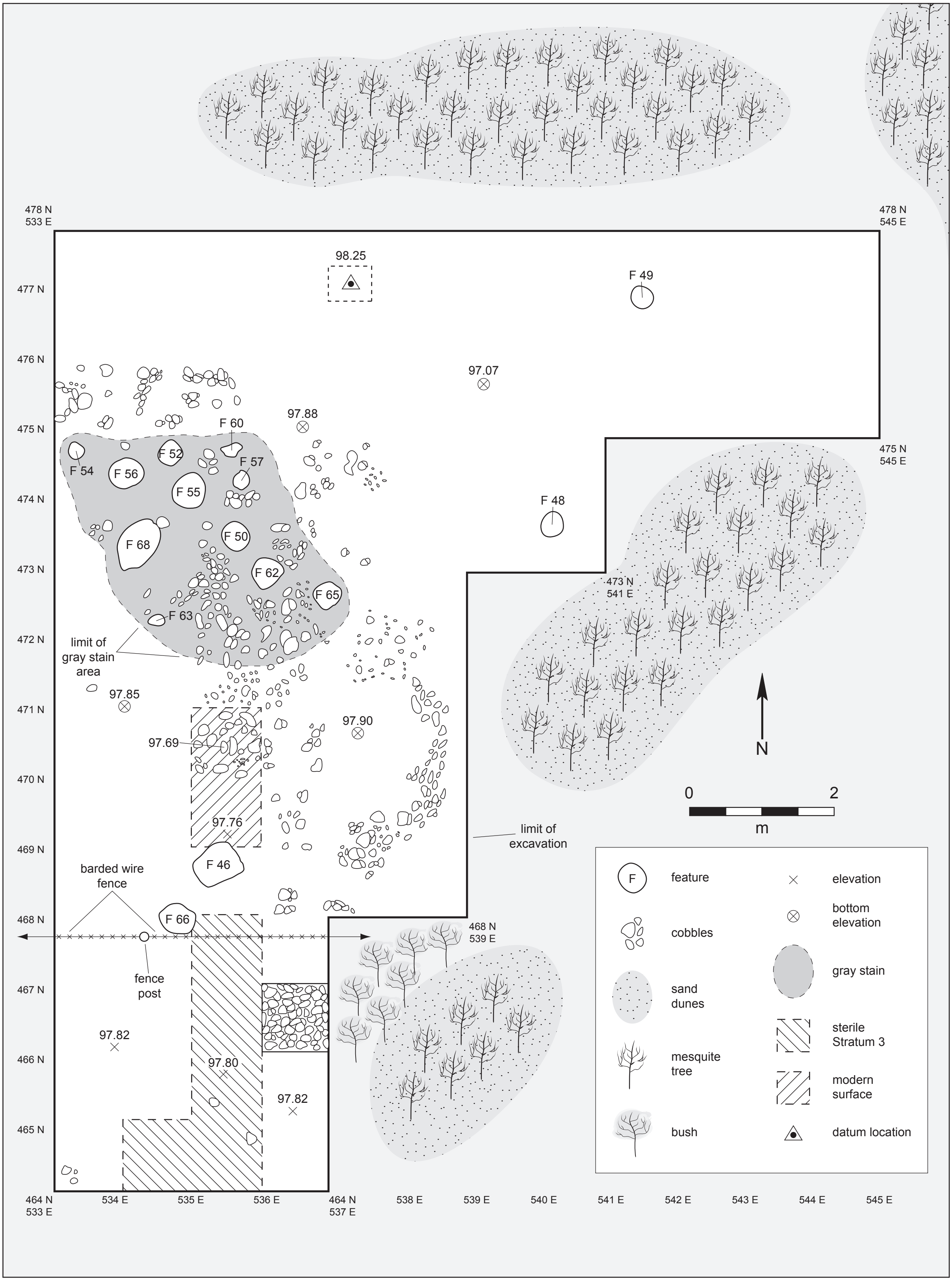

Figure 8.9. LA 129214, Block 6, plan.

Figure 8.10. LA 129214, Block 6, overview of cluster of thermal features, facing northwest.

The chipped lithic debitage, pottery sherds, ground stone fragments, projectile point, and hammerstones from Block 6 (Table 8.7) averaged 7.7 items per square meter of excavated area.

Table 8.7. LA 129214, Block 6, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	529
Pottery sherds	218
Projectile point	1
Manos and metates	4
Hammerstone	2
Animal bone	4
Mussel shell	5
Glass	2
C-14 sample	7
Flotation sample	19
Pollen sample	15
Total	**806**

Block 7 (43 sq m)

Block 7 is the westernmost block in the group of contiguous blocks that includes Blocks 5, 7, and 14 (Fig. 8.7). All three strata and calcrete were exposed in the block. The upper surface of the calcrete undulated, with some exposures being elevated in places within the block. A 1 by 2 m expanse of an unusually hard-packed surface was identified in the first excavated level of Stratum 2 in the approximate center of the block; it may represent a use-surface or bedding area packed by human treadage or sleeping. The surface was pocked with holes about one centimeter in diameter and colored brown (Munsell 7.5YR 4/4). This compact lens was a relatively uniform 2 cm in thickness. Some additional carbonate pebbles appeared at the base of or immediately below the lens, and the fill transitioned from Stratum 2 to Stratum 3 once the lens was removed. Five pieces of lithic debitage were retrieved from the level containing the lens, but the fill below the lens was devoid of cultural materials. Thermal Features 47, 51, 53, 79, 84, and 87 were exposed and excavated in the block. The openings, or mouths, of all were in Stratum 2, but the basins extended into Stratum 3. Five pockets with similar depths and diameters were found within the calcrete formation (Fig. 8.7). These were the size of postholes, but it is possible that they were natural phenomena.

Table 8.8. LA 129214, Block 7, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	68
Pottery sherds	16
Animal bone	4
Mussel shell	1
Eggshell	1
Mineral	1
C-14 sample	5
Flotation sample	7
Pollen sample	2
Total	**105**

Table 8.9. LA 129214, Block 8, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	362
Pottery sherds	12
Projectile point	1
Biface	1
Manos and metates	3
Mussel shell	20
Mineral	80
C-14 sample	2
Flotation sample	8
Total	**489**

Table 8.10. LA 129214, Block 9, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	294
Pottery sherds	58
Mortar/anvil	1
Animal bone	2
Mussel shell	2
Pecos Valley diamonds	1
Total	**358**

However, of the extensive exposures of calcrete made elsewhere at LA 129214, similar pockets were noted only in Block 5 located immediately to the east of Block 7. They averaged 10 cm in diameter and 15 cm in depth. Because we could not confidently determine their status as cultural, we did not assign feature numbers to them. Nevertheless, they are depicted in Figure 8.7. The chipped lithic debitage, pottery sherds, and ground stone fragments from Block 7 (Table 8.8) averaged 2.0 items per square meter of excavated area.

Block 8 (87 sq m)

Block 8, situated on the lower slope in the eastern part of the site, was established to investigate Surface Survey Feature 7, a burned caliche and ash concentration according to both TRC and SWCA.

Excavations in most squares of Block 8 were carried only through Level 1, 0 to 10 cm below modern surface. This work removed Stratum 1 sediments and in some cases the uppermost part of Stratum 2 sediments. Additionally, several areas within the central and southern thirds of the block were excavated through Levels 2 and 3 (1 to 30 cm), exposing the top of Zone 3 sediments. In order to permit profiling the stratigraphy through the middle of the block, seven squares along an east–west line (upslope–downslope) were excavated as deep as 4 to 6 levels (40 to 60 cm) where calcrete was generally encountered.

Thermal Features 64, 69, 70, 71, 73, 75, 80, and 82 were exposed and excavated in the block (Fig. 8.11). All occurred within Stratum 2 sediments.

The chipped lithic debitage, pottery sherds, ground stone fragments, projectile point, and biface from Block 8 (Table 8.9) averaged 2.3 items per square meter of excavated area.

Block 9 (88 sq m)

Block 9, located about mid-slope of the site (Fig. 8.12), was initiated to investigate Surface Survey Feature 9 (TRC Associates 2000). Because Backhoe Trench 11 intersected Block 9, and many features were discovered where the two units joined, the features and the activities they represent are usually discussed together.

Excavations in most squares of Block 9 were carried only through Level 1, 0 to 10 cm below modern surface. This work removed Stratum 1 sediments and in some cases the uppermost part of Stratum 2 sediments. Additionally, several areas within the east-central part of the block were excavated through Level 2 (10 to 20 cm). Two squares in the west-central part of the block were excavated through Level 4 (30 to 40 cm) where Stratum 3 sediments were encountered. No excavations encountered calcrete.

Twenty-nine features were exposed and excavated in the block and adjacent BHT 11. These include Thermal Features 72, 78, 86n, 86s, 93–96, 98–99, 106, 152, 156, 158, 165, 191, 193–196, 203–205 and 207

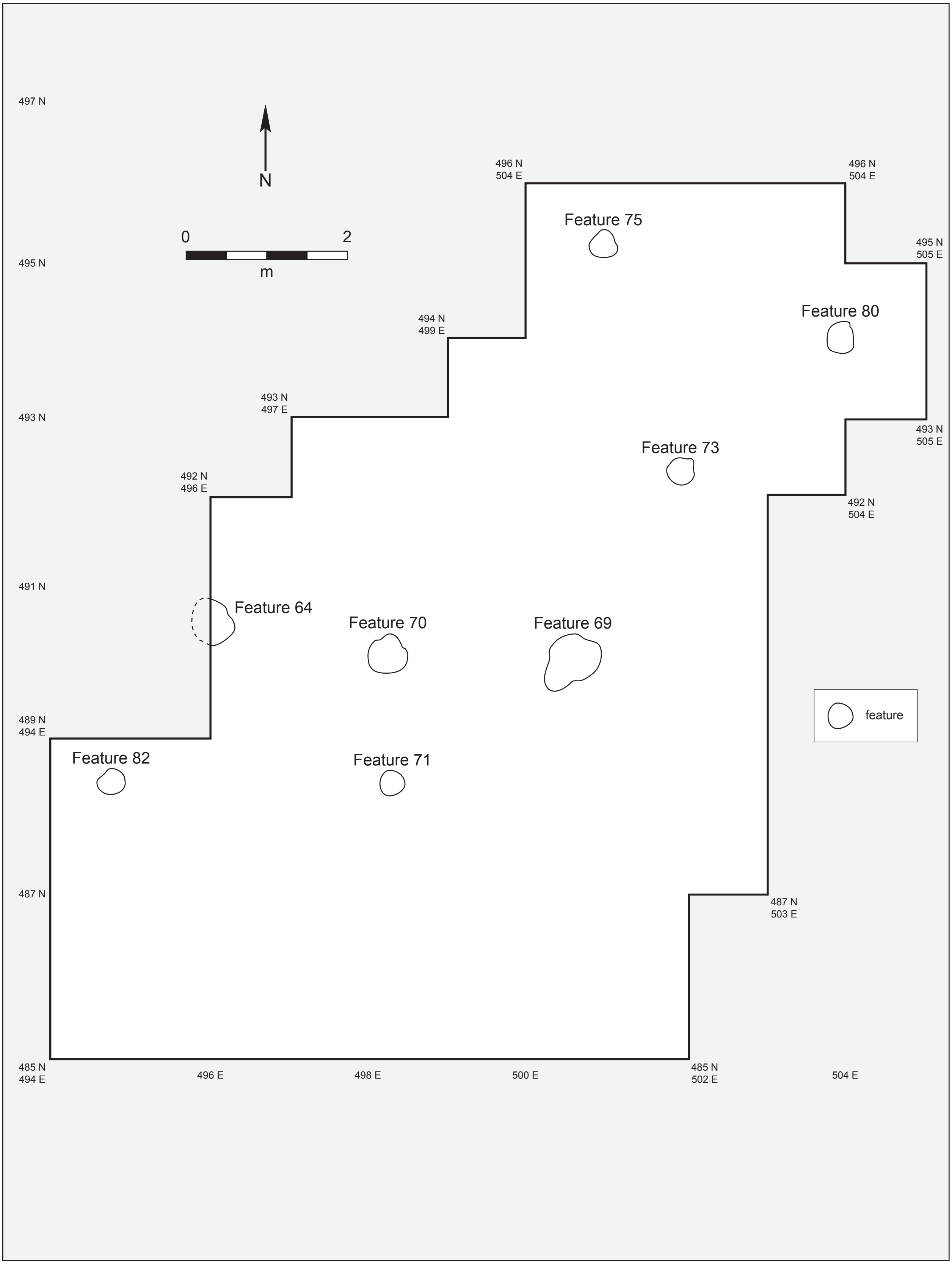

Figure 8.11. LA 129214, Block 8, plan.

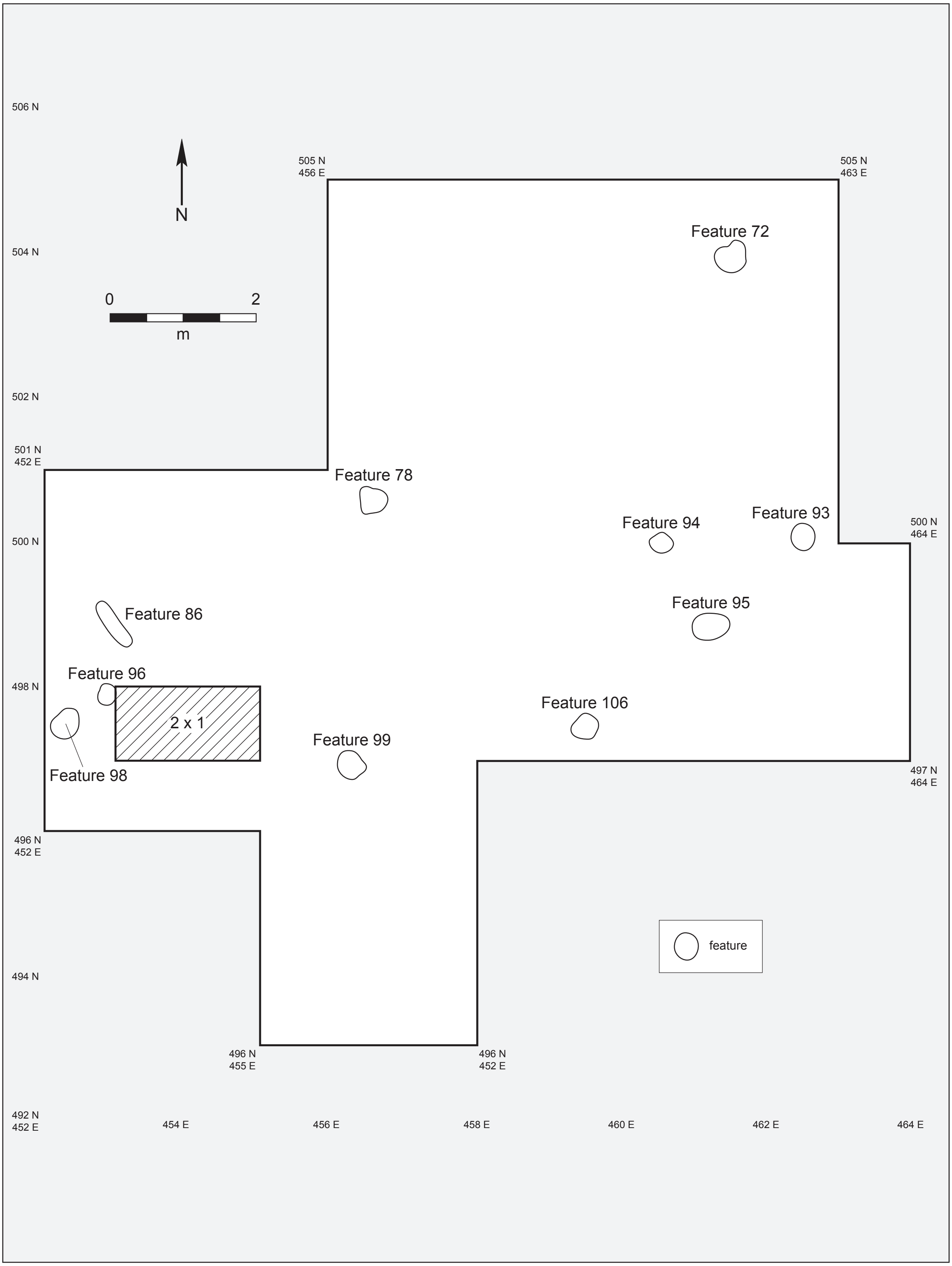

Figure 8.12. LA 129214, Block 9, plan.

(Fig. 8.13). The remaining four—168, 169, 170 and 192—are postholes. All were in Stratum 2 sediments.

The chipped lithic debitage, pottery sherds, and ground stone fragments from Block 9 (Table 8.10) averaged 4.0 items per square meter of excavated area.

Block 10 (42 sq m)

Block 10 was established to investigate Surface Survey Feature 8, a burned caliche ash midden. The dimensions recorded for this feature by TRC in 2000 (4 by 4 m) and SWCA in 2006 (7 by 14 m) varied significantly, probably because of shifting of surface sediments during the intervening years between the two projects. In order to afford adequate assessment of Surface Survey Feature 8, this block and Block 11 were excavated.

Block 10 encompassed a small deflation depression (blowout), the surface contours of which sloped from west to center, then leveled out (Fig. 8.14). Artifacts and burned rocks/caliche were observed on the ground surface typified with the loose sandy sediments of Stratum 1. Modern bottle glass fragments (not tabulated here) were also common throughout these loose sediments. As is usually the case, the majority of aboriginal charcoal flecks and burned rocks/caliche were contained in the Stratum 2 (or anthrosol), and these were mainly concentrated in the central part of the block. However, the majority of pieces of lithic debitage and pottery sherds were recovered from Stratum 1 sediments.

Thermal Features 76 and 77 and a possible thermal feature were exposed and excavated in this block. The possible, unnumbered thermal feature (in Square 480N/471E) consisted of a loose concentration of burned rock/caliche with no associated fill; it appears to have been deflated, scattered, then covered with sediment.

The chipped lithic debitage, pottery sherds, and manuport from Block 10 (Table 8.11) averaged 2.4 items per square meter of excavated area.

Table 8.11. LA 129214, Block 10, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	88
Pottery sherds	13
Manos and metates	1
Flotation sample	3
Pollen sample	1
Total	**106**

Block 11 (20 sq m)

Block 11 (Fig. 8.15), located 7 m west of Block 10, was also established to investigate TRC Surface Survey Feature 8 (see discussion for Block 10).

After Stratum 1 was removed, the upper surface of Stratum 2 was found to slope rather strongly (50 cm drop in elevation) from the northwest to the southeast. Artifacts, burned rock/caliche, and charcoal-stained sediments were redeposited and did not come from intact deposits. The calcrete layer was exposed at a distance of about 25 cm below the surface in the northern part of the block.

Thermal Features 91 and 92 were exposed in this block. Unfortunately, Feature 91 was so eroded that more than half of it was excavated/removed before it was recognized to be a feature. Feature 92 and the sediments in an adjacent square were intact and constituted the only exception to the generalized disturbance noted for this block.

The chipped lithic debitage, pottery sherds, and shaped stone artifact from Block 11 (Table 8.12) averaged 7.8 items per square meter of excavated area.

Table 8.12. LA 129214, Block 11, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	127
Pottery sherds	27
Shaped stone	1
Mussel shell	1
Flotation sample	3
Pollen sample	2
Total	**161**

Block 12 (77.5 sq m)

Block 12 (Fig. 8.16) was established to investigate TRC Surface Survey Feature 6 located within a large deflation depression (blowout) and identified by TRC as a burned, caliche ash midden. It is situated near the top of the east slope and is located just below the crest of the ridge. The blowout, which sloped gently to the northeast, was surrounded by dunes on all sides with the exception of a small gap to the southeast.

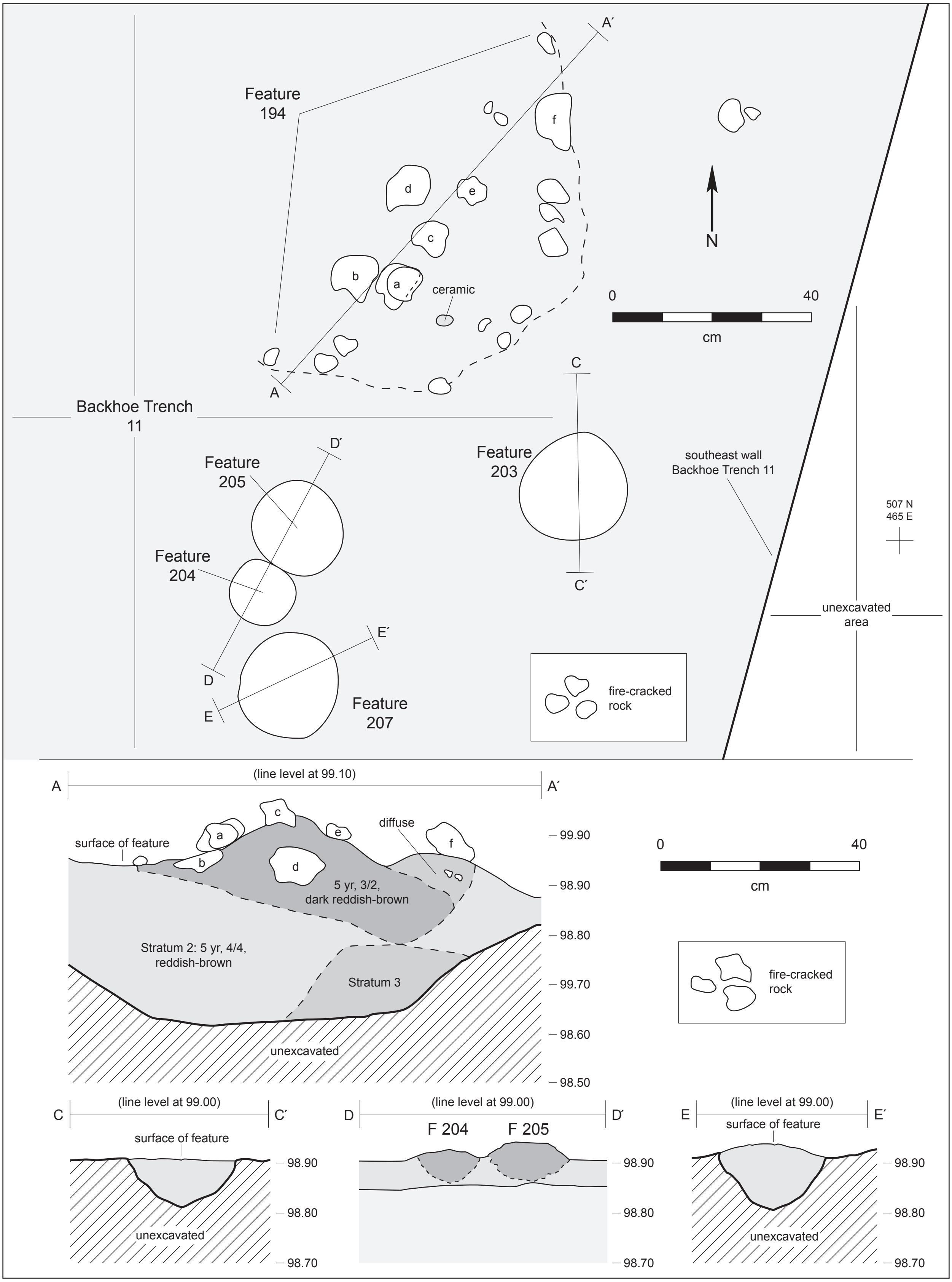

Figure 8.13. LA 129214, Thermal Features 203, 204, 205, and 207, found during dune removal next to Block 9.

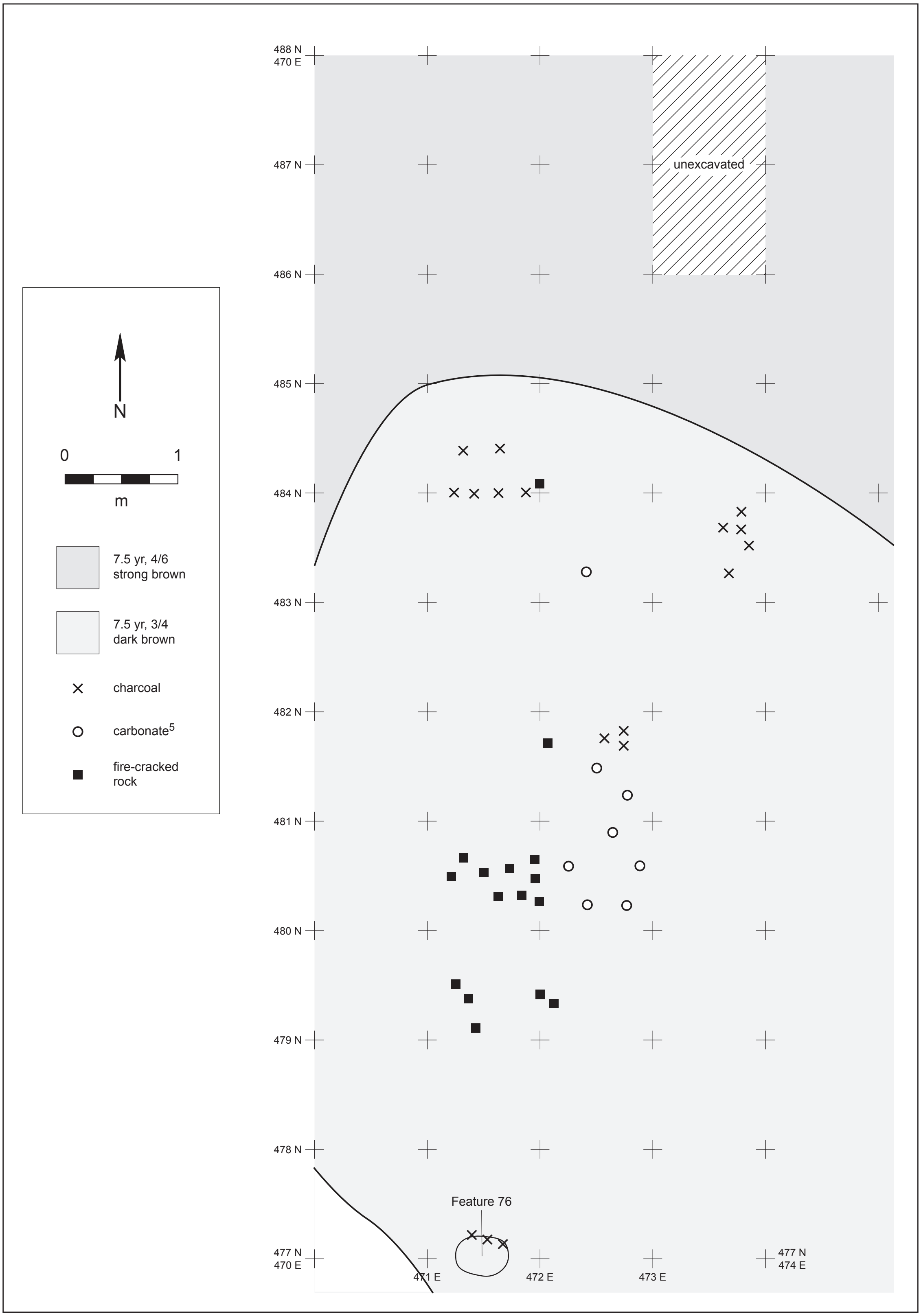

Figure 8.14. LA 129214, Block 10, plan.

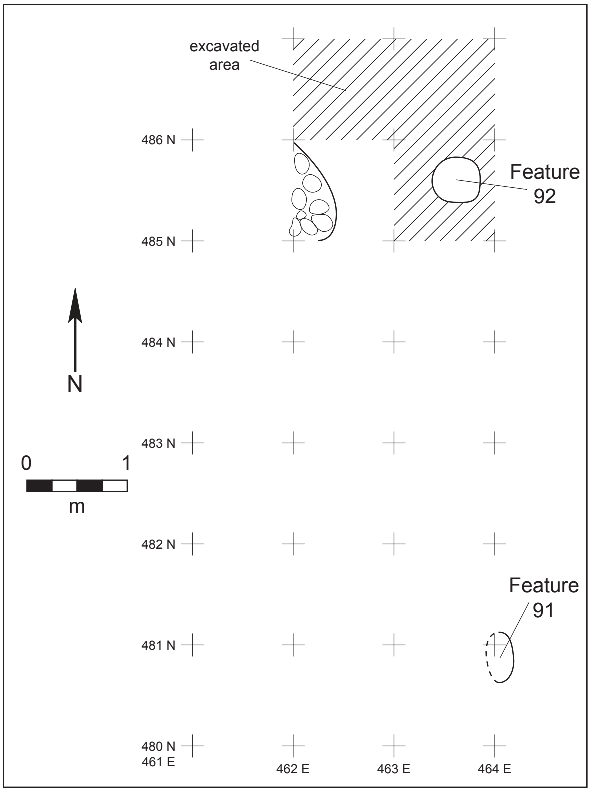

Figure 8.15. LA 129214, Block 11, plan.

Excavation revealed that windblown sand overburden was relatively thin across the block and averaged 10 cm in thickness. Stripping of surface sediments revealed extremely dark brown to black anthrosol across the western half of the block. Within the eastern half, the color of the anthrosol was less intense, being dark brown overall.

Units were excavated to a maximum of 60 cm below ground surface and encountered Stratum 3 caliche-flecked sediments or the calcrete layer. All features, with the exception of two, were initially identified in Stratum 2 sediments. All features but 97 and 107 extended into Stratum 3 sediments or were positioned on calcrete.

The 26 features exposed and excavated in Block 12 include 97, 101–105, 107–110, 119–121, 123–124, 128–131, 136, 172, 176, 183–185, and 190. All but two are thermal features; Features 172 and 184 are postholes (Figs. 8.17—8.19).

The chipped lithic debitage, pottery sherds, ground stone fragments, lithic tools, hammerstones, metate fragment, and manuport from Block 12 (Table 8.13) averaged 8.1 items per square meter of excavated area.

Block 13 (135 sq m)

Block 13 (Figs. 8.20 and 8.21) was established to examine Surface Survey Feature 33 identified by both TRC and SWCA as a 10 by 20 m burned caliche ash midden. The block, situated fully on top of the ridge, is the western-most block to uncover a large number of features. Block 13 and nearby Block 12 were separated by a large dune that was about 15 m (49 ft) across. An "ashy," 20 cm thick, gray-colored sediment was present across the entire block, occurred in the lower margin of Stratum 2 at a depth of 25 to 30 cm below the modern ground surface. Excavations were carried to calcrete across the entire block.

Seven features exposed and excavated in Block 13 include Thermal Features 122, 132–133, 135, 139, and 141 and one post-support configuration composed of 14 cobbles (140; Fig. 8.22).

A significant artifact assemblage dominated by chipped lithic debitage was recovered from Block 13. Numerous fragments of red ochre, a few pieces of limonite, a white pigment sample, and a small rock with red paint were also recovered. It must be noted that red ochre occurs naturally in the vicinity but in this case was found in combination with the stone with red pigment.

The chipped lithic debitage, pottery sherds, ground stone fragments, projectile points, lithic tools, hammerstones, metate fragment, mano, polishing stones, and lithic with red pigment from Block 13 (Table 8.14) averaged 7.0 items per square meter of excavated area.

Block 14 (53 sq m)

A moderate-sized dune separated Blocks 5 and 7. This sand accumulation, mechanically removed to investigate the possibility of the continuation of thermal features between the two blocks, became Block 14 (Fig. 8.7). Excavations were carried into but not through Stratum 2 in a search for features. They were not carried deep enough to expose the calcium-infused sediment designated Stratum 3, although the excavation of several features exposed the presence of Stratum 3 deposits in the bases of the features.

Seven thermal features were exposed and excavated in this block. Thermal Features 113, 114, 115, 116, 117, and 118 are clustered in the western part of the block (Fig. 8.23) near another cluster of thermal features in the eastern part of Block 7. Thermal

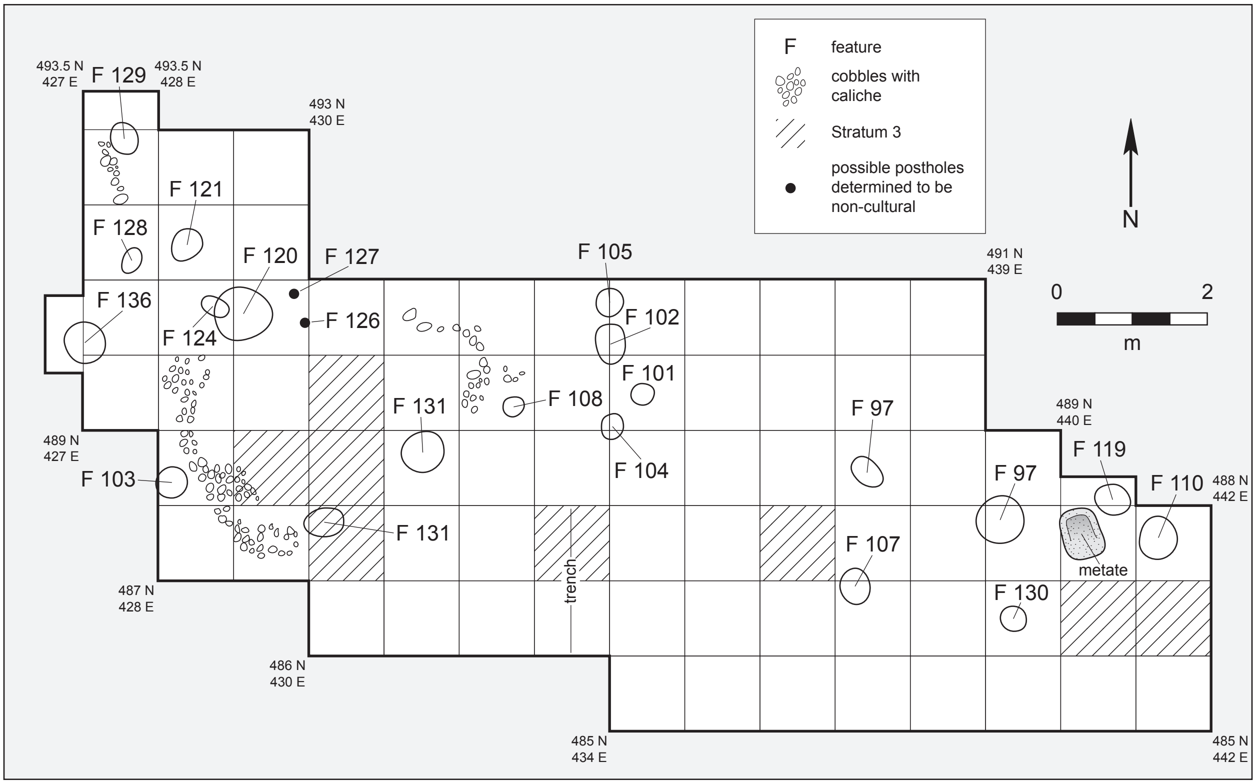

Figure 8.16. LA 129214, Block 12, plan.

Figure 8.17. LA 129214, Block 12, Rock Thermal Feature 129, before excavation.

Figure 8.18. LA 129214, Block 12, Rock Thermal Feature 129, excavated, showing calcrete bedrock bottom.

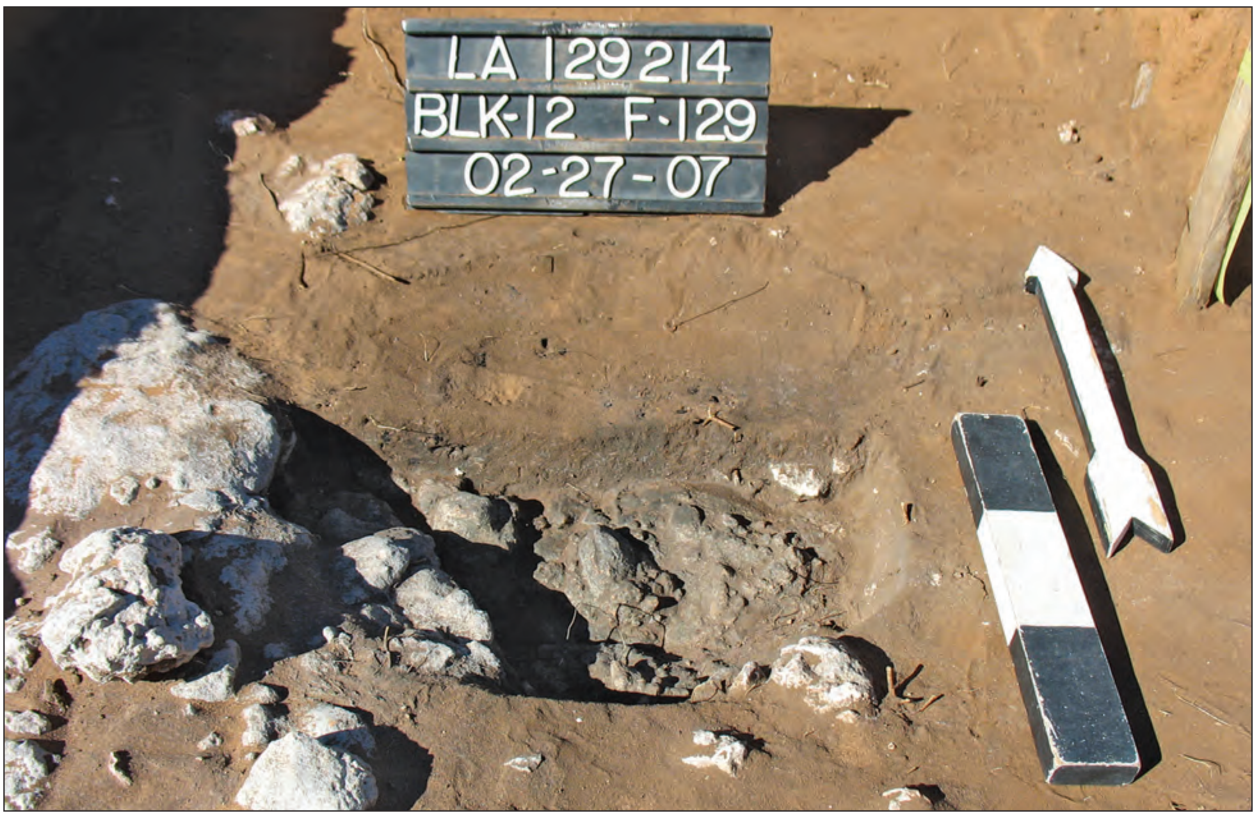

Figure 8.19. LA 129214, Block 12, Rock Thermal Feature 129, profile of fill.

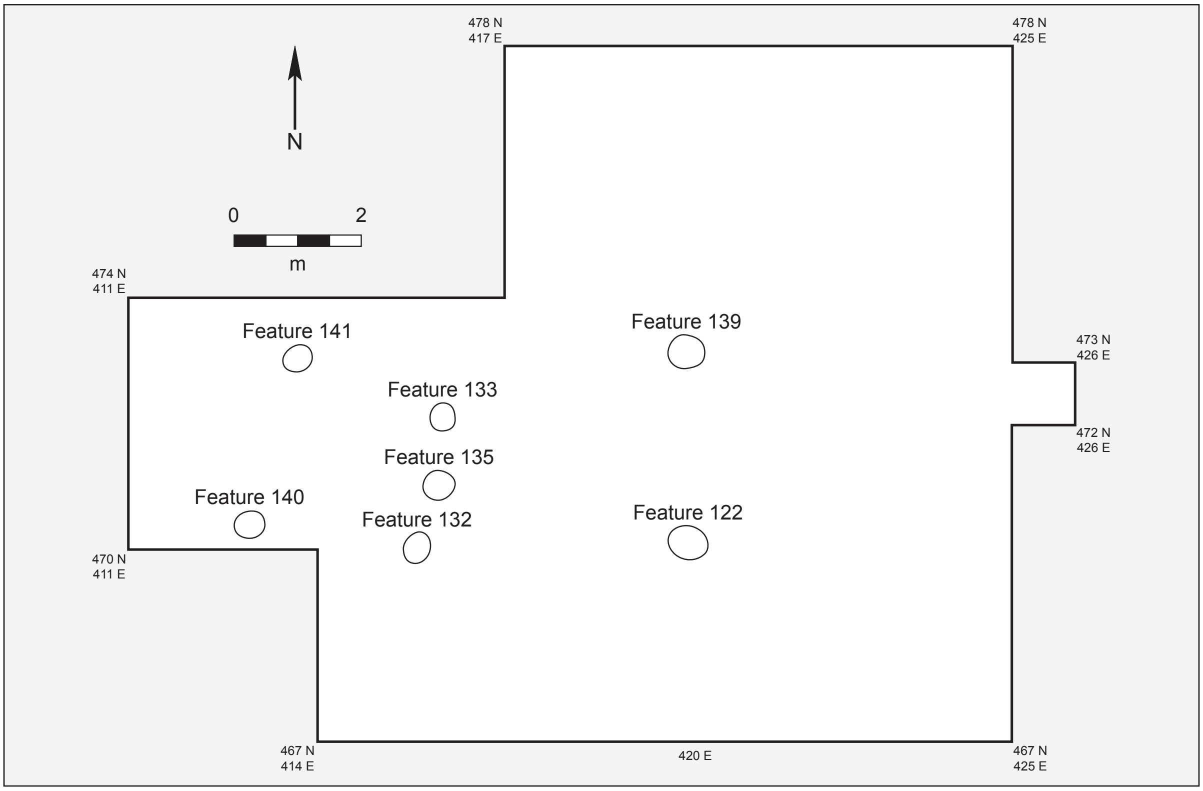

Figure 8.20. LA 129214, Block 13, plan.

Feature 112 is on the eastern margin of the block and extends partly into Block 5.

The chipped lithic debitage and pottery sherds from Block 14 (Table 8.15) averaged 0.4 items per square meter of excavated area.

Block 15 (18 sq m)

Block 15 (Fig. 8.24) was established to examine Surface Survey Feature 34 identified by both TRC and SWCA as a burned caliche, ash, and charcoal midden. The grid was expressly established over a small burned caliche scatter. Though all strata were identified in the excavation of this block, Stratum 3 did not present until the bottom 2 to 3 cm on the western margin of the block and then only as a gradual transition from Stratum 2. The calcrete layer was not exposed in this block. Thermal Features 134, 137, 142, 151, 153–155, 160–161, and 202 were exposed and excavated in Block 15. All were first defined within the third level within Stratum 2. The chipped lithic debitage, pottery sherds, ground stone fragments, projectile point, and lithic tool from Block 15 (Table 8.16) averaged 22.1 items per square meter of excavated area.

Table 8.13. LA 129214, Block 12, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	572
Pottery sherds	44
Lithic tool	5
Hammerstone	2
Manos and metates	4
Manuport	1
Animal bone	4
Mussel shell	10
Burned clay	1
Mineral	15
Earthy red mineral	10
C-14 sample	24
Flotation sample	114
Pollen sample	14
Soil sample	2
Total	**822**

Block 16 (36 sq m in two sections)

Block 16 was established to investigate TRC Surface Survey Features 10 and 11. Block 16 was divided into two sections labeled 16 East and 16 West (Figs. 8.25a and 8.25b). Features 10 and 11 were identified

Figure 8.21. LA 129214, Block 13, excavated, showing calcrete bottom, facing north.

Figure 8.22. LA 129214, Feature 140, piled-rock post support prior to excavation.

Figure 8.23. LA 129214, Block 14, six thermal features prior to excavation, facing north.

as burned caliche and ash concentrations by TRC and SWCA. At the time of our excavations, Surface Survey Feature 10 (TRC Associates 2000) was one of two surface survey features (the other being 13) to display pale gray sediment believed to be ash on the surface.

Strata 1 through 3 were exposed during excavation. The calcrete layer was presented across most of Block 16 West. The cultural horizon, Stratum 2, was up to 50 in deep and was further subdivided into two units, which displayed a slight difference in the degree of consolidation— light to moderate. Both were infused with charcoal, ash, burned caliche/rock, and artifacts. Squares were excavated to a maximum of six levels below the modern ground surface.

Fourteen thermal features were exposed and excavated in Block 16. Thermal Features 138, 143–146, 148–150, and 180–182 are in the West section within the area of Surface Survey Feature 10, and three (162–164) are in the East section within the area of TRC Surface Survey Feature 19.

Of all the blocks, Block 16 produced the highest total number of artifacts and the highest number of artifacts per square meter (Table 8.17). The chipped lithic debitage, pottery sherds, ground stone fragments, lithic tools, polishing stones, and lithic with pigment from Block 16 averaged 79.1 items per square meter of excavated area.

Block 17 (4 sq m in two 1 by 2 m units)

Block 17 was established in two units, each measuring 1 by 2 m, to investigate TRC Surface Survey Features 36 and 37 described as burned caliche concentrations. The Block 17 units were fully on top of the ridge.

Excavation of Surface Survey Feature 36 found that a 10 cm layer of Stratum 1 sediments overlay the calcrete. Four pieces of lithic debitage were recovered from this unit.

Slightly greater deposition was present at Surface Survey Feature 37 as Stratum 2 sediments by the third excavated level below modern ground surface; Stratum 3 sediments were not encountered

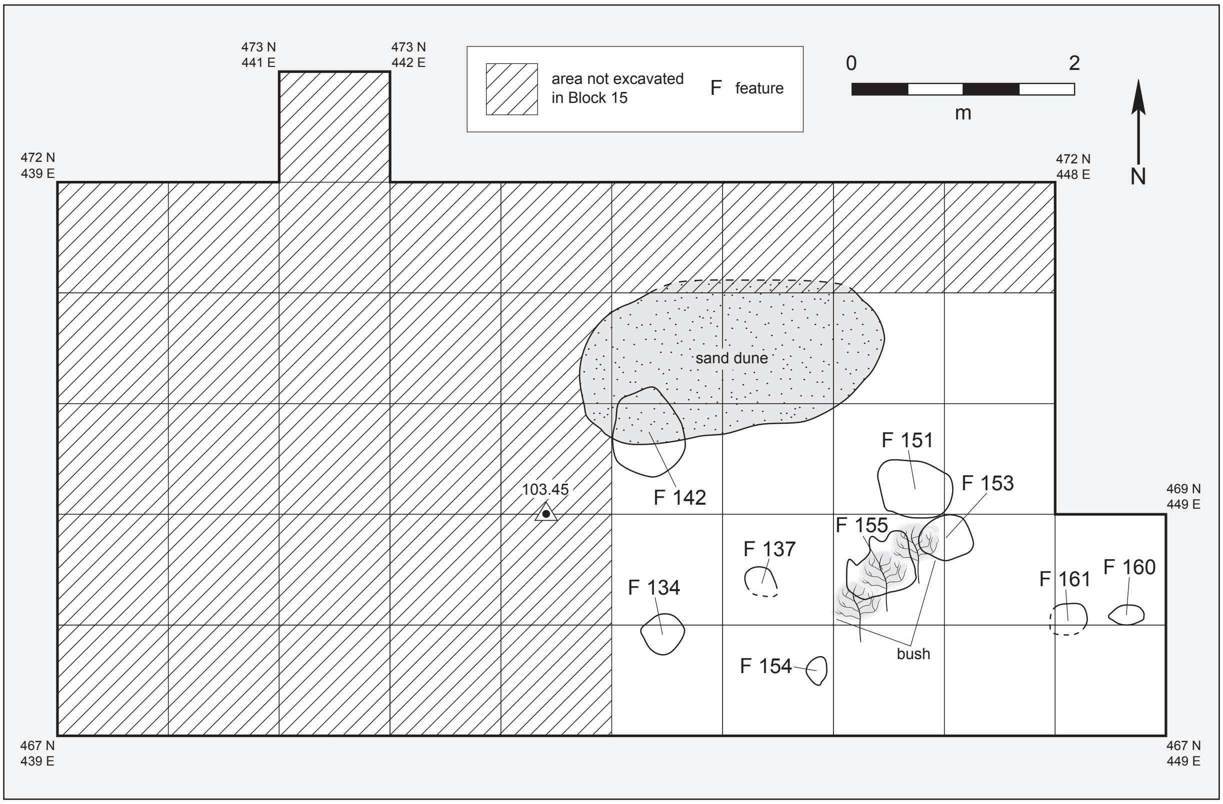

Figure 8.24. LA 129214, Block 15, plan.

and calcrete was exposed across approximately one-half of this unit at the termination of excavations. The sediments in this second unit were somewhat ashy in color with only sparse charcoal flecking.

No cultural features were found in Block 17.

The chipped lithic debitage, pottery sherds, and piece of ground stone from Block 17 (Table 8.18) averaged 10.5 items per square meter of excavated area.

Block 18 (10 sq m)

Block 18 (Fig. 8.26) was established to investigate Surface Survey Feature 32 described by TRC as a rock alignment and possible roomblock structure. Block 18 was fully on top of the ridge.

Excavation of the southernmost 10 squares quickly revealed that no association existed between the surface cobbles and a subsurface feature. It is believed that this was not a prehistoric feature, but a remnant of a historic digging event, the purpose of which remains unknown.

Another area at the Surface Survey Feature 32 locale also consisted of mounded sediment with the

Table 8.14. LA 129214, Block 13, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	877
Pottery sherds	22
Projectile points	2
Lithic tools	3
Manos and metates	11
Mortar/anvil	1
Hammerstones	2
Lithic with paint	1
Polishing stone	6
Ground stone	20
Metate	1
Mano	1
Animal bone	35
Mussel shell	46
Mineral	3
Earthy red mineral	33
Earthy yellow mineral	3
Earthy white mineral	1
Pecos Valley diamond	16
C-14 sample	9
Flotation sample	17
Pollen sample	6
Geologic sample	1
Total	**1117**

cobbles scattered on top. Further west and beyond the site boundary three more manifestations were noted, each a circular mound of sediment with calcrete cobbles scattered on top. All of these mounds, including the "rock alignment" of Surface Survey Feature 32, formed a staccato line that paralleled the existing highway right-of-way fence for NM 128 and probably resulted from fence building activity.

Units in Block 18 were excavated to depths of 40 to 50 cm below the modern ground surface. While Zones I and II were encountered throughout the block, Stratum 3 sediments were encountered in small patches scattered across the block and positioned on top of the calcrete.

Though the cobbles that drew attention to the Block 18 locale are not considered to have represented aboriginal activity, artifacts recovered from the upper three 10 cm levels of the excavated units include a number of prehistoric items.

Thermal Features 157 and 159 can be attributed to aboriginal occupation of the Block 18 locale.

The chipped lithic debitage, pottery sherds, and ground stone fragments from Block 18 (Table 8.19) averaged 12.2 items per square meter of excavated area.

Block 19 (approximately 20 sq m)

Block 19 is situated fully on top of the ridge (Fig. 8.27). It was established within the angle formed by the intersecting segments of Trench 10. Here, heavily charcoal-infused anthrosol was exposed, ultimately revealing the presence of several thermal features.

Using the sediment profile exposed by Trench 10 as a guide, Stratum 1 sediments were removed with a backhoe to a level approximately 5 cm above the upper limit of Stratum 2 sediments. The grid for hand excavation was then established with the segments of Trench 10 forming the northern and western limits.

Four 10 cm levels were excavated in most squares (or units), with most levels consisting of Stratum 2 sediments. Most of the features identified in Block 19 were first defined at the bottom of Level 2 (about 20 cm below surface) in upper to middle Stratum 2 sediments. The greatest concentration of artifacts was recovered in Levels 2 and 3, bracketing the appearance of the features. By Level 4, artifact counts dropped drastically.

Thermal Features 166–167 and 173–175 were exposed in Block 19 and examined in detail. Additional Thermal Features 187, 188, and 189 were also exposed by Trench 10; these are grouped with Block 19 even though they do not actually lie within the hand-excavated squares of the block. Feature 171, a large irregular pit that was only partly exposed, was interpreted by the excavator as a probable dump of burned cobbles, charcoal, and ash rather than a thermal feature. The chipped lithic debitage, pottery sherds, ground stone fragments, projectile points, a lithic tool, and a polishing stone from Block 19 (Table 8.20) averaged 11.6 items per square meter of excavated area.

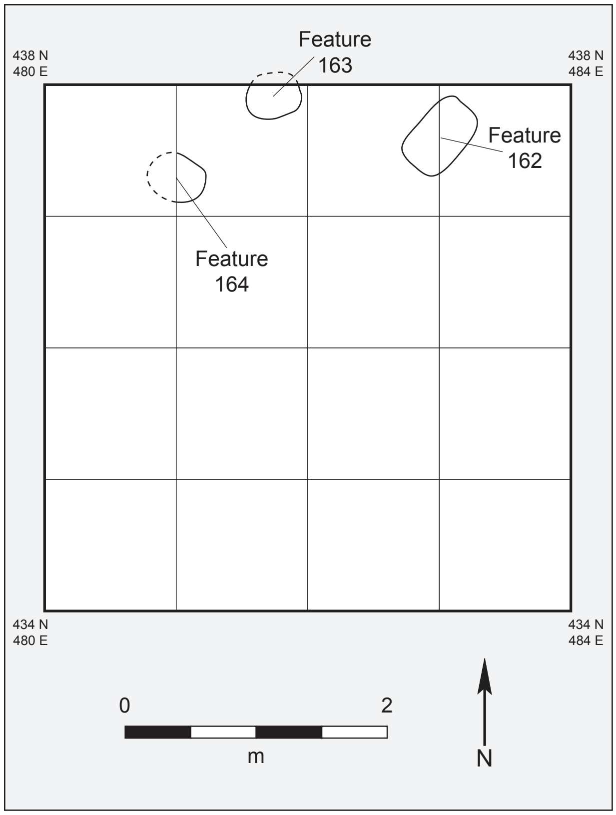

Figure 8.25a. LA 129214, Blocks 16 east and 16 west, plan.

Table 8.15. LA 129214, Block 14, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	19
Pottery sherds	3
Manos and metates	1
Animal bone	29
C-14 sample	1
Flotation sample	2
Total	**55**

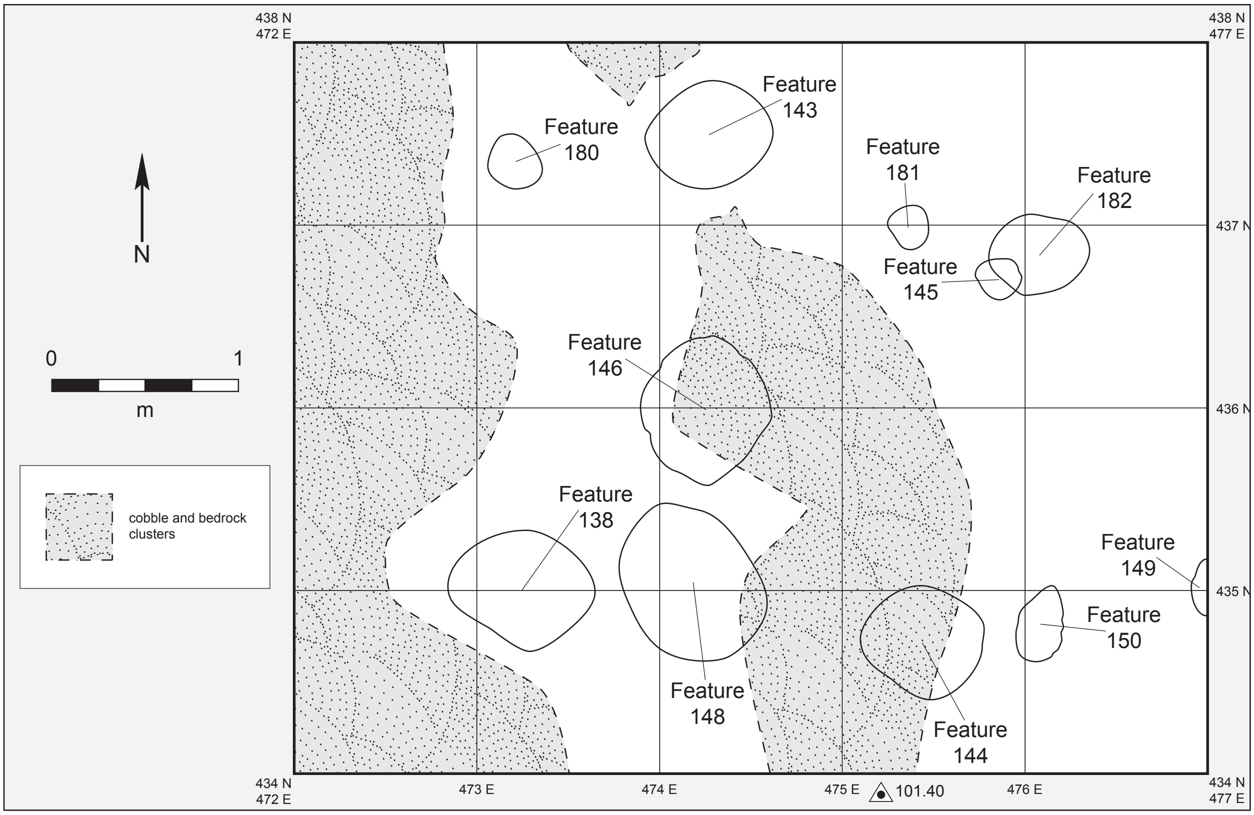

Figure 8.25b. LA 129214, Blocks 16 east and 16 west, plan.

Block 20 (28 sq m)

Block 20 (Fig. 8.28), initially established as a 6 by 6 m block to investigate TRC Surface Survey Feature 20, was located immediately south of the then-existing highway right-of-way fence from Blocks 16W and 16E.

Time constraints and a nearby dune caused us to scale down the actual excavation area to 12 sq m. Like the nearby Surface Survey Features 10 and 19, Surface Survey Feature 20 was characterized by TRC and SWCA as a burned caliche, ash midden. Surface manifestations included a light scatter of burned caliche and some charcoal staining.

Prior to commencement of excavations, 8 kg of burned caliche nodules were collected from the surface.

Only Strata 1 and 2 were exposed during the time available to investigate this block. The top of the calcrete layer was first exposed at the base of the first excavated level in Stratum 2.

The three features exposed and excavated in Block 20 include Thermal Feature 177 and two post-holes (178, 186).

The chipped lithic debitage, pottery sherds, ground stone fragments, a mano, a hammerstone, lithic tools, and a polishing stone from Block 20 (Table 8.21) averaged 6.8 items per square meter of excavated area.

Table 8.16. LA 129214, Block 15, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	349
Pottery sherds	43
Projectile points	2
Lithic tool	1
Manos and metates	3
Animal bone	55
Mussel shell	16
Ochre	48
C-14 sample	6
Flotation sample	20
Pollen sample	1
Total	**544**

Block Summary

A summary of findings for all blocks can be found in Table 8.22.

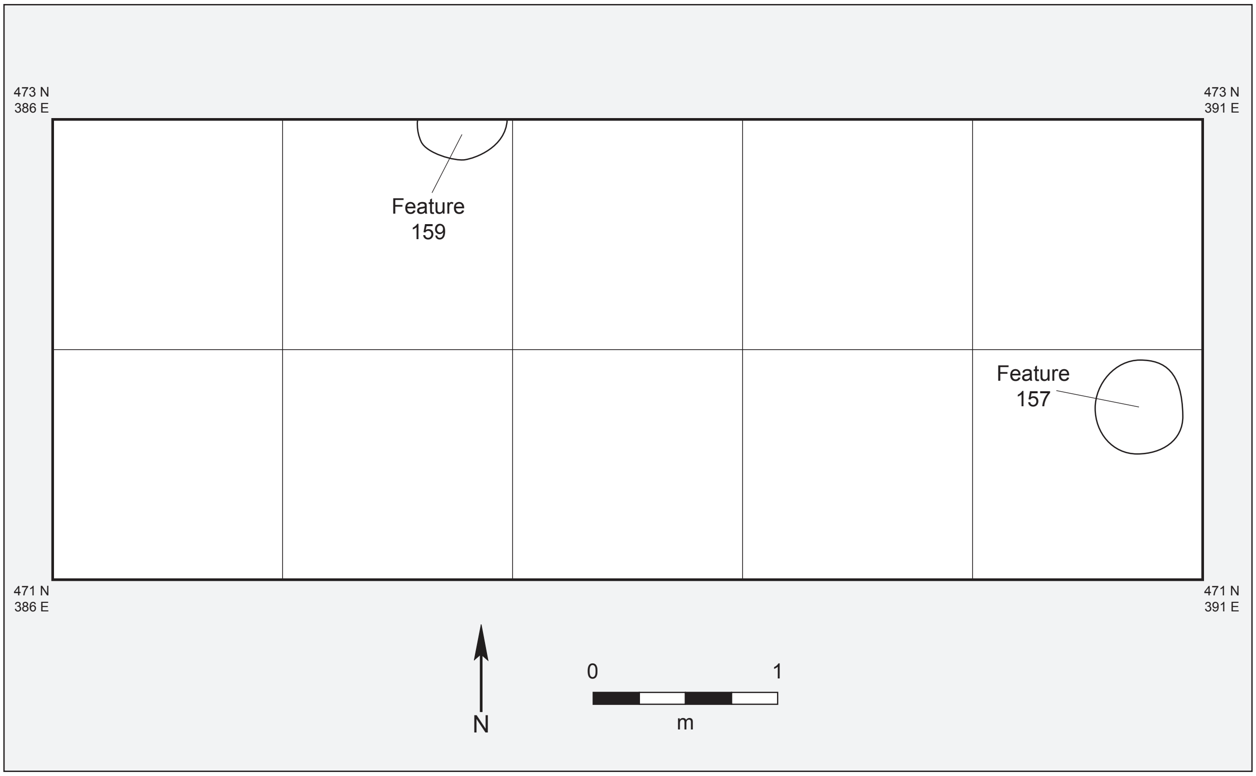

Figure 8.26. LA 129214, Block 18, plan.

Anthrosol Presence and Distribution

One of the more interesting aspects of the fill at Site 129214 is the presence of an anthrosol, a human-generated sediment unit. As detailed by Hall in Chapter 24, there seems to be little reason to question whether this unit (Stratum 2) was generated by man. However, Hall's chemical tests revealed that total phosphorus (P) is not elevated as would be expected for anthropogenic sediment. While this situation is at first baffling, I suspect that the blackness of the unit may be caused by finely divided charcoal powder from the many thermal features, rather than from decaying vegetal, animal, and human matter. LA 129214 is one of only two sites (the other being LA 129216) investigated in this project to produce an anthrosol, the distribution of which is fairly wide (Fig. 8.30).

Table 8.17. LA 129214, Block 16, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	2691
Pottery sherds	125
Lithic tool	6
Lithic with paint	1
Polishing stone	2
Manos and metates	23
Burned clay	1
Macrobotanical	10
Animal bone	484
Mussel shell	12
Mineral	3
Ochre	33
Glass	1
C-14 sample	23
Flotation sample	58
Pollen sample	2
Pollen with burned rock	3
Total	**3478**

Feature Descriptions

Feature 39: Thermal pit, non-rock, shallow, medium
Provenience: Block 1, 506N/514E
Elevation and Stratum: 98.43–98.21, Stratum 2
Size and Shape: Oval, 43 by 31 by 11 cm
Definition: Good
Fill: Black, charcoal pieces
Bioturbation: Rodent, rootlets
Artifacts: None

Table 8.18. LA 129214, Block 17, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	39
Pottery sherds	2
Ground stone	1
Total	**42**

Table 8.19. LA 129214, Block 18, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	107
Pottery sherds	14
Manos and metates	1
Mineral	12
C-14 sample	2
Flotation sample	7
Pollen sample	4
Total	**147**

Table 8.20. LA 129214, Block 19, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	202
Pottery sherds	17
Projectile points	2
Manos and metates	2
Lithic tool	1
Polishing stone	1
Burned clay	1
Animal bone	3
Mussel shell	8
Earthy red mineral	6
Burned rock sample	4
C-14 sample	6
Flotation sample	15
Pollen sample	2
Pollen with burned rock	1
Total	**271**

Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1020 (Beta 258469)

Features 40 and 41: Possible windbreak comprised of two segments of calcrete outcrop situated end to end, forming an angle; carbonate cobbles and small boulders piled on top could have anchored perishable cover materials such as mats, hides, or brush.
Provenience: Block 1
Elevation and Stratum: 98.43–98.10 and 98.54–98.15
Size and Shape: Two elongate oval calcrete outcrops; Feature 40: 2.6 m long, 0.93–1.45 m wide, 0.6+ m high; Feature 41: 2.4 m long, 1.3–2.0 m wide, 0.6+ m high
Dates: Calibrated intercept dates of thermal features, some of them superimposed, that may have been used in conjunction with the windbreak include: AD 90 (F.58); AD 140 (F.88); AD 250 (F.59); AD 770 (F.89); AD 1020 (F.39); AD 1030 (F.85)

Feature 42: A third calcrete outcrop in the block that might have served as a windbreak (see description for Features 40 and 41)
Provenience: Block 1, 508N/510–512E
Elevation and Stratum: 98.46–98.18
Size and Shape: One elongate oval calcrete outcrop, 4.0 m long, 3.9 m wide, 0.18 m high
Dates: See data for Features 40 and 41.

Feature 43: Uncertain, thermal pit, non-rock
Provenience: Block 1, 504N/509E
Elevation and Stratum: 98.35–98.25
Size and Shape: Oval, 39+ by 35+ by 10 cm (exact size uncertain)
Definition: Good
Fill: Black
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon
Dates: None

Feature 44: Spring/water-catchment
Provenience: Block 2, 507–509N/534–536E
Elevation and Stratum: 97.00–82.00
Size and Shape: 520 by 500 by 85 cm (not completely exposed)
Definition: Good
Fill: Light yellowish-brown to medium-yellowish brown; loose to semi-consolidated; very fine sandy silty loam
Bioturbation: Root
Artifacts: Animal bone
Samples: Vertical series of pollen samples
Dates: None

Feature 45: No data.

Feature 46: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 468N/535E

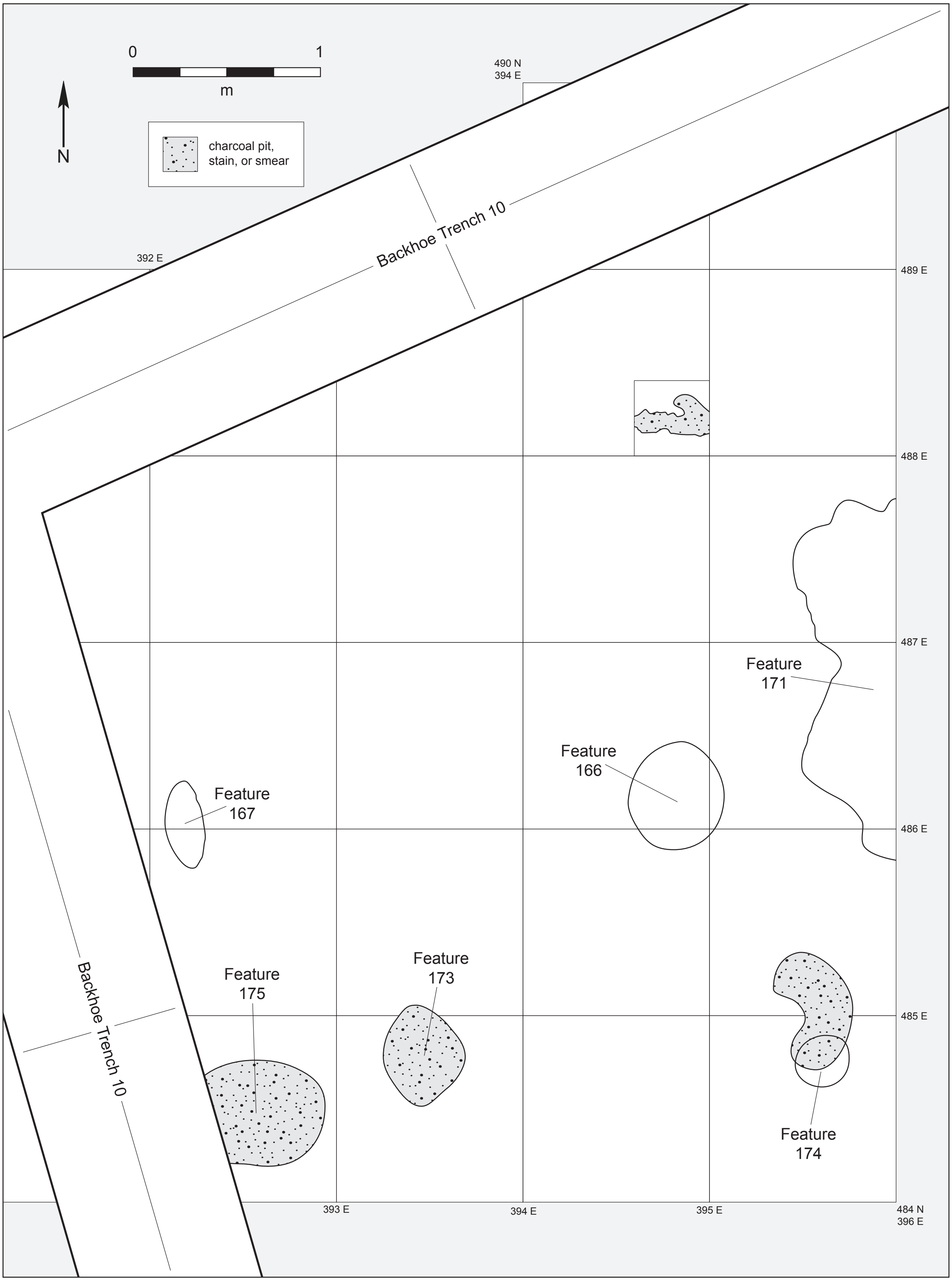

Figure 8.27. LA 129214, Block 19, plan.

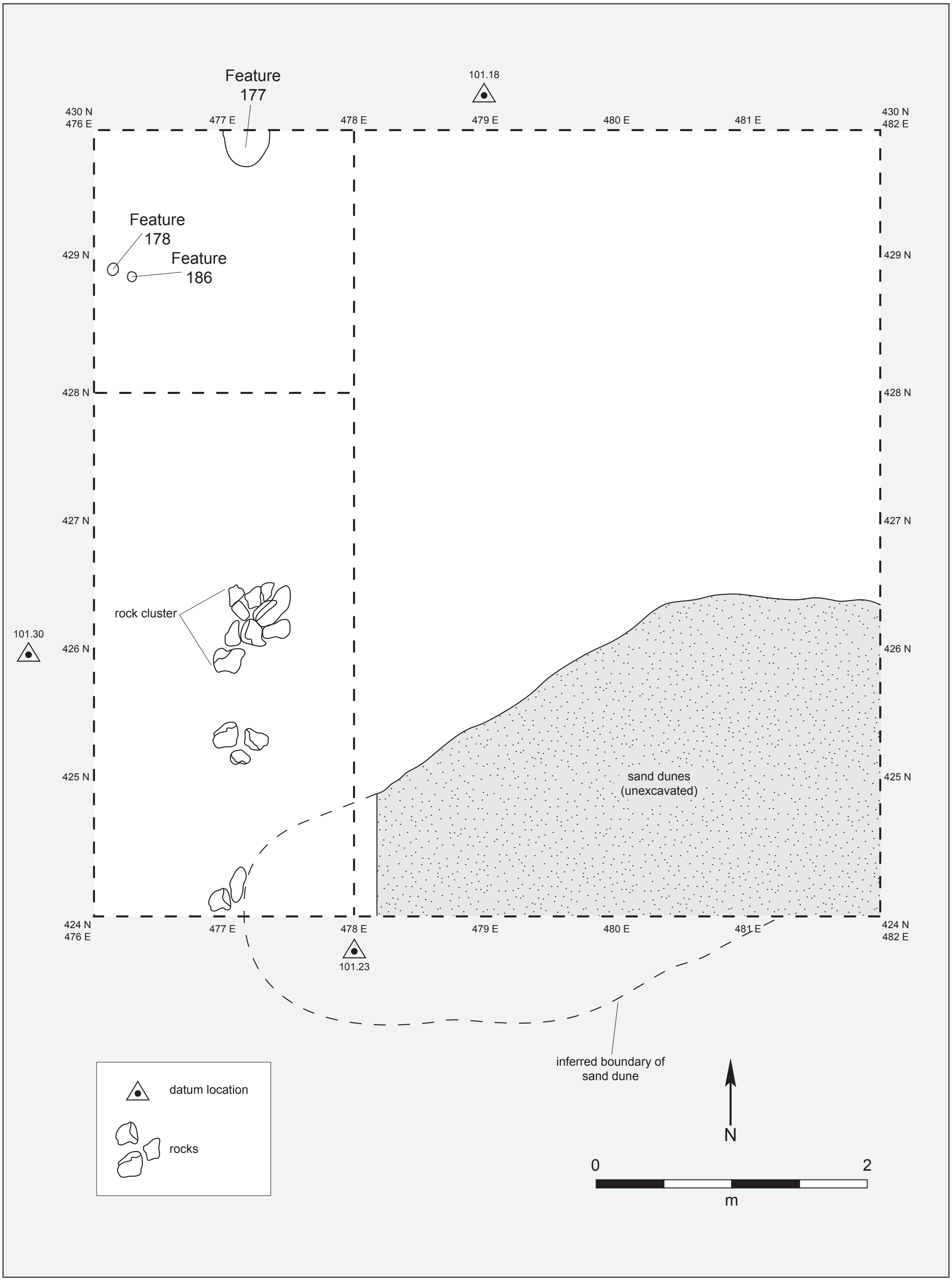

Figure 8.28. LA 129214, Block 20, plan.

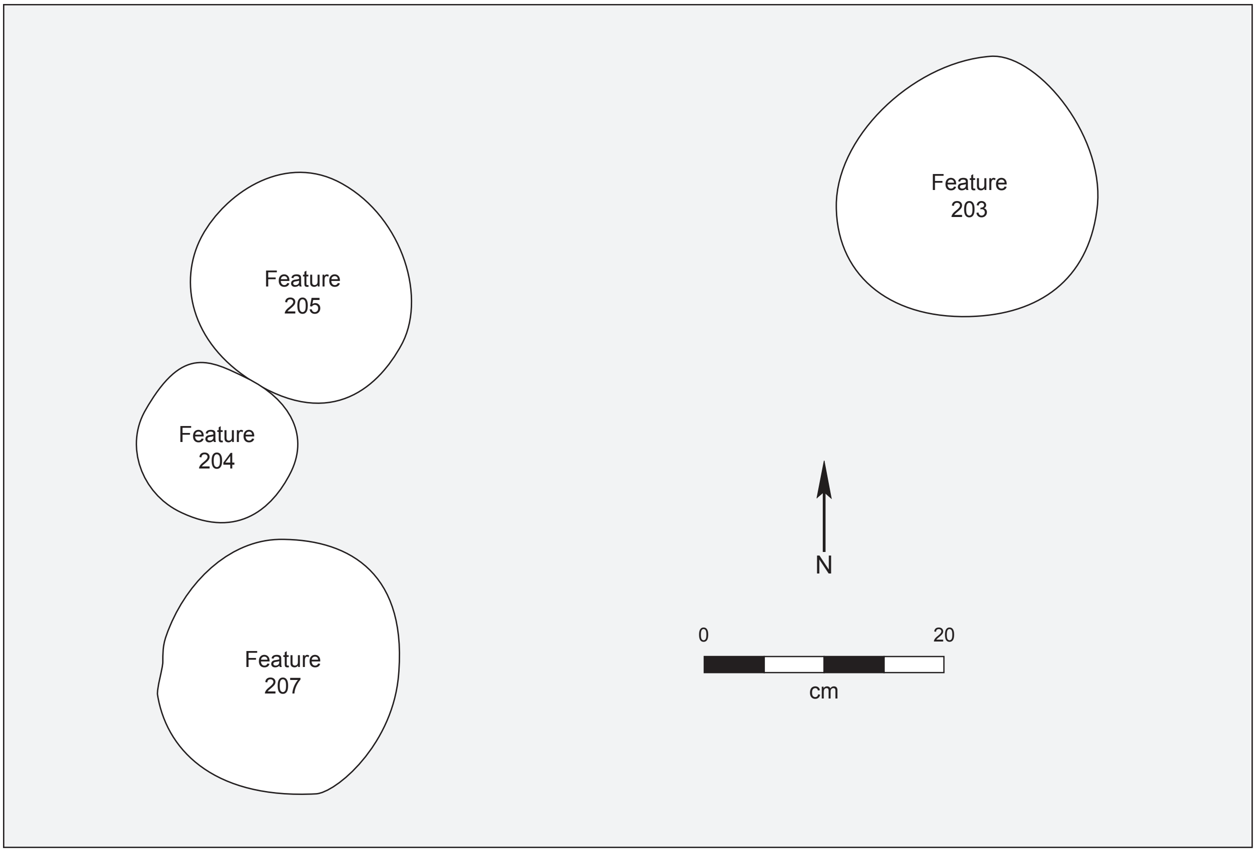

Figure 8.29. LA 129214, plan of Thermal Pits 203, 204, 205, and 207.

Elevation and Stratum: 97.92–97.77, Stratum 2
Size and Shape: Irregular oval, 45 by 44 by 15 cm
Definition: Good
Fill: Very dark gray, "charcoal mixed with sand"
Bioturbation: Rodent, root
Artifacts: Mano in fill
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1020 (Beta 232969)

Feature 47: Thermal pit, non-rock, shallow, medium
Provenience: Block 7, 485N/526E
Elevation and Stratum: 98.16–98.01
Size and Shape: Angular oval, 50 by 38 by 15 cm
Definition: Good
Fill: Dark gray-brown with charcoal "stain"
Bioturbation: Present but unspecified
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 230 (Beta 232968)

Feature 48: Small thermal pit, non-rock, shallow
Provenience: Block 6, 473N/540E

Table 8.21. LA 129214, Block 20, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	166
Pottery sherds	10
Lithic tool	2
Hammerstone	1
Manos and metates	10
Polishing stone	1
Mussel shell	5
C-14 sample	1
Flotation sample	4
Total	**200**

Elevation and Stratum: 97.94–97.84; orifice at top of Stratum 2; bottom at culturally sterile brown sand
Size and Shape: Oval, 32 by 29 by 10 cm
Definition: Fair
Fill: Very dark brown, with charcoal flecking
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation

Table 8.22. LA 129214, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK NO.	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURE/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	91.0	10 or 11	8	2 or 3	–	–	2.2
2	36.0	0	–	–	–	–	<0.1
3	18.0	0	–	–	–	–	1.7
4	29.0	0	–	–	–	–	1.3
5	24.0	2	1	1	–	–	13.3
6	93.0	14	14	–	–	–	10.5
7	44.0	6	6	–	–	–	2.8
8	77.0	8	8	–	–	–	5.8
9	90.0	10	10	–	–	–	4.3
10	42.0	2 or 3	2 or 3	–	–	–	2.7
11	20.0	2	2	–	–	–	8.4
12	77.5	25	23	–	–	2	8.5
13	135.0	7	6	–	–	1	7.8
14	45.0	7	7	–	–	–	1.1
15	18.0	9	9	–	–	–	24.4
16	36.0	14	14	–	–	–	90
17	4.0	0	–	–	–	–	11.8
18	25.0	2	2	–	–	–	5.9
19	20.0	9	9	–	–	–	15.4
20	28.0	3	1	–	–	2	7.2
Total	**952.5**	**130 or 132**	**122 or 123**	**3 or 4**	**0**	**5**	–

Dates: None

Feature 49: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 477N/541E
Elevation and Stratum: 97.77–97.54; orifice in Stratum 1
Size and Shape: Oval, 41 by 34 by 18 cm
Definition: Good, with some oxidation of sides
Fill: Very dark gray-brown with charcoal flecking
Bioturbation: None noted
Artifacts: One lithic debitage
Samples: Flotation, radiocarbon
Dates: None

Feature 50: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 473N/535E
Elevation and Stratum: 98.00–97.86?
Size and Shape: Oval, 40 by 35 by 14 cm
Definition: Good
Fill: Black, with charcoal flecking and pieces
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1160 (Beta 232971)

Feature 51: Thermal pit, non-rock, shallow, medium
Provenience: Block 7, 489N/528E
Elevation and Stratum: 98.25–98.17
Size and Shape: Irregular circle, 50 by 50 by 9 cm
Definition: Good
Fill: Mottled, charcoal-stained sand with abundant charcoal
Bioturbation: Present but unspecified
Artifacts: One potsherd
Samples: Flotation
Dates: Intercept cal AD 1210 (Beta 258470)

Feature 52: Thermal pit, non-rock, deep, small
Provenience: Block 6, 474N/534E
Elevation and Stratum: 98.01–97.93
Size and Shape: Circular, 36 by 35 by 19 cm
Definition: Good
Fill: Very dark gray-brown, with some charcoal flecking
Bioturbation: Root

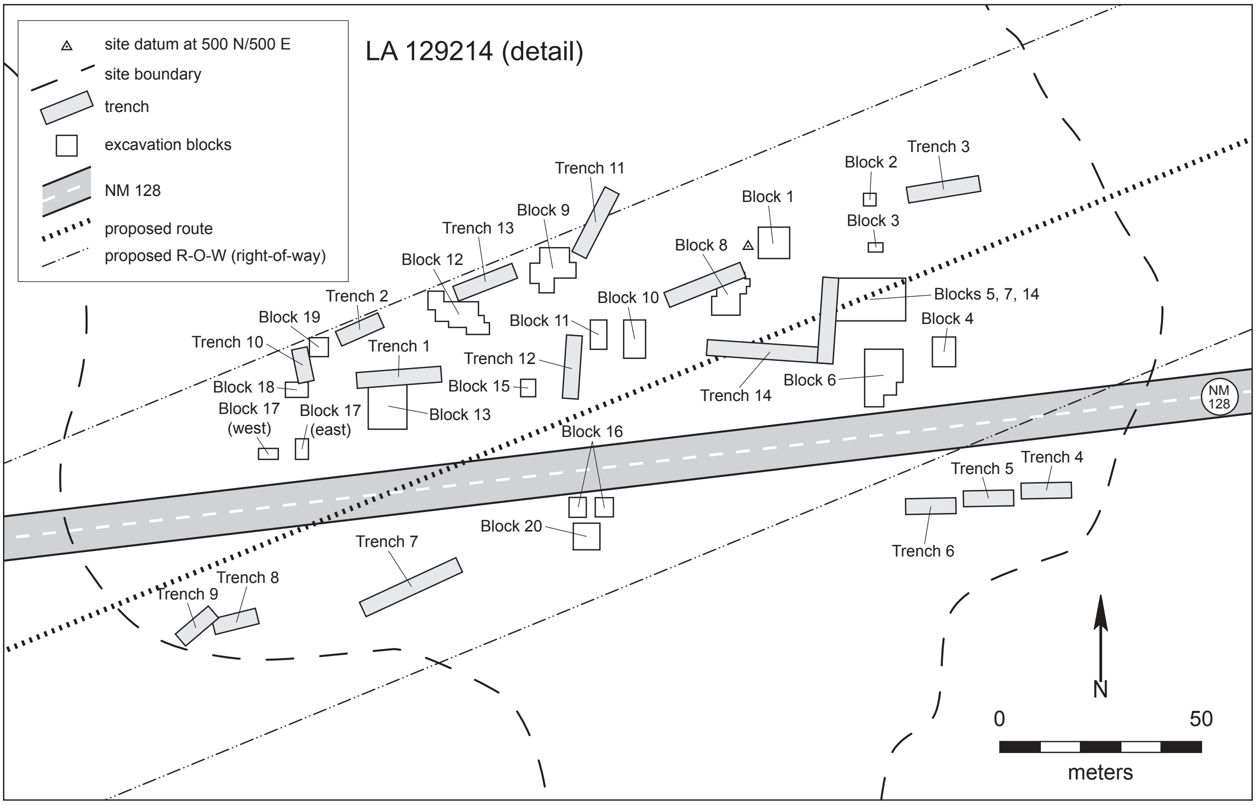

Figure 8.30. LA 129214, site map showing reconstructed extent of anthrosol unit in excavated areas.

Artifacts: None in feature fill, but four potsherds and three lithics just outside
Samples: Flotation, pollen
Dates: Intercept cal AD 890 (Beta 258471)

Feature 53: Thermal pit, non-rock, shallow, medium
Provenience: Block 7, 483N/527–528E
Elevation and Stratum: 91.23–91.10; from Strat 1/2 interface and terminated in Stratum 2
Size and Shape: Oval, 44 by 33 by 13 cm
Definition: Good, except for southwest quarter
Fill: Black (much darker than surrounding Stratum 2 sediments)
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1030 (Beta 232970)

Feature 54: Thermal pit, non-rock?, shallow, small
Provenience: Block 6, 474N/533E
Elevation and Stratum: 97.99–97.92
Size and Shape: Circular, 29 by 27 by 7 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 710/750/760 (Beta 258472)

Feature 55: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 474N/534E
Elevation and Stratum: 98.03–97.88
Size and Shape: Oval, 54 by 43+ by 16 cm (not fully excavated)
Definition: Good
Fill: Dark gray/brown, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 620 (Beta 232972)

Feature 56: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 474N/533–534E
Elevation and Stratum: 98.00–97.92
Size and Shape: Oval, 45 by 41+ by 8 cm (not fully excavated)

Definition: Good
Fill: Very dark gray-brown, with some charcoal
Bioturbation: Root
Artifacts: One lithic debitage
Samples: Flotation, pollen
Dates: None

Feature 57: Thermal pit, rock, shallow, small
Provenience: Block 6, 474N/535E
Elevation and Stratum: 97.88–97.81
Size and Shape: Oval, 34 by 29 by 9 cm
Definition: Abrupt outline and dark fill
Fill: Very dark gray-brown, with charcoal flecking
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 680 (Beta 258473)

Feature 58: Thermal pit, non-rock, deep, medium
Provenience: Block 1, 504–505N/508E
Elevation and Stratum: 98.26–97.96, Stratum 3
Size and Shape: Oval, 50 by 50 by 19 cm
Definition: Not well defined
Fill: Dark brown to black, with pieces of charcoal
Bioturbation: Rodent, rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 90 (Beta 258474). Note: this date is earlier than the date from Feature 89 that underlies Feature 58. See discussion in text.

Feature 59: Thermal pit, non-rock, shallow, medium
Provenience: Block 1, 505N/508E
Elevation and Stratum: 98.14–98.01, Stratum 3
Size and Shape: Oval, 54 by 44 by 13 cm
Definition: Not stated
Fill: Dark brown to black, with pieces of charcoal
Bioturbation: Rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 250 (Beta 258475)

Feature 60: Voided

Feature 61: Thermal pit, non-rock, shallow, medium (in Feature 300?)
Provenience: Block 5, 487N/539E
Elevation and Stratum: 97.45–97.36, Stratum 3
Size and Shape: Oval, 65 by 51 by 9 cm
Definition: Good
Fill: Very dark with plenty of charcoal
Bioturbation: Rodent, root, insect
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 650 (Beta 258476)

Feature 62: Thermal pit, rock, shallow, medium
Provenience: Block 6, 473N/536E
Elevation and Stratum: 97.96–97.81; Stratum 2, with base on calcrete?
Size and Shape: Egg-shaped, 48 by 45 by 15 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 1160 (Beta 258477)

Feature 63: Thermal pit, non-rock, shallow, small
Provenience: Block 6, 472N/534E
Elevation and Stratum: 97.93–97.85; Stratum 2
Size and Shape: Egg-shaped, 20 by 17 by 9 cm
Definition: Fair, fill darker than Stratum 2; excavator uncertain as to whether it was a feature
Fill: darker than Stratum 2 fill, charcoal
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 570 (Beta 258478)

Feature 64: Thermal pit, non-rock, deep, uncertain
Provenience: Block 8, 490N/496E
Elevation and Stratum: 98.92–97.64
Size and Shape: Oval?, 40+ by 40 by 28 cm (not completely exposed)
Definition: Good
Fill: Dark
Bioturbation: Not noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 400 (Beta 258479)

Feature 65: Thermal pit, rock, shallow, medium
Provenience: Block 6, 472N/536E
Elevation and Stratum: 97.82–97.75, on calcrete
Size and Shape: Irregular oval, 44 by 40 by 7 cm
Definition: Good
Fill: Dark gray-brown, with charcoal
Bioturbation: None noted
Artifacts: None

Samples: Flotation, pollen
Dates: None

Feature 66: Thermal pit, non-rock, deep, uncertain
Provenience: Block 6, 467–468N/534E
Elevation and Stratum: 97.95–97.71?
Size and Shape: Irregular oval, 60+ by 60 by 24 cm (not complete)
Definition: Good
Fill: Stratified; lower: black, with charcoal pieces; upper: very dark gray-brown, with charcoal
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation, radiocarbon
Dates: None

Feature 67: Posthole (in structure, Feature 300)
Provenience: Block 5, 484N/539E
Elevation and Stratum: 97.39–97.22, Stratum 3
Size and Shape: Circular, 14 by 14 by 17 cm
Definition: Fair
Fill: Dark brown, with small, isolated flecks of charcoal
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 650 (Beta 232973)

Feature 68: Thermal pit, rock?, shallow, large
Provenience: Block 6, 473N/534E
Elevation and Stratum: 97.90–97.78, Stratum 2 to calcrete in places
Size and Shape: Elongate oval, 81 by 50 by 12 cm
Definition: Good
Fill: Very dark gray-brown, with some charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 550 (Beta 232974)

Feature 69: Thermal? pit, non-rock, shallow, medium
Provenience: Block 8, 489N/500E
Elevation and Stratum: 98.87–98.80
Size and Shape: Triangular with rounded corners, 52 by 50 by 7 cm
Definition: Ephemeral, possibly truncated by erosion
Fill: "Faint stain"; brown, with small numbers of charcoal flecks
Bioturbation: None noted
Artifacts: None
Samples: None
Dates: None

Feature 70: Thermal? pit, non-rock, shallow, medium
Provenience: Block 8, 490N/498E
Elevation and Stratum: 98.80–98.62
Size and Shape: Truncated oval, 45 by 45 by 18 cm
Definition: Upper part diffuse; lower part good
Fill: Dark brown, with charcoal
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, radiocarbon
Dates: None

Feature 71: Thermal pit, non-rock, shallow, medium
Provenience: Block 8, 488N/498E
Elevation and Stratum: 99.01–98.90; Stratum 2 to calcrete
Size and Shape: Oval, 43 by 43 by 11 cm
Definition: Good, with burned interior
Fill: Dark brown, with "ash"
Bioturbation: Noted but not specified
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 410 (Beta 258480)

Feature 72: Thermal pit, rock, shallow, medium
Provenience: Block 9, 503N/461E
Elevation and Stratum: 100.66–100.56
Size and Shape: Nearly circular, 61 by 59 by 10 cm
Definition: Good
Fill: Black, with plentiful charcoal chunks
Bioturbation: Rodent, root, insect
Artifacts: One piece of lithic debitage
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 710/750/760 (Beta 258481)

Feature 73: Thermal pit, rock, shallow, medium
Provenience: Block 8, 492–493N/501–502E
Elevation and Stratum: 98.76–98.60; Stratum 1 to calcrete
Size and Shape: Irregular oval, 46 by 40 by 16 cm
Definition: Good
Fill: Dark brown, with charcoal
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 380 (Beta 258482)

Feature 74: Thermal pit, rock, shallow, medium
Provenience: Block 5, 485N/538E (on edge of structure, Feature 300)
Elevation and Stratum: 97.50–97.33, in edge of rock ring
Size and Shape: Circular, 39 by 38 by 17 cm
Definition: Boundaries of top part diffuse and in Stratum 2 sediments; lower sides and bottom defined by rocks of rock ring
Fill: Dark and infused, with charcoal; charcoal chunks at top
Bioturbation: Root, insect, worm
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 680 (Beta 232975)

Feature 75: Thermal pit, non-rock, shallow, medium
Provenience: Block 8, 495N/500–501E
Elevation and Stratum: 98.81–98.74; Stratum 1
Size and Shape: Egg-shaped, 63 by 41 by 8 cm
Definition: Difficult to see unless moist
Fill: Brown, with charcoal flecking
Bioturbation: Root
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 140 (Beta 258483)

Feature 76: Thermal pit, non-rock, shallow, medium
Provenience: Block 10, 477N/471E
Elevation and Stratum: 100.88–100.77; Stratum 2
Size and Shape: Circular, 49 by 49 by 11 cm
Definition: Good
Fill: Stratified, with dark lens (very dark brown, with charcoal) sandwiched between lighter units
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 410 (Beta 258484)

Feature 77: Uncertain,thermal pit, non-rock
Provenience: Block 10, 484N/471E
Elevation and Stratum: 100.68–100.60; Stratum 2
Size and Shape: Unknown, 25+ by 16+ by 8 cm (not fully exposed)
Definition: Poor, heavily disturbed
Fill: Dark brown to very dark brown, with charcoal pieces
Bioturbation: Root
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 870 (Beta 258485)

Feature 78: Thermal pit, rock, shallow, medium
Provenience: Block 9, 500N/456E
Elevation and Stratum: 100.66–100.56
Size and Shape: Triangular with rounded corners, 46 by 46 by 17 cm
Definition: Upper part diffuse, lower part good
Fill: Black, with a few pieces of charcoal
Bioturbation: Rodent, root, insect
Artifacts: None
Samples: Flotation, radiocarbon
Dates: None

Feature 79: Thermal pit, non-rock, shallow, medium
Provenience: Block 7, 482–483N/528–529E
Elevation and Stratum: 98.18–98.05, from Strat 1/2 interfaced and terminated in Stratum 2
Size and Shape: Circular, 51 by 50 by 13 cm
Definition: Good
Fill: Black (much darker than surrounding Stratum 2 sediments)
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1040/1100/1120 (Beta 232976)

Feature 80: Thermal pit, rock, shallow, medium
Provenience: Block 8, 493–494N/503–504E
Elevation and Stratum: 98.64–98.46
Size and Shape: Oval, 64 by 60 by 18 cm
Definition: Good
Fill: Dark reddish brown, with charcoal
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 420 (Beta 258486)

Feature 81: Thermal pit, non-rock, shallow, small (in Feature 300)
Provenience: Block 5, 484N/539E
Elevation and Stratum: 97.40–97.27
Size and Shape: Circular, 25 by 22 by 13 cm
Definition: Upper part poorly defined, lower part better defined

Fill: Dark, infused with charcoal; sparse charcoal chunks
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 82: Small thermal pit, non-rock, shallow, small
Provenience: Block 8, 488N/594E
Elevation and Stratum: 98.18–98.09, Stratum 1
Size and Shape: Nearly circular, 36 by 33 by 11 cm
Definition: Good, with slight oxidation on bottom
Fill: Reddish black, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 450/450/460/480/530 (Beta 258487)

Feature 83: Thermal pit, non-rock, shallow, medium
Provenience: Block 1, 502N/507E
Elevation and Stratum: 98.42–98.27
Size and Shape: Irregular oval, 60 by 45 by 15 cm
Definition: Poor
Fill: Black, with charcoal pieces
Bioturbation: Rodent and/or root
Artifacts: None
Samples: Flotation
Dates: None

Feature 84: Thermal pit, non-rock, deep, medium
Provenience: Block 7, 483N/529E
Elevation and Stratum: 98.33–98.10, Stratum 2 into Stratum 3
Size and Shape: Oval, 42 by 35 by 23 cm
Definition: Good
Fill: Three strata; lowest: black, with charcoal chunks; middle: dark gray; upper: lighter still, mottled, possibly by rodent intrusion
Bioturbation: Rodent in upper part, root and insect lower down
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1020 (Beta 258488)

Feature 85: Uncertain, thermal pit, non-rock
Provenience: Block 1, 502N/506E
Elevation and Stratum: 98.43–98.36
Size and Shape: Sub-rectangular, 15+ by 12+ by 7+ cm (bottom part only)
Definition: Poor
Fill: Strong brown, with charcoal coloration
Bioturbation: Not stated
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 1030 (Beta 258489)

Feature 86: Paired thermal pits, non-rock
Provenience: Block 9, 498N/451E
Elevation and Stratum: 101.12–100.95
Size and Shape: Overall, oblong with one end pointed; north pit: oval, 42 by 34 by 13 cm; south pit: oval, 37 by 34 by 6 cm
Definition: Distinct
Fill: Dark gray; north: charcoal infused; south: less so
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1000 (Beta 258490)

Feature 87: Deep thermal pit, rock, shallow, medium
Provenience: Block 7, 482N/524E
Elevation and Stratum: 98.48–98.32, Stratum 3 to calcrete
Size and Shape: Irregular circle, 45 by 45 by 16 cm
Definition: Good
Fill: Dark brown with charcoal chunks
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 770 (Beta 232978)

Feature 88: Uncertain, thermal pit, non-rock,
Provenience: Block 1, 505N/507E
Elevation and Stratum: 98.35–98.15, Stratum 2
Size and Shape: 28+ by 12+ by 20 cm (not fully exposed)
Definition: Good
Fill: Slightly darker than surrounding Stratum 2 sediment
Bioturbation: Not noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 140 (Beta 258491)

Feature 89: Uncertain, thermal pit, non-rock

Provenience: Block 1, 505N/507E
Elevation and Stratum: 98.35–98.12, Stratum 2
Size and Shape: 38+ by 18+ by 23 cm (not fully exposed)
Definition: Good
Fill: Slightly darker than surrounding Stratum 2 sediment
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 120 (Beta 258492)

Feature 90: Posthole (in Feature 300)
Provenience: Block 5, 484N/540E
Elevation and Stratum: 97.45–97.37, Stratum 3
Size and Shape: Circular, 5 by 5 by 8 cm
Definition: Good
Fill: Silty sand, with charcoal flecks; large pebble at bottom
Bioturbation: None
Artifacts: None
Samples: Flotation
Dates: None

Feature 91: Uncertain, thermal pit, non-rock
Provenience: Block 11, 480N/464E
Elevation and Stratum: 101.26–101.23, Stratum 2
Size and Shape: Oval?, 40 by 23+ by 3+ cm (not fully exposed)
Definition: Good
Fill: Very dark gray, with some charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 92: Thermal pit, rock, shallow, medium
Provenience: Block 11, 485N/463E
Elevation and Stratum: 100.99–100.84, Stratum 2 to calcrete
Size and Shape: Nearly circular, 39 by 38 by 15 cm
Definition: Good
Fill: Very dark brown, with charcoal
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 93: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 500N/462E
Elevation and Stratum: 100.73–100.59
Size and Shape: Oval, 40 by 34 by 14 cm
Definition: Good; one side destroyed by rodent burrow
Fill: Dark brown, with charcoal mottling
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 770 (Beta 258493)

Feature 94: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 499N/460E
Elevation and Stratum: 100.83–100.60
Size and Shape: Triangular with rounded corners, 47 by 33 by 13 cm
Definition: Good
Fill: Dark gray, with dense charcoal mottling at top, lighter gray towards bottom
Bioturbation: Root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 670 (Beta 232977)

Feature 95: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 498N/461E
Elevation and Stratum: 100.75–100.63
Size and Shape: Oval, 53 by 42 by 12 cm
Definition: Good boundary definition
Fill: Dark brown, with charcoal flecking
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 810 (Beta 258494)

Feature 96: Thermal pit, non-rock, deep, small
Provenience: Block 9, 497N/452E
Elevation and Stratum: 101.13–100.94
Size and Shape: Oval, 32 by 24 by 19 cm
Definition: Boundary well defined by a thick oxidized rind
Fill: Dark, with charcoal bits
Bioturbation: Root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1040 (Beta 258495)

Feature 97: Thermal pit, non-rock, shallow, medium

Provenience: Block 12, 488N/437E
Elevation and Stratum: 102.81–102.77, Stratum 1
Size and Shape: Irregular oval, 53 by 39 by 4 cm
Definition: Distinct
Fill: Central part dark and charcoal infused, periphery lighter
Bioturbation: Root
Artifacts: None
Samples: Flotation
Dates: None

Feature 98: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 497N/452E
Elevation and Stratum: 101.18–101.05
Size and Shape: Irregular circular, 43 by 42 by 14 cm
Definition: Top part, somewhat diffuse; lower part and bottom, good definition with some oxidation
Fill: Charcoal-stained
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 1210 (Beta 258496)

Feature 99: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 496N/456E
Elevation and Stratum: 101.03–100.92
Size and Shape: Oval, 48 by 45 by 11 cm
Definition: Clear, distinct, with mottled oxidation on sides and bottom
Fill: Dark brown, with charcoal coloration
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 890 (Beta 258497)

Feature 100: Voided

Feature 101: Thermal pit, non-rock, shallow, small
Provenience: Block 12, 489N/434E
Elevation and Stratum: 102.69–102.61, Stratum 2
Size and Shape: Irregular oval, 32 by 30 by 8 cm
Definition: Distinct
Fill: Very dark gray
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 980 (Beta 258498)

Feature 102: Thermal pit, non-rock, deep, medium
Provenience: Block 12, 490N/433–434E
Elevation and Stratum: 102.76–102.55, Stratum 2
Size and Shape: Nearly circular, 56 by 53 by 21 cm
Definition: Distinct
Fill: Dark gray-brown, charcoal infused
Bioturbation: Rootlet
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 890 (Beta 258499)

Feature 103: Thermal pit, rock, shallow, medium
Provenience: Block 12, 488N/428E
Elevation and Stratum: 103.23–103.10, Stratum 2
Size and Shape: Nearly circular, 48 by 46 by 13 cm
Definition: Diffuse upper boundary, better defined lower boundary; terminated on calcrete
Fill: Dark brown, with charcoal
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 690 (Beta 232979)

Feature 104: Thermal pit, non-rock, shallow, small
Provenience: Block 12, 489N/434E; possibly belongs to Surface Survey Feature 6
Elevation and Stratum: 102.74–102.67, Stratum 2
Size and Shape: Kidney-bean shaped, 53 by 38 by 7 cm
Definition: Not noted
Fill: Charcoal infused
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 890 (Beta 258500)

Feature 105: Thermal pit, rock?, deep, medium
Provenience: Block 12, 490N/434E
Elevation and Stratum: 102.70–102.42, Stratum 3
Size and Shape: Oval, 49 by 45 by 28 cm
Definition: Not noted
Fill: Charcoal infused
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 640 (Beta 258501)

Feature 106: Thermal pit, non-rock, shallow, small
Provenience: Block 9, 497N/459E
Elevation and Stratum: 100.92–100.84

Size and Shape: Triangular with rounded corners, 37 by 36 by 8 cm
Definition: Poor (much rodent disturbance)
Fill: Dark brown with some charcoal flecking
Bioturbation: Rodent
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 870 (Beta 258502)

Feature 107: Thermal pit, non-rock, shallow, small
Provenience: Block 12, 486N/437E
Elevation and Stratum: 102.90–102.81, orifice just below top of Stratum 2
Size and Shape: Irregular oval, 24 by 21+ by 9 cm (incomplete)
Definition: Distinct
Fill: Very dark brown infused with charcoal
Bioturbation: Insect, root
Artifacts: None
Samples: Pollen
Dates: None

Feature 108: Thermal pit, rock, shallow, medium
Provenience: Block 12, 489N/432E
Elevation and Stratum: 102.84–102.73, Stratum 2
Size and Shape: Oval, 60 by 48 by 11 cm
Definition: Bottom and NW periphery calcrete; the rest was poorly defined
Fill: Mottled, light gray and black
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 109: Thermal pit, rock, very deep, medium
Provenience: Block 12, 487N/430E
Elevation and Stratum: 103.14–102.80, Strata 2 and 3
Size and Shape: Roughly circular, 44 by 42 by 34 cm
Definition: Good
Fill: Mixed, disturbed; mostly very dark gray-black where intact
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 420 (Beta 232980)

Feature 110: Thermal pit, non-rock, very deep, medium
Provenience: Block 12, 487N/441E
Elevation and Stratum: 102.51–102.19, Stratum 2
Size and Shape: Oval, 50 by 46 by 32 cm
Definition: Good
Fill: Very dark brown, charcoal-stained
Bioturbation: Insect, root
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 430 (Beta 258503)

Feature 111: Voided; but, have ^{14}C intercept date of cal AD 710/750/760 (Beta 232981)

Feature 112: Thermal “pit,” rock, shallow, medium
Provenience: Block 14, 484N/535E
Elevation and Stratum: 97.80–97.75, Stratum 2 to calcrete
Size and Shape: Circular, 42 by 42 by 5 cm
Definition: Good
Fill: Dark
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 120 (Beta 258504)

Feature 113: Thermal pit, non-rock, shallow, medium
Provenience: Block 14, 484N/530E
Elevation and Stratum: 98.12–98.07
Size and Shape: Oval, 40 by 30 by 5 cm
Definition: Good
Fill: Dark gray, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 114: Thermal pit, rock, shallow, medium
Provenience: Block 14, 484–485N/530E
Elevation and Stratum: 98.12–97.94; Stratum 3 to calcrete
Size and Shape: Circular, 60 by 59 by 14 cm
Definition: Good
Fill: Dark reddish brown, with charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 1010 (Beta 258505)

Feature 115: Thermal pit, non-rock, shallow, medium
Provenience: Block 14, 484N/530E
Elevation and Stratum: 98.15–98.07; Stratum 2
Size and Shape: Oval, 44 by 32 by 8 cm
Definition: Good
Fill: Dark gray-brown, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 900/920/960 (Beta 258506)

Feature 116: Thermal pit, non-rock, shallow, medium
Provenience: Block 14, 484N/530E
Elevation and Stratum: 98.13–97.95; Stratum 2
Size and Shape: Oval, 44 by 22 by 18 cm
Definition: Good
Fill: Dark reddish brown, with charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1200 (Beta 258507)

Feature 117: Thermal pit, non-rock, shallow, small
Provenience: Block 14, 484N/530E
Elevation and Stratum: 98.12–98.03; Stratum 2
Size and Shape: Circular, 26 by 26 by 9 cm
Definition: Good
Fill: Dark reddish brown, with charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation
Dates: None

Feature 118: Thermal pit, non-rock?, shallow, medium
Provenience: Block 14, 484–485N/530–531E
Elevation and Stratum: 98.11–98.00; Stratum 2
Size and Shape: Circular, 42 by 42 by 13 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 1030 (Beta 258508)

Feature 119: Thermal pit, non-rock, deep, medium
Provenience: Block 12, 487N/440E
Elevation and Stratum: 102.57–102.34, Stratum 2
Size and Shape: Circular, 43 by 43 by 23 cm
Definition: Good
Fill: Black in center, with dark brown sand around periphery
Bioturbation: Insect, root
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 660 (Beta 258509)

Feature 120: Thermal pit, rock, deep, medium
Provenience: Block 12, 490N/428E
Elevation and Stratum: 103.10–102.82, Stratum 2
Size and Shape: Circular, 43 by 43 by 23 cm
Definition: Good, with bottom of calcrete; partly overlain by Feature 124
Fill: Uppermost 5 to 6 cm dark brown, grading to black with depth; charcoal pieces scattered throughout
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 680 (Beta 232984)

Feature 121: Thermal pit, non-rock, shallow, medium
Provenience: Block 12, 491N/428E
Elevation and Stratum: 103.12–103.05, Stratum 2
Size and Shape: Oval, 50 by 40 by 7 cm
Definition: Upper part: diffuse; lower sides and bottom: good
Fill: Very dark brown with pieces of charcoal
Bioturbation: Rootlets
Artifacts: One animal bone fragment
Samples: Flotation, radiocarbon
Dates: None

Feature 122: Thermal pit, rock, shallow, medium
Provenience: Block 13, 470N/420E
Elevation and Stratum: 104.12–104.03
Size and Shape: Corn kernel-shaped, 42 by 32 by 9 cm
Definition: Well-defined but believed by recorder to be severely deflated
Fill: Brown with abundant chunks of charcoal
Bioturbation: Rootlets
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 250 (Beta 232982)

Feature 123: Thermal pit, non-rock, deep, medium

Provenience: Block 12, 487N/439E
Elevation and Stratum: 102.60–102.35, Strata 2 and 3
Size and Shape: Circular, 65 by 63 by 25 cm
Definition: Diffuse upper part in Stratum 2, good lower part in Stratum 3
Fill: Dark reddish brown, with charcoal flecking
Bioturbation: Rodent
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 260/290/320 (Beta 232983)

Feature 124: Thermal pit, non-rock, shallow, medium
Provenience: Block 12, 490N/428E
Elevation and Stratum: 103.08–103.02, Stratum 2
Size and Shape: Oval, 39 by 29 by 6 cm
Definition: Poor (partly superimposed over Feature 120)
Fill: Dark brown with layer of charcoal pieces at top
Bioturbation: Rodent
Artifacts: None
Samples: Flotation
Dates: None

Features 125–127: Voided

Feature 128: Thermal pit, rock?, shallow, medium
Provenience: Block 12, 491N/427E
Elevation and Stratum: 103.10–103.05, Stratum 2
Size and Shape: Elongate oval, 49 by 29 by 5 cm
Definition: Poor
Fill: Dark brown, with small pieces of charcoal
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 129: Thermal pit, rock, shallow, medium
Provenience: Block 12, 492N/427E
Elevation and Stratum: 103.16–103.05, Strata 2 and 3
Size and Shape: Oval, 51 by 45 by 11 cm
Definition: Good; bottom and lower sides in calcrete
Fill: Dark brown, with charcoal flecks and pieces
Bioturbation: Insect and other
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 540 (Beta 258510)

Feature 130: Thermal pit, rock?, deep, medium
Provenience: Block 12, 486N/439E
Elevation and Stratum: 102.60–102.33, Strata 2 and 3
Size and Shape: Circular, 55 by 54 by 27 cm
Definition: Upper boundary diffuse; bottom and lower sides, fair to good
Fill: Where undisturbed (bottom), dark brown, with charcoal chunks
Bioturbation: Serious rodent and root disturbance
Artifacts: Minerals
Samples: Flotation, radiocarbon
Dates: None

Feature 131: Thermal pit, rock, deep, medium
Provenience: Block 12, 488N/431E
Elevation and Stratum: 102.97–102.69, Stratum 3
Size and Shape: Irregular oval, 59 by 51 by 28 cm
Definition: Very good
Fill: Very dark gray, with charcoal
Bioturbation: Rootlet
Artifacts: Hammerstone (from pit lining)
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 810 (Beta 258511)

Feature 132: Thermal pit, rock, shallow, large
Provenience: Block 13, 469–470N/415E
Elevation and Stratum: 104.30–104.25, Stratum 2
Size and Shape: Oval, 75 by 53 by 5 cm
Definition: Orifice defined by burned rocks
Fill: Brown with charcoal flecks
Bioturbation: None noted
Artifacts: Two pieces of ground stone
Samples: Flotation, pollen
Dates: Intercept cal AD 260/280/330 (Beta 258512)

Feature 133: Thermal pit, non-rock, shallow, medium
Provenience: Block 13, 471N/415E
Elevation and Stratum: 104.35–104.27
Size and Shape: Irregular oval, 55 by 43 by 5 cm
Definition: Upper part poor, lower part better but still disturbed
Fill: Dark brown, with plentiful charcoal pellets
Bioturbation: Rodent, insect
Artifacts: None

Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1400 (Beta 258513)

Feature 134: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 467N/444E
Elevation and Stratum: 103.19–103.08, Stratum 2
Size and Shape: Oval, 48 by 42 by 12 cm
Definition: Very good
Fill: Charcoal-flecked
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1030 (Beta 258514)

Feature 135: Thermal pit, non-rock, shallow, medium
Provenience: Block 13, 470N/415E
Elevation and Stratum: 104.34–104.24, Stratum 2
Size and Shape: Oval?, 64 by 41+ by 5 cm (incomplete)
Definition: Fair
Fill: Dark brown, with charcoal flecks
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1060/1080/1150 (Beta 232985)

Feature 136: Thermal pit, rock, deep, medium
Provenience: Block 12, 489N/427E
Elevation and Stratum: 103.24–102.95, Strata 2 and 3
Size and Shape: Oval, 66 by 62 by 29 cm
Definition: Good
Fill: Stratified, with two episodes of use indicated by a lower stratum (very dark brown with charcoal stain), then a Stratum 2 interlude fill, then a final-use fill denoted by very dark brown, with charcoal stain
Bioturbation: Rootlet, insect
Artifacts: One lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 690 (Beta 258515); probably pertains to second use of feature

Feature 137: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 468N/445E
Elevation and Stratum: 103.09–103.00
Size and Shape: Elongate oval, 40 by 27 by 7 cm
Definition: Good
Fill: Dark, charcoal-flecked
Bioturbation: Rodent
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 980 (Beta 258516)

Feature 138: Thermal pit, non-rock, deep, large
Provenience: Block 16, 434–435N/472–473E
Elevation and Stratum: 101.12–100.90, Stratum 2, possibly into Stratum 3
Size and Shape: Squarish with nearly vertical sides, 75 by 65 by 22 cm
Definition: Somewhat diffuse rim, very good lower sides and bottom
Fill: Dark gray to black
Bioturbation: Rodent, root
Artifacts: One lithic debitage, one animal bone
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1060/1080/1150 (Beta 258517)

Feature 139: Uncertain, thermal pit, rock
Provenience: Block 13, 472N/419E
Elevation and Stratum: 104.13–104.02
Size and Shape: Oval, 46+ by 43+ by 12+ cm (incomplete)
Definition: Good (consisting mainly of burned spot on calcrete)
Fill: Basically no fill remaining (totally deflated, then re-covered by later deposition of functionally unrelated sediments)
Bioturbation: None noted
Artifacts: None
Samples: None
Dates: None

Feature 140: Rock-pile type of post support
Provenience: Block 13, 470N/412E
Elevation and Stratum: 104.50–104.28, uppermost Stratum 2
Size and Shape: Roughly circular, 55 by 55 by 22 cm
Definition: Good, though partly dissembled; includes both burned and unburned cobbles; no evidence that the presumed post had been sunk into the underlying sediments
Fill: Not applicable
Bioturbation: None noted

Artifacts: None
Samples: Pollen
Dates: None

Feature 141: Thermal pit, rock, shallow, medium
Provenience: Block 13, 472–473N/413E
Elevation and Stratum: 104.30–104.21, Stratum 2 with bottom of calcrete
Size and Shape: Egg-shaped, 51 by 50 by 9 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal flecks
Bioturbation: Rodent, rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 670 (Beta 232986)

Feature 142: Thermal pit, non-rock, deep, large
Provenience: Block 15, 469N/444E
Elevation and Stratum: 102.92–102.74, Stratum 1?
Size and Shape: Oval, 87 by 79 by 22 cm
Definition: Fair
Fill: Dark gray, with charcoal flecks
Bioturbation: Rodent
Artifacts: Three lithic debitage, one mussel shell fragment
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 890 (Beta 258518)

Feature 143: Thermal pit, rock, shallow, medium
Provenience: Block 16, 437N/473–474E
Elevation and Stratum: 101.11–100.99, Stratum 2
Size and Shape: Oval, 57 by 50+ by 12 cm
Definition: Good
Fill: Black
Bioturbation: Roots, rootlets
Artifacts: One lithic debitage, two animal bones
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 900/920/960 (Beta 258519)

Feature 144: Thermal pit, non-rock, shallow, medium
Provenience: Block 16, 434–435N/475E
Elevation and Stratum: 101.08–100.90, Stratum 2
Size and Shape: Circular with vertical sides, 62 by 60+ by 18 cm
Definition: Fairly well-defined rim; calcrete bottom
Fill: Dark center, with lighter periphery
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon, macrobotanical
Dates: Intercept cal AD 1020 (Beta 258520)

Feature 145: Thermal pit, non-rock, shallow, small
Provenience: Block 16, 436N/475E
Elevation and Stratum: 101.07–100.99, Stratum 2
Size and Shape: Oval, 26 by 22+ by 8 cm
Definition: Good; overlay but separate from Feature 182
Fill: Black, with pieces of charcoal
Bioturbation: Rootlets
Artifacts: One lithic debitage
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1020 (Beta 258521)

Feature 146: Thermal pit, rock, shallow, large
Provenience: Block 16, 435–436N/473–474E
Elevation and Stratum: 101.13–100.99, Stratum 2
Size and Shape: Oval, 80 by 72 by 14 cm
Definition: Good
Fill: Dark gray to black, with pieces of charcoal
Bioturbation: None noted
Artifacts: Two animal bones
Samples: Flotation, pollen, radiocarbon, macrobotanical, burned rock
Dates: Intercept cal AD 900/920/950 (Beta 232988)

Feature 147: Voided

Feature 148: Thermal pit, non-rock, shallow, large
Provenience: Block 16, 434–435N/473–474E
Elevation and Stratum: 101.11–100.98, Stratum 2
Size and Shape: Oval, 90 by 75 by 13 cm
Definition: Good
Fill: Dark center, lighter periphery
Bioturbation: Root, insect
Artifacts: Four lithic debitage, one ground stone, three animal bones
Samples: Flotation, radiocarbon, macrobotanical
Dates: Intercept cal AD 890 (Beta 258522)

Feature 149: Thermal pit, non-rock?, shallow, medium
Provenience: Block 16, 434–435N/476E
Elevation and Stratum: 101.07–100.95
Size and Shape: Oval, 57 by 17+ by 12 cm; only partly exposed
Definition: Good, with clear boundaries
Fill: Very dark gray to black

Bioturbation: Rootlets
Artifacts: Two lithic debitage
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1270 (Beta 258523)

Feature 150: Thermal pit, non-rock, shallow, medium
Provenience: Block 16, 434–435N/476E
Elevation and Stratum: 101.04–100.95
Size and Shape: : Non-symmetric oval, 55 by 40 by 9 cm
Definition: Difficult to distinguish from surrounding Stratum 2 sediments
Fill: Slightly darker than surrounding fill
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 151: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 469N/446E
Elevation and Stratum: 102.98–102.88
Size and Shape: Oval, 64 by 54 by 13 cm
Definition: Very good
Fill: Dark, with charcoal flecks
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 650 (Beta 258524)

Feature 152: Thermal pit (bell-shaped), non-rock, very deep, uncertain
Provenience: Block 9 (BHT 11), 505N/461E
Elevation and Stratum: 99.26–98.77
Size and Shape: Oval?, 44+ by 24+ by 49 cm
Definition: Good; bottom and lower sides heavily oxidized; upper sides less-well oxidized; west side partly superimposed by Feature 156
Fill: Dark brown, with charcoal coloration and many small- to medium-sized pieces of charcoal
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 650 (Beta 232987)

Feature 153: Thermal pit, non-rock, shallow, medium
Provenience: Block 15, 468N/446E
Elevation and Stratum: 102.96–102.84, Stratum 2
Size and Shape: Oval, 54 by 46 by 5 cm
Definition: Poor to fair
Fill: Dark, with charcoal flecks
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 890 (Beta 232991)

Feature 154: Thermal pit, non-rock, shallow, small
Provenience: Block 15, 467N/445E
Elevation and Stratum: 103.04–102.94, Stratum 2
Size and Shape: Oval, 24 by 20 by 9 cm
Definition: Poor
Fill: Dark, with charcoal flecks
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 900/920/950 (Beta 258525)

Feature 155: Thermal pit, non-rock, deep, medium
Provenience: Block 15, 468N/446E
Elevation and Stratum: 102.92–102.62, Stratum 2
Size and Shape: Irregular with nearly vertical sides, 65 by 58 by 30 cm
Definition: Poor
Fill: Dark, with charcoal flecks and pieces
Bioturbation: Rodent
Artifacts: One lithic debitage?
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 900/920/950 (Beta 258526)

Feature 156: Thermal pit, non-rock, shallow, small
Provenience: Block 9, 506N/461E
Elevation and Stratum: 99.24–99.06, Stratum 2
Size and Shape: Oval, 26 by 23 by 10 cm
Definition: Good, except for part that intruded into Feature 152
Fill: Dark brown, with heavy infusion of charcoal
Bioturbation: Rodent, root
Artifacts: Mano
Samples: Flotation, pollen
Dates: Intercept cal AD 670 (Beta 258527)

Feature 157: Thermal pit, rock, shallow, medium
Provenience: Block 18, 471N/389E
Elevation and Stratum: 105.02–104.87, Stratum 2 to calcrete
Size and Shape: Irregular oval, 46 by 46 by 15 cm
Definition: Good

Fill: Dark brown to very dark brown, with infusion of charcoal
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1170 (Beta 232989)

Feature 158: Thermal pit, non-rock, shallow, large
Provenience: Block 9 (BHT 11), 506N/463E
Elevation and Stratum: 99.29–99.12, Stratum 3
Size and Shape: Oval?, 74+ by 70 by 12 cm
Definition: Good, west end undefined because it overlaps another feature
Fill: Dark brown, with heavy infusion of charcoal
Bioturbation: Rodent, root
Artifacts: Mano
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 770 (Beta 232990)

Feature 159: Thermal pit, rock, very deep, uncertain
Provenience: Block 18, 472N/387E
Elevation and Stratum: 104.92–104.35, Stratum 2
Size and Shape: Oval?, 39+ by ? by 40 cm (not fully excavated)
Definition: Good
Fill: Black
Bioturbation: Rodent; extreme depth may be rodent caused
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 560 (Beta 258528)

Feature 160: Thermal pit, non-rock, shallow, small
Provenience: Block 15, 468N/448E
Elevation and Stratum: 103.05–102.97, Stratum 2
Size and Shape: Elongate oval, 34 by 19 by 8 cm
Definition: Fair
Fill: Dark, with charcoal flecks
Bioturbation: Root
Artifacts: None
Samples: Flotation
Dates: None

Feature 161: Uncertain, thermal pit, non-rock
Provenience: Block 15, 468N/448E
Elevation and Stratum: 103.13–102.99
Size and Shape: Oval, 30+ by 26+ by 14 cm (not fully exposed)
Definition: Moderately good
Fill: Dark, with charcoal flecks
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation
Dates: Intercept date AD 880 (Beta 258529)

Feature 162: Thermal pit, rock, shallow, large
Provenience: Block 16, 436N/482E
Elevation and Stratum: 100.69–100.58
Size and Shape: Elongate oval, 90 by 55 by 11 cm
Definition: Fairly good
Fill: Black, with pieces of charcoal
Bioturbation: Some spread, due to human traffic post abandonment?
Artifacts: Lithic debitage
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1020 (Beta 258530)

Feature 163: Thermal pit, non-rock, shallow, small
Provenience: Block 16, 437N/481E
Elevation and Stratum: 100.70–100.60, Stratum 2
Size and Shape: Oval, 30 by 27+ by 10 cm (not fully exposed)
Definition: Good
Fill: Dark gray to black, with charcoal flecks
Bioturbation: Rootlets
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 970 (Beta 258531)

Feature 164: Thermal pit, non-rock, shallow, medium
Provenience: Block 16, 437N/481E
Elevation and Stratum: 100.72–100.67, Stratum 2
Size and Shape: Oval, 45 by 35+ by 15 cm (partial exposure)
Definition: Poor, diffuse, slightly darker than surrounding fill
Fill: Very dark gray-brown color
Bioturbation: Rootlets, nearby highway construction/off-road use?
Artifacts: Mano
Samples: Flotation
Dates: None

Feature 165: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 504N/462E
Elevation and Stratum: 99.26–99.14, Stratum 3

Size and Shape: Oval, 58 by 45 by 14 cm
Definition: Clear and distinct
Fill: Upper part black, lower part dark brown
Bioturbation: Rodent disturbance in top part of fill
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 166: Thermal pit, non-rock, shallow, medium
Provenience: Block 19, 485N/394E
Elevation and Stratum: 105.00–104.85, Stratum 2
Size and Shape: Oval, 53 by 50 by 15 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal bits and flecking
Bioturbation: Rodent, insect, root
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 167: Thermal pit, non-rock?, shallow, medium
Provenience: Block 19, 485–486N/392E
Elevation and Stratum: No data
Size and Shape: Elongate oval, 55 by 27 by 11 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal bits and flecking
Bioturbation: Rodent
Artifacts: Two lithic debitage
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 1010 (Beta 232993)

Feature 168: Posthole
Provenience: Block 9, 505N/461E
Elevation and Stratum: 99.29–99.12, Stratum 2
Size and Shape: Oval, 11 by 10 by 17 cm
Definition: Clear, with four pieces of rock in side wall
Fill: Dark brown, with charcoal flecks
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 169: Posthole
Provenience: Block 9, 504N/461E
Elevation and Stratum: 99.29–99.10, Stratum 2
Size and Shape: Oval, 12 by 10 by 19 cm
Definition: East side: good; west side: rodent disturbed; several rocks set in side wall of feature
Fill: Dark brown
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 170: Posthole
Provenience: Block 9, 505N/461E
Elevation and Stratum: 99.17–98.91, Stratum 2
Size and Shape: Circular, 11 by 11 by 26 cm
Definition: Upper boundary good, lower boundary rodent disturbed
Fill: Dark brown, with charcoal flecking; several rocks set near side wall
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 171: Large, irregular, trash accumulation
Provenience: Block 19, 485–487N/395E
Elevation and Stratum: No data
Size and Shape: Irregular shape, 226+ by 55+ by ? cm; only partly exposed
Definition: Diffuse boundaries
Fill: Varying light to dark shades, with spotty concentrations of charcoal and burned-rock fragments
Bioturbation: Rodent
Artifacts: Two lithic debitage
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 690 (Beta 232992)

Feature 172: Possible posthole
Provenience: Block 12, 489N/427E
Elevation and Stratum: 103.20–103.15, Stratum 3
Size and Shape: Oval, 10 by 8 by 5 cm
Definition: Fair; rough-edged profile that might be due to shape of a post
Fill: Fine sand with charcoal flecks
Bioturbation: Not noted
Artifacts: None
Samples: None
Dates: None

Feature 173: Thermal pit, rock, deep, medium
Provenience: Block 19, 484–485N/393E

Elevation and Stratum: 104.87–104.61; Stratum 2 to calcrete
Size and Shape: Oval, 50 by 32 by 26 cm
Definition: Good
Fill: Very dark gray
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 174: Thermal pit, non-rock, shallow, small
Provenience: Block 19, 484N/395E
Elevation and Stratum: 104.90–104.81; Stratum 2
Size and Shape: Circular, 30 by 30 by 9 cm
Definition: Good
Fill: Dark reddish gray, with charcoal staining
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 175: Thermal pit, non-rock, shallow, medium
Provenience: Block 19 (BHT 10), 484N/392E
Elevation and Stratum: 105.01–104.95; Stratum 2
Size and Shape: Oval, 49 by 36+ by 6 cm (not fully exposed)
Definition: Good, but upper part missing
Fill: Dark reddish gray, with charcoal staining
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation
Dates: None

Feature 176: Thermal pit, non-rock, shallow, small
Provenience: Block 12, 487N/436E
Elevation and Stratum: 102.62–102.58, Stratum 2
Size and Shape: Oval, 32 by 20 by 4 cm
Definition: Good
Fill: Reddish brown, with charcoal flecks and small chunks; grayer than surrounding sediments
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 177: Uncertain, thermal pit, non-rock
Provenience: Block 20, 429N/476E
Elevation and Stratum: 100.87–100.75, Stratum 2
Size and Shape: Oval, 40+ by 39 by 12 cm (not fully exposed)
Definition: Good, with clear boundaries
Fill: Black
Bioturbation: Root, rootlets
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 890 (Beta 258532)

Feature 178: Possible posthole
Provenience: Block 20, 428N/476E
Elevation and Stratum: 100.91–100.83
Size and Shape: Oval, 20 by 12 by 8 cm
Definition: Good
Fill: Dark reddish gray, with charcoal flecking
Bioturbation: Root, rootlets
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 670 (Beta 258533)

Feature 179: Voided

Feature 180: Thermal pit, rock, shallow, small
Provenience: Block 16, 437N/473E
Elevation and Stratum: 101.28–100.93, Stratum 2
Size and Shape: Oval, 27 by 20 by 11 cm
Definition: Generally good, some diffuseness caused by turbation
Fill: Black, slightly darker than surrounding Stratum 2 sediments
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 550 (Beta 258534)

Feature 181: Thermal pit, non-rock, shallow, small
Provenience: Block 16, 437N/473E
Elevation and Stratum: 100.90–101.12
Size and Shape: Oval, 26 by 26 by 14 cm
Definition: Abrupt boundary
Fill: Black in center, lighter colored around periphery; charcoal flecks and pieces
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 770 (Beta 258535)

Feature 182: Thermal pit, non-rock, shallow, medium
Provenience: Block 16, 437N/473E

Elevation and Stratum: 101.32–100.96; partly overlapped by Feature 45 but clearly separate
Size and Shape: Oval, 40 by 36 by 8 cm
Definition: Boundary difficult to distinguish from Stratum 2 sediments because of closeness of colors
Fill: Very dark gray to black center, lighter colored periphery; charcoal flecks fairly common; charcoal pieces in center
Bioturbation: Rootlets
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 670 (Beta 258536)

Feature 183: Thermal pit, non-rock, shallow, medium
Provenience: Block 12, 487N/435–436E
Elevation and Stratum: 102.65–102.50
Size and Shape: Irregular oval, 66 by 40 by 12 cm
Definition: Good
Fill: Dark reddish gray with charcoal flecks; some oxidation on bottom
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 184: Thermal pit?, non-rock, shallow, small
Provenience: Block 12, 487N/435E
Elevation and Stratum: 102.64–102.58
Size and Shape: Oval, 17 by 15 by 6 cm (upper part may be missing)
Definition: Good
Fill: Dark reddish gray with charcoal flecks and small chunks
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 185: Thermal pit, non-rock, shallow, small
Provenience: Block 12, 487N/436E
Elevation and Stratum: 102.62–102.56, Stratum 2
Size and Shape: Circular, 28 by 27 by 6 cm (upper part may be missing)
Definition: Good
Fill: Reddish brown, with charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 186: Possible posthole
Provenience: Block 20, 428N/476E
Elevation and Stratum: 100.85–100.81
Size and Shape: Circular, 8 by 8 by 4 cm
Definition: Fair
Fill: Dark reddish gray, with charcoal flecking
Bioturbation: Root, rootlets
Artifacts: None
Samples: Flotation
Dates: None

Feature 187: Thermal pit, non-rock, deep, medium
Provenience: Block 19 (BHT 10), 483–484N/391E
Elevation and Stratum: 105.12–104.91; Stratum 2
Size and Shape: Oval, 49 by 36+ by 21 cm (not fully exposed)
Definition: Good, with clear boundaries; upper part missing
Fill: Dark reddish gray, with some charcoal flecking
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, burned rock
Dates: None

Feature 188: Thermal pit, non-rock, deep, large
Provenience: Block 19 (BHT 10), 483–484N/391E
Elevation and Stratum: 105.04–104.74; Stratum 2 to top of Stratum 3
Size and Shape: Unknown, 66+ by ? by 28 cm (not fully exposed)
Definition: Good, with clear boundaries
Fill: Stratified; lower strat: gray; middle strat: black; upper strat: dark reddish brown
Bioturbation: Roots, rootlets
Artifacts: Three lithic debitage
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 189: Thermal pit, non-rock, deep, uncertain
Provenience: Block 19 (BHT 10), 490N/396E
Elevation and Stratum: 105.02–104.71; Stratum 2 to top of Stratum 3
Size and Shape: Unknown, 25 by ? by 31 cm (not fully exposed)
Definition: Good, with clear boundaries
Fill: Dark reddish brown to gray-black to black, with charcoal flecking
Bioturbation: Roots, rootlets
Artifacts: None

Samples: Flotation, burned rock
Dates: None

Feature 190: Thermal pit, rock, deep, large
Provenience: Block 12 (BHT 13), 498N/440E
Elevation and Stratum: No elevations taken; in Stratum 3 (capped by Stratum 2 sediments); bottom resting directly on calcrete
Size and Shape: Unknown shape; 72 by ? by 23 cm
Definition: Good
Fill: Dark reddish brown to very dark gray, with charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 191: Thermal pit, non-rock, shallow, small
Provenience: Block 9 (BHT 11), 504N/460E
Elevation and Stratum: 99.25–99.13, Stratum 2
Size and Shape: Oval?, 24 by 14+ by 12 cm (incomplete)
Definition: Good where not destroyed by trenching and some rodent activity
Fill: Very dark gray, with charcoal flecking in center of top
Bioturbation: Rodent
Artifacts: None
Samples: Flotation
Dates: None

Feature 192: Burned? post hole
Provenience: Block 9 (BHT 11), 504N/461E
Elevation and Stratum: 99.24–99.10, Stratum 2
Size and Shape: Oval to circular?, 12 by 4+ by 14 cm (incomplete)
Definition: Fair, though defined by some oxidation of sides
Fill: Dark gray to black, with fine charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 193: Thermal pit, rock?, shallow, medium
Provenience: Block 9 (BHT 11), 506N/462E
Elevation and Stratum: 99.15–99.03, Stratum 3
Size and Shape: Oval, 48 by 40+ by 12 cm (incomplete)
Definition: Clear and distinct
Fill: Dark gray to black, for the most part
Bioturbation: Rodent, insect
Artifacts: None
Samples: Flotation, burned rock
Dates: None

Feature 194: Thermal pit, rock, very deep, medium
Provenience: Block 9 (BHT 11), 507N/465E
Elevation and Stratum: 99.08–98.76, Stratum 2 (terminates at Stratum 3 boundary)
Size and Shape: Oval?, 55 by 40+ by 32 cm (incomplete)
Definition: Reasonably good
Fill: Dark reddish brown and infused with charcoal
Bioturbation: Root, insect
Artifacts: One pottery sherd
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

Feature 195: Thermal pit, non-rock, shallow, large
Provenience: Block 9 (BHT 11), 506N/465E
Elevation and Stratum: 99.02–98.88
Size and Shape: Oval?, 80+ by 64+ by 18 cm (uncertain)
Definition: Indistinct boundaries
Fill: Dark reddish brown, with charcoal flecking and some pieces
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon, burned rock
Dates: None

Feature 196: Thermal pit, rock, shallow, uncertain
Provenience: Block 9 (BHT 11), 505N/462–463E
Elevation and Stratum: 99.11–99.00, Stratum 3
Size and Shape: Unknown, 30+ by 30 by 11 cm (incomplete)
Definition: Clear boundaries
Fill: Black and dark reddish gray, with charcoal
Bioturbation: Rodent, root, rootlet
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

Feature 197: Thermal pit, rock, shallow, uncertain

Provenience: BHT 14
Elevation and Stratum: No elevations taken; Stratum 2, through a thin Stratum 3, to calcrete
Size and Shape: Unknown, 52+ by ? by 14 cm (not totally exposed)
Definition: Good where observed
Fill: Very dark gray to black, with charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, burned rock
Dates: None

Feature 198: Thermal pit, rock, deep, uncertain
Provenience: BHT 14
Elevation and Stratum: No elevations taken; Stratum 2 to calcrete; Stratum 3 not present
Size and Shape: Unknown, 54+ by ? by 30 cm (not totally exposed)
Definition: Good, with clear boundaries where observed
Fill: Very dark gray, with charcoal
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

Feature 199: Thermal pit, non-rock, deep, large
Provenience: BHT 7, 429N/417E
Elevation and Stratum: 102.84–102.54, Stratum 2
Size and Shape: Unknown; 70+ by 45+ by 30 cm (not fully exposed)
Definition: Good, with clear boundaries
Fill: Dark reddish brown to dark reddish gray, with charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

Feature 200: Thermal pit, rock, deep, uncertain
Provenience: BHT 7
Elevation and Stratum: 102.88–102.64, Stratum 3 to calcrete
Size and Shape: Unknown; 56+ by ? by 24 cm (inside of trench)
Definition: Good
Fill: Dark reddish brown, with charcoal
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

Feature 201: Possible Protohistoric thermal feature (unexcavated)
Provenience: Block 15 (BHT 4)

Feature 202: Thermal pit, rock?, very deep, medium
Provenience: Block 15 (BHT 12), 473N/453E
Elevation and Stratum: 102.43–101.95, Strata 2 and 3
Size and Shape: Unknown; 54 by 26+ by 48 cm (in side of trench)
Definition: Good
Fill: Very dark gray, with charcoal pieces
Bioturbation: Roots, rootlets
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: None

Feature 203: Thermal pit, non-rock, shallow, small
Provenience: Block 9 (BHT 11), 507N/464E
Elevation and Stratum: 98.99–98.91
Size and Shape: Circular, 20 by 20 by 8 cm
Definition: Good, with some oxidation of bottom
Fill: Dark gray, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 204: Thermal pit, non-rock, uncertain
Provenience: Block 9 (BHT 11), 506N/464E
Elevation and Stratum: 98.97–98.90, Stratum 2
Size and Shape: Circular, 12+ by 12+ by 7+ cm (incomplete)
Definition: Upper part missing but otherwise distinct and oxidized
Fill: Dark gray, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 205: Small thermal pit, non-rock, shallow, small

Provenience: Block 9 (BHT 11), 507N/463E
Elevation and Stratum: 98.99–98.90, Stratum 2
Size and Shape: Circular, 20 by 20 by 9 cm (incomplete?)
Definition: Upper portion might be missing, otherwise distinct, with oxidized bottom, sides
Fill: Dark reddish brown, with charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 206: Voided

Feature 207: Thermal pit, non-rock, shallow, small
Provenience: Block 9 (BHT 11), 506N/463E
Elevation and Stratum: 99.00–98.87
Size and Shape: Circular, 22 by 22 by 13 cm
Definition: Good as preserved but upper part may be eroded away
Fill: Dark reddish brown, with charcoal flecking
Bioturbation: Insect
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 300: Probable structure
Provenience: Block 5, 483–486N/537E–540E
Size and Shape: Oval, approximately 3.5 m by 2.8 m by 0.35 m; see individual feature numbers for descriptions and measurements.
Associated Sub-Features: See individual feature descriptions; 61: small thermal pit, intercept cal AD 650 (Beta 258476); 67: posthole, intercept cal AD 650 (Beta 232973); 81: small thermal pit; 90: posthole
Feature Probably Not Associated With: Structure 74: thermal pit, intercept cal AD 680 (Beta 232975)
Additional Comments, Feature 300: At the time of excavation, there was no consensus on whether this locus, and its constituent features, was a structure and should be recorded as such. Consequently, a number of critical details were not investigated that would provide more convincing evidence as to whether it was or was not a structure. An in-office review of the data has resulted in the concurrence that it should be considered a structure and assigned the designation number Feature 300.

Thus, Feature 300 may be described as follows: The outline shown in Figure 1 represents the shape of the inside margin of the rock ring. The shape and size may be in part natural and in part culturally modified. The rocks comprising this ring are derived from the calcrete that underlies the cultural deposits across the site. While the uppermost cobbles appear at first glance to be piled rocks, closer inspection shows them to be the loosened cobbles from the top surface of the formation. If humans had a hand in the modification of these rocks, it was probably in the nature of making a natural opening larger or more to their liking as to size and shape, perhaps piling some of the rocks to the side (on top of the calcrete). Loose rocks such as these could then be used to anchor structural members and coverings such as mats, hides, brush, and the like.

The full width of the "wall" around the rock ring itself was not determined, but it was certainly a meter and more in the places where exterior excavations were extended outward and carried below the top of the wall. Whether or not the opening in the east "wall" of the ring represents a doorway cannot be stated with certainty.

The "floor" of the structure is composed of the top of Stratum 3 sediments, probably unintentionally, or possibly intentionally, scooped out and/or compacted through use as a living surface.

Four floor features, identified and recorded separately, apparently belong to this structure. Data and profile details on each feature are documented as separate entries under their respective feature numbers. A fifth feature, Number 74, was probably made and used subsequent to the abandonment of the structure.

Features 61 and 81 are thermal pits, one located in the north-central part of the floor and the other in the south-central part of the floor. Evidently, both served, probably at different times, as sources of heating, lighting, or cooking for structure occupants. A calibrated radiocarbon sample from Feature 61 has an intercept date of AD 650 (Beta 258476).

Features 67 and 90 are small diameter holes that could have served as sockets for vertical posts used to support the roof, assuming that a roof covered the floor space. Charcoal from Feature 67 provides a radiocarbon date with a calibrated intercept date of AD 650 (Beta 232973).

Feature 74 is problematic as to whether its use was associated with the occupation of the structure. Excavation notes indicate that its upper sides and original orifice occurred in Stratum 2 sediments at least 10 cm above the rock ring that defines the boundaries of the structure. Also, it served as a thermal pit, a function that, given its location on the edge of the structure, would have endangered the materials comprising the roof. This assumes, of course, that the entryway was not located on the west side of the structure. Also, a radiocarbon date of intercept cal AD 680 (Beta 232975) obtained from this feature is 30 years later than the two dates (both AD 650) obtained from structure features. Thus, Feature 74 probably was not coeval with the occupation of Feature 300.

Although we suspect that the structure was roofed, we have no evidence other than the two possible postholes in the structure floor. Even these are not placed symmetrically with respect to the floor, as one is situated in the south-central area and the other is along the southeast floor-limit. If the structure was roofed, then that roof was likely made of perishable materials that were anchored among the rocks of the rock ring that defines the floor limit (see earlier discussion).

Feature 301: Probable shelter floor
Provenience: Block 7, 485N–486N/524E
Size and Shape: Shape not stated in notes; approximately 2.0 m (north–south) by 1.0 m (east–west) by 0.02 m.
Possibly Associated Features: See feature description; 47: small thermal pit, intercept cal AD 230 (Beta 232968); no feature numbers: two small postholes 1 m east of use-surface.
Additional Comments, Feature 301: The excavator noted the presence of a probable use-surface at this locus, described it, but did not assign it a feature number. This is the only instance of a use-surface being noted at this site, thereby attesting to a uniqueness that has led to the assignment of a feature number at this late date (October 2009).

9 ⊻ LA 129216

Regge N. Wiseman and Donald E. Tatum

Site Description

LA 129216 is a large site situated on top of the back ridge about 200 m west of LA 129214 (Fig. 9.0). The ridge is composed of Quaternary alluvial and bolson deposits. The elevation of the site is 919 m (3015 ft) amsl and 17 m (55 ft) above the flats to the south. The site was thought to represent a single-component on the basis of one arrow point.

Environment

LA 129216 is covered with a nearly flat sand sheet with the occasional meter-high stabilized coppice dune crowned by mesquite (Fig. 9.1). These dunes occurred mainly in the eastern end of the site. While the site possessed areas that were deflated by wind—and especially precipitation runoff—"blowouts" or deflation basins were not well developed. Burned-rock features exposed on the site surface are clustered in the central part of the site. Otherwise, surface artifacts that permit definition of the site and its boundaries are thinly scattered, probably due, in large part, to the accessibility of the site to artifact collectors. In addition to the occasional mesquite, on-site vegetation includes four-wing saltbush, creosote, acacia, all thorn, and fluff grass (TRC Associates 2000).

LA 129216 measures 116 m (380 ft) north–south and 208 m (682 ft) west–east. An unknown portion of the southern limit of the site was removed during construction of the original alignment of NM 128. At the time of this project, the total site area is approximately 4.42 acres (1.79 ha), 0.93 acres (0.38 ha) (21.7 percent) of which lies within the project limits. Both the existing and proposed rights-of-way for NM 128 transected the site.

The site was initially recorded by TRC in 2000 during a cultural resource inventory for the New Mexico Department of Transportation (NMDOT). TRC identified nine surface survey features from surface indicators, none of which were within the construction project. However, two of the surface survey features were near the new north right-of-way limit and within a 10 m buffer zone, presenting the possibility that they extend subsurface into the project and would require data attention (TRC Associates 2000; OAS 2006).

Surface artifacts identified during the TRC survey recorded the presence of chipped stone debitage, mano and metate fragments, a pestle, a hammerstone, and an arrow projectile point. The paucity of diagnostic artifacts recovered during site recording—probably the result of decades of artifact collecting by locals—made problematic the estimation of occupation dates. Although pottery is absent, the presence of an arrow point suggested a Formative period occupation sometime between AD 750 and 1300 (OAS 2006). Subsequent data recovery by OAS demonstrated the presence of buried remains dating to the Archaic and possibly even the Paleoindian periods.

Surface Features

During the initial survey, TRC (2000) identified two features (1, 2) lying within the 10 m buffer zone of the project limits (Table 9.1).

Grids for 10 excavation blocks were established to investigate the two surface survey features just mentioned; two thermal features, exposed by mechanical scraping and dune removal; four burn areas discovered in the trenching process; a thin scatter of surficial burned rock; and a blowout bearing lithic debitage. Seventy-six 1 by 1 m units were hand-excavated to depths from 10 to 40 cm below the present ground surface. Excavation was discontinued when the calcrete layer appeared or when culturally sterile levels were achieved. Eleven subsurface features were discovered and excavated. These included 10 thermal features and one pit.

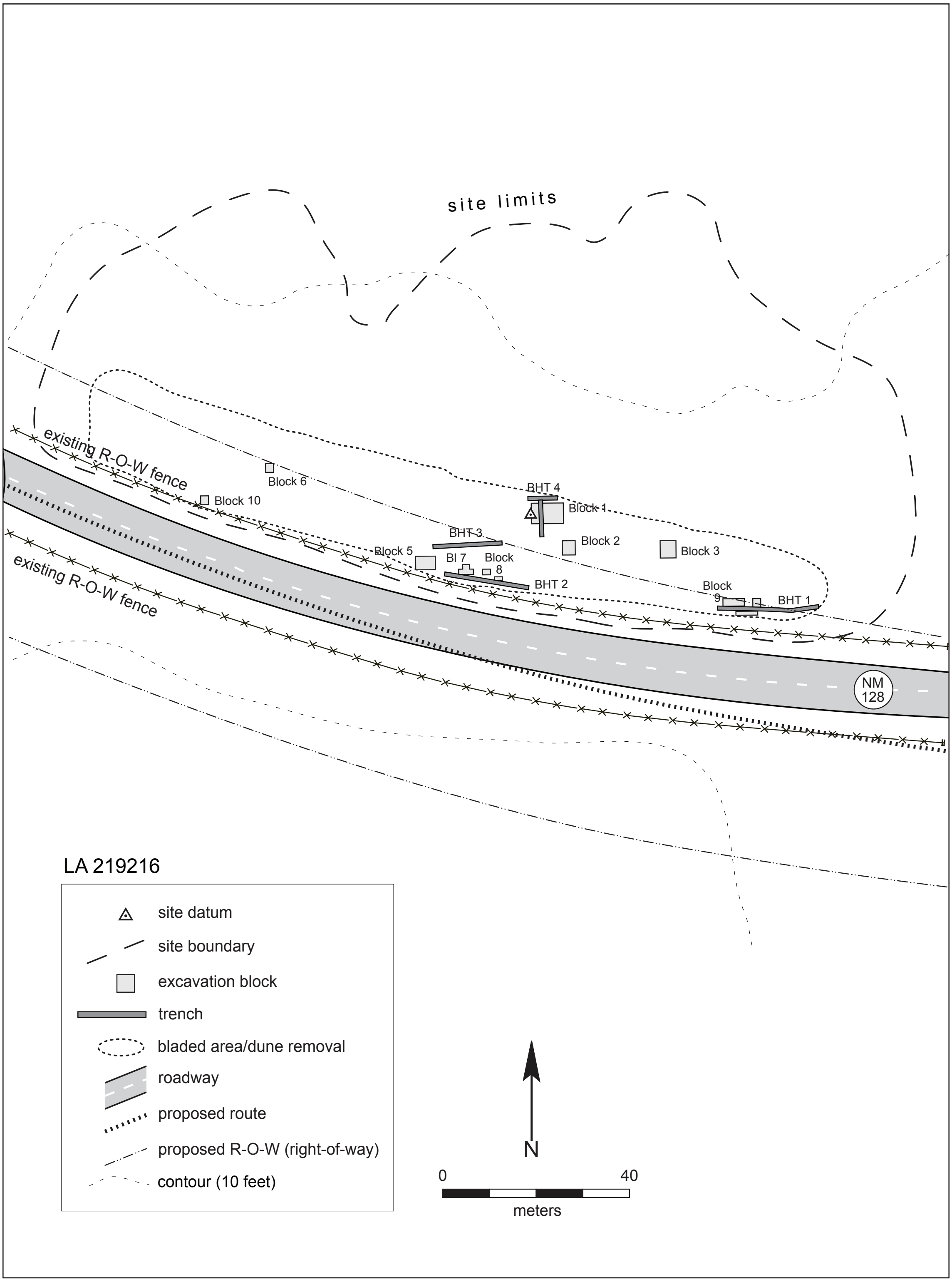

Figure 9.0. LA 129216, site map.

Figure 9.1. LA 129216, overview of site showing vegetation and Block 2, as excavated.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

Site LA 129216 occupies a broad terrace that is part of a small, northeast-trending ridge descending from the north-trending Quahada Ridge, 2 miles to the northwest. Part of the site was occupied by a series of rolling coppice dunes and blowout depressions. The NM Highway 128 relocation corridor crosses the south edge of the site.

Archaeological Surface Sediment Zone and Trench Distribution

The western half of the LA 129216/NM 128 relocation corridor crossing was occupied by archaeological surface sediment Zone 2. Most of the eastern half of the crossing was archaeological surface sediment Zone 3. A small segment at the east end was occupied by archaeological surface sediment Zone 2. Three backhoe trenches and one mechanically bladed area were excavated to explore link between surface visibility of archaeological materials and subsurface cultural and geomorphic deposits in Zones 1, 2, and 3. One trench (BHT 1) was excavated in the Zone 2 area in the east end of the LA corridor crossing. Two trenches (BHT 2, BHT 3) crossed the Zone 2 and Zone 3 areas occupying the south-central part of the corridor crossing.

Table 9.1. LA 129216, surface survey features.

FEATURE	OAS BLOCK NO.	FEATURE TYPE	SIZE (M) (TRC 2000)
1	1	burned caliche scatter	3 x 5
2	2	burned caliche and scatter	4 x 4

Site data from TRC Associates 2000 and SWCA 2006.

Soils, Stratigraphy, and Lithology of Trenches and Bladed Area

Soils on the east side of the site consisted of Tonuco loamy sand, an eroded soil derived from mixed al-

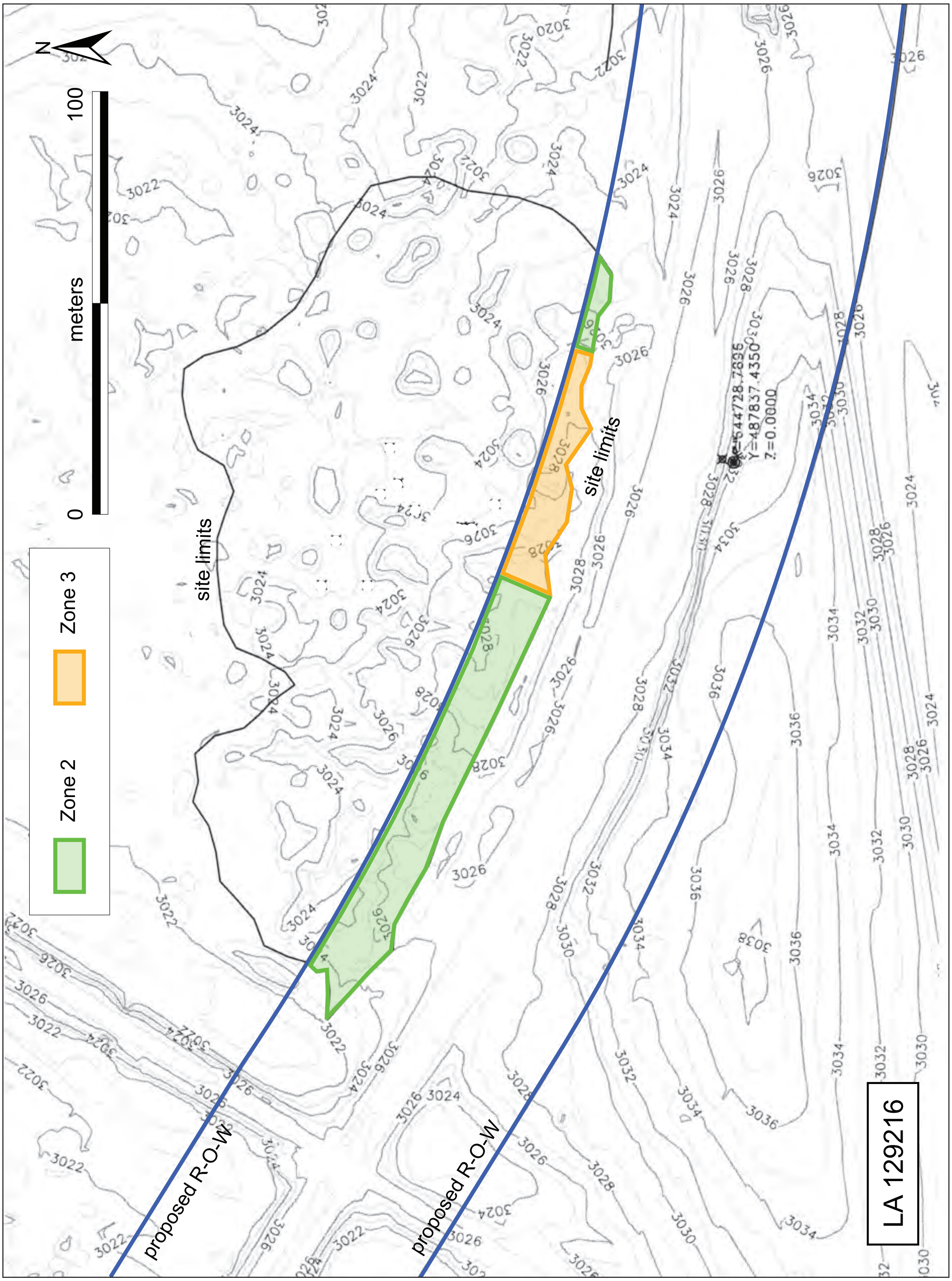

Figure 9.2a. LA 129216, map showing surface sediment zones, excavation blocks, and mechanically excavated areas.

Figure 9.2b. LA 129216, BHT 1, north wall, profile. Feature 11 appears at the Bw/Bk horizon boundary.

luvium and/or eolian sand occurring on alluvial fans and plains. Soils on the west side of the site were Pajarito loamy fine sand, of alluvial and eolian parentage. The loamy fine sand grades into fine sandy loam with depth. Tonuco and Pajarito soils are associated with the Gypsiorthid-Torriorthent-Gypsum Land thermic soil complex of loam, clay loam, and gypsiferous material derived from weathered gypsum (USDA-NRCS 2009; Maker et al. 1978).

Most of the site was capped by shallow, unconsolidated eolian sand deposits and by low, poorly developed coppice dunes partially stabilized by vegetative growth. The fine- to medium-grained sand forming these deposits was locally derived through erosion and deflation of the substrate. The shallow eolian deposits contained plentiful inclusions of organic clastic material such as rodent and rabbit fecal matter, and vegetative matter, indicating recent reworking and deposition.

The coppice dune deposits were heavily turbated by wood rat burrowing activities and by mesquite and other vegetative root growth. Under the coppice dunes, remnant anthrosols were protected from deflation by the accumulation of dune-forming sand on top of them.

One trench (BHT 1) was excavated in the Zone 2 area occupying the east end of the LA corridor crossing. Two trenches (BHT 2, BHT 3) crossed the Zone 2 and Zone 3 areas occupying the south-central part of the corridor crossing (Fig. 9.2a).

The stratigraphic profiles of the trenches showed that the surface eolian deposits were underlain by weakly consolidated, fine- to medium-grained brown sand with weak B- horizon development (Bw horizon) and sparsely distributed inclusions of weathered caliche pebbles. In some areas, bioturbation was prevalent in this stratum, the result of root, rodent, and insect activity.

The boundary of this deposit was gradual; it was underlain by a Bk horizon with carbonate precipitates, such as granules, filaments, and slips, which imparted weak cementation to the soil. The parent material for the Bw and the Bk horizons was the Unit 1 eolian sand (Hall 2002). The Bk was underlain by a Ck horizon, indicated by a sharp increase in percentage by volume of highly weathered and fragmented, rounded to subrounded caliche granules, pebbles, and cobbles derived from the underlying calcrete of the Mescalero Paleosol. The weathered carbonate colluvial and alluvial material concentrated in a shallow deposi-

Figure 9.2c. LA 129216, BHT 1, north wall, profile. Feature 12 appears at the Bw/Bk horizon boundary.

tional horizon across the site could indicate a period of erosion and deflation that occurred prior to, or early in the stage of, deposition of the Unit 1 eolian sand comprising the Bk and Bw horizons.

Two fire-cracked rock concentrations (Features 11 and 12) were discovered in BHT 1 (Figs. 9.2b and 9.2c). One thermal pit (Feature 10) was discovered in the north wall of BHT 2 (Fig. 9.2d).

One overburden removal area was excavated in Zone 2 in the western half of the relocation corridor crossing, uncovering four thermal pit features (Features 13, 15, 19, and 20).

Chronology Discussion

The main stratum of archaeological importance on LA 129216 was the Unit 1 sand (Hall this report). The majority of the archaeological features discovered during the LA 129216 data recovery originated in the Bw sand and terminated in the Bk. A total of seven features were discovered during mechanical excavations. Five of the features originated in the Bw sand and were selected for AMS dating, yielding a range of dates between AD 240 and AD 1010.

Features 11 and 12 were burned-rock concentrations that were discovered during the mechanical excavation of BHT 1 (Figs. 9.2b and 9.2c). The features originated at the Bw/Bk boundary. Aside from dispersed charcoal flecking, the fine-grained matrix was undistinguishable from the surrounding Bk matrix with its fine inclusions of carbonate precipitate, indicating that the features were used and abandoned prior to, or concurrent with, the development of the Bk horizon. The features were interpolated to be 8596 years and 10,977 years old, respectively, based on OSL dates from BHT 1 and rate of sedimentation calculations (Hall this report).

Conclusion

Three backhoe trenches and one surface-bladed area were excavated to explore relationships between areas with archaeological materials exposed at the ground surface and subsurface cultural and geomorphic deposits in archaeological Zones 2 and 3. No archaeological features were visible on the surface in the areas that were mechanically excavated. The discovery of seven subsurface archaeological deposits in the backhoe trenches and surface-bladed areas indicates that presence or ab-

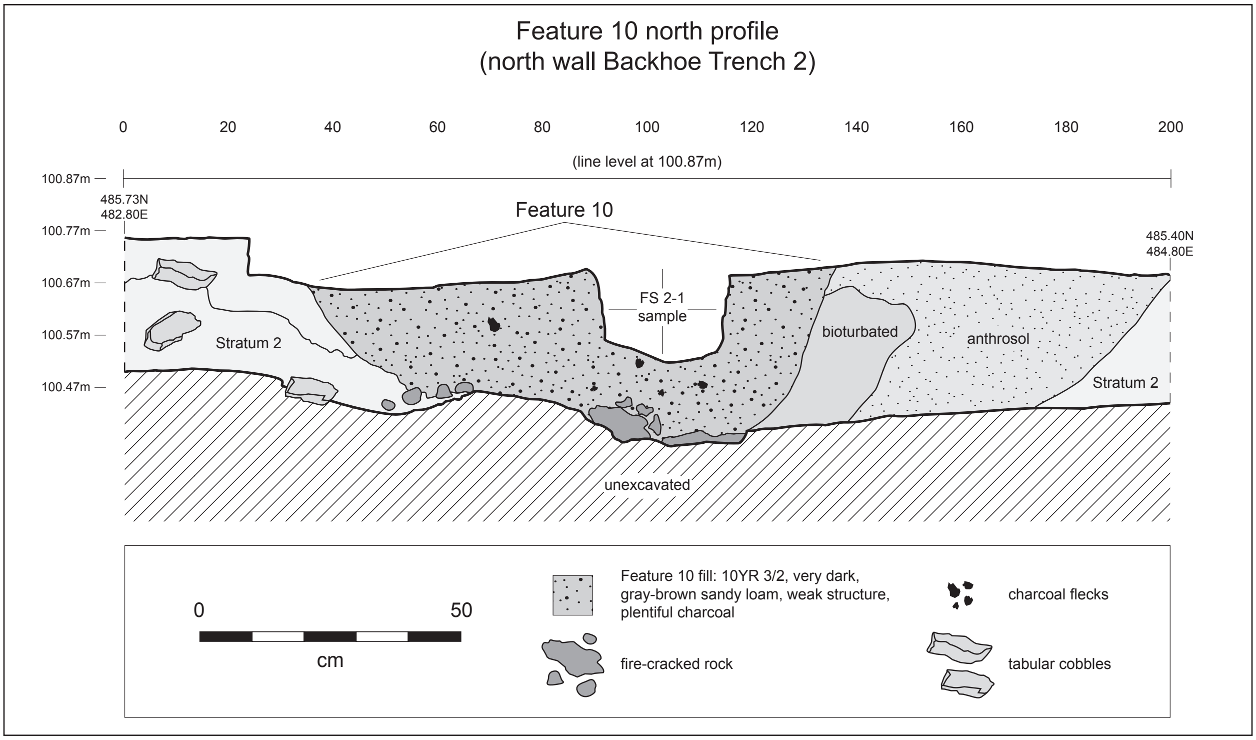

Figure 9.2d. LA 129216, BHT 5, north wall, profile.

sence of such materials at ground surface does not accurately predict presence or absence of intact subsurface archaeological deposits.

Strata exposed in the backhoe trenches included a widespread, recent eolian surface deposit and low, poorly developed coppice dunes partially stabilized by vegetative growth. The surface eolian deposits were immediately underlain by Bw horizon sands. With depth, the Bw gradually transitioned into a sandy Bk horizon, which was immediately and unconformably underlain by the calcrete of the Mescalero Paleosol. The sand constituent for the Bw and Bk horizons was derived from the Unit 1 eolian sand deposit.

All five of the thermal pit features originated in the Bw horizon sand; the two burned-rock concentrations originated at the Bw/Bk contact. The thermal pit features originating in the Bw sand were chronometrically dated, yielding a range of dates between AD 240 and AD 1010. The two burned-rock concentrations (Features 11, 12) originating at the Bw/Bk contact were dated using interpolative techniques based on nearby OSL dates and calculated rates of sedimentation, yielding dates of 8596 years BP and 10,977 years BP (Hall this report). The occurrence of the two features at the soil horizon boundary, though elevationally dissimilar, may indicate the existence of a stable paleo surface at the top of the Bk-forming deposit.

Hand Excavation: Block Descriptions

Block 1 (16 sq m)

Block 1 was established to investigate Surface Survey Feature 1 (TRC Associates 2000). It was originally set up to be a 5 by 8 m block (40 sq m), but only 16 1 by 1 m squares were excavated because of a paucity of results (features, artifacts, burned caliche, etc.).

Excavations in most 1 by 1 m squares in Block 1 were carried only through Level 1, 0 to 10 cm below the surface. Four squares were excavated through Level 3 (30 cm final depths). Only Stratum 1 sediments (loose sand) were encountered. Charcoal flecks and burned caliche pieces were almost nonexistent throughout.

Because the excavation of the 1 by 1 m squares produced uniformly negative results, auger bores were placed in almost all squares to confirm the absence of significant cultural materials at greater depths and to locate bedrock calcrete/caliche. Four of the 15 bores recovered scattered charcoal flecks and occasional small fragments of burned caliche scattered through their depths. However, the lack of concentration of these materials, plus evidence of bioturbation, resulted in a conclusion that they were insufficient to warrant continued work in this block. As might be expected, depth to bedrock (calcrete/caliche), as determined by the auger bores, varied from as shallow as 81 cm to a depth of more than 215 cm below the surface, the greatest reach of the augers. No cultural features were found despite the supposed presence of Surface Survey Feature 1 (TRC Associates 2000). Although the OAS crew used the GPS coordinates provided by TRC, it appears that an unattributable error may have resulted in an incorrect placement of the block. Very few artifacts were recovered from Block 1 (Table 9.2). Chipped lithic debitage and one hammerstone constituted an average of 0.5 items per square meter of excavated area.

Table 9.2. LA 129216, Block 1, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	7
Hammerstone	1
Total	**8**

Table 9.3. LA 129216, Block 2, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic Debitage	2
Total	**2**

Table 9.4. LA 129216, Block 3, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	14
C-14 sample	1
Total	**15**

Table 9.5. LA 129216, Block 5, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	1
Animal bone	1
Earthy red mineral	14
Total	**16**

Block 2 (9 sq m)

Block 2 was established to investigate Surface Survey Feature 2 (TRC Associates 2000). All 1 by 1 m squares in Block 2 were excavated through Level 1, 0 to 10 cm below surface. Only Stratum 1 sediments were encountered. Since few cultural items were recovered or observed, two 1 by 1 m squares were selected for deeper excavation, one for three more levels (40 cm final depth) and the other for four more levels (50 cm final depth). While sparse charcoal flecking and an occasional charcoal piece were noted throughout, and a couple more lithic artifacts and a piece of burned caliche were recovered, these results were insufficient to warrant further work other than to make auger bores to bedrock. No cultural features were found in spite of the supposed presence of Surface Survey Feature 2 (TRC Associates 2000). Although the crew used GPS coordinates provided by TRC, it appears an un-attributable error may have resulted in the incorrect placement of the block. Very few artifacts were recovered from Block 2 (Table 9.3). Chipped lithic debitage constituted an average of 0.22 items per square meter of excavated area.

Block 3 (16 sq m)

Block 3 was established to investigate a cluster of artifacts in a deflation depression. All 1 by 1 m squares in Block 3 were excavated through Level 3, 20 to 30 cm below surface, and four were selected for excavation through a fourth level. Mainly Stratum 2 sediments were encountered; charcoal flecking and occasional small pieces of charcoal were noted during excavation and in the screens. Generally, small burned caliche/rocks were occasionally noted, but none were clustered. No cultural features were found in Block 3. Chipped lithic debitage (Table 9.4) constituted an average of 0.9 items per square meter of excavated area.

Block 4

The Block 4 grid was established but ultimately was not excavated.

Block 5 (15 sq m)

Block 5 was established to investigate a small burned caliche concentration not noted by earlier surveys.

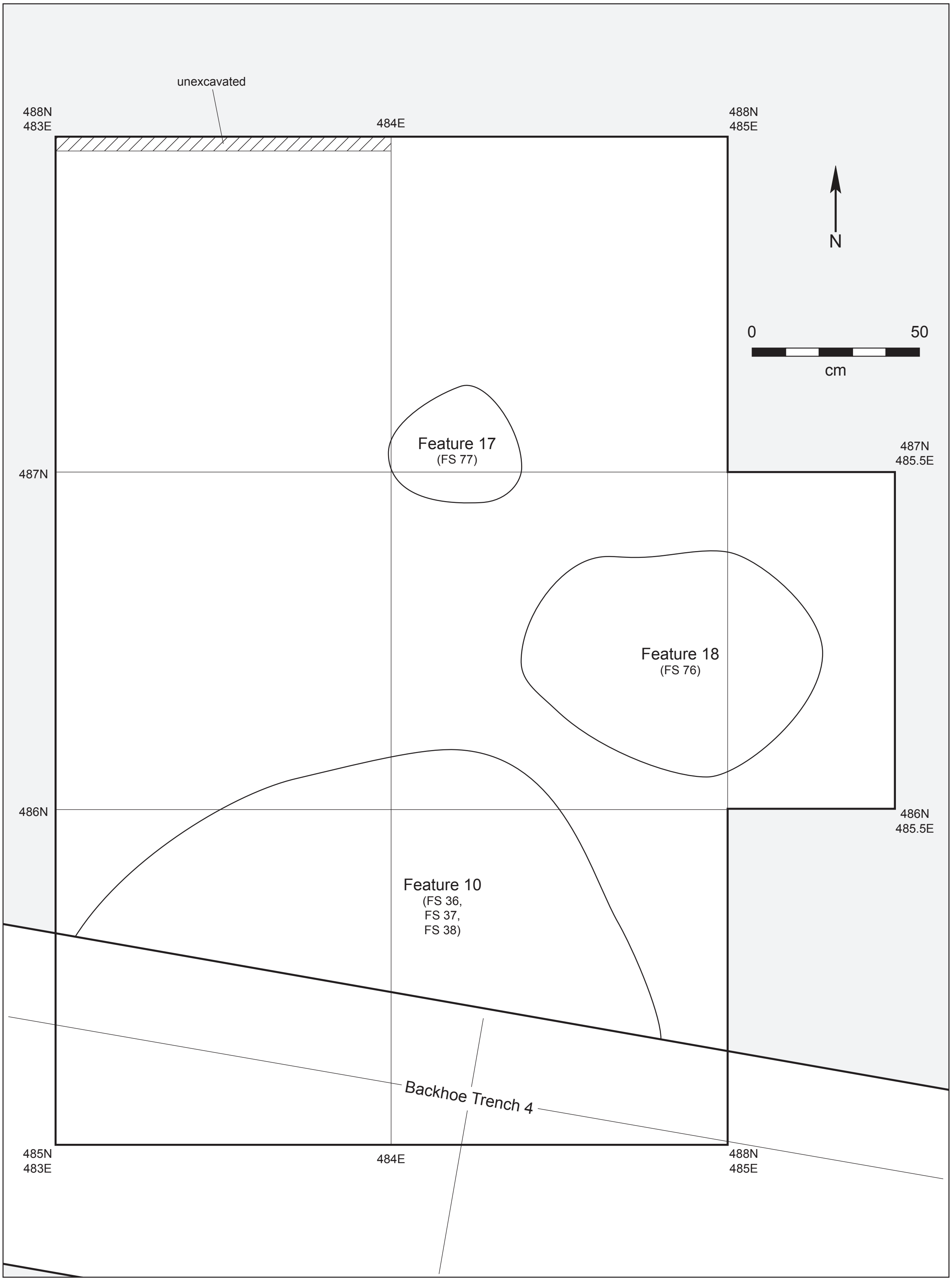

Figure 9.3. LA 129216, Block 7, plan.

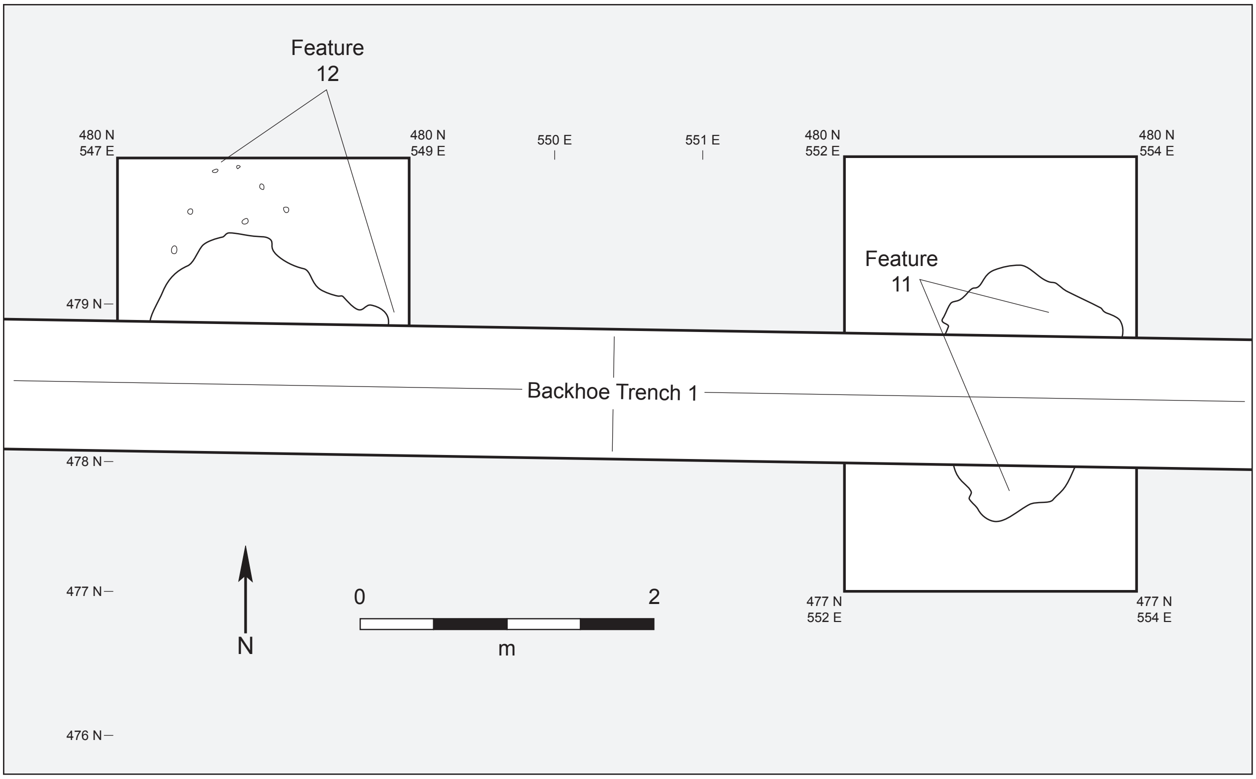

Figure 9.4. LA 129216, Block 9, plan.

The 1 by 1 m squares in Block 5 were excavated to varying levels, with the shallowest being carried through Level 2 (10 to 20 cm below surface), and the deepest through Level 5 (40 to 50 cm). Only Stratum 1 sediments were encountered, and although different sand units could be segregated on the basis of grain size, the differences evidently were natural. Charcoal flecking, organic stain, and burned rocks were rare to non-existent throughout the block. Carbonate pebbles and cobbles were noted, especially in the lowest levels, but bedrock as such was not encountered. No cultural features were found in Block 5. Chipped lithic debitage (Table 9.5) constituted an average of 0.1 items per square meter of excavated area.

Block 6 (4 sq m)

Block 6 was established to investigate a stain exposed by mechanical scraping down to Zone 2 sediments in the western part of the site.

With the exception of the square containing the feature, the 1 by 1 m squares in Block 6 were excavated through Level 3, 20 to 30 cm below surface. All three strata, 1 through 3, were encountered in these excavated squares. Charcoal flecking, organic stain, and burned rocks were basically restricted to the feature. Stratum 3 sediments, the precursor of the appearance of bedrock, were noted in all deep squares, but bedrock as such was not encountered. Thermal Feature 13 was excavated in Block 6. No artifacts or samples were collected from Block 6.

Table 9.6. LA 129216, Block 7, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	6
Ground stone?	1
C-14 sample	4
Flotation sample	3
Pollen sample	2
Total	**16**

Block 7 (5.5 sq m)

Block 7 was established to investigate a stain exposed in the north side of Backhoe Trench 2. All 1 by 1 m squares in Block 7 were excavated through Level 4, 30 to 40 cm below surface. Strata 1 through 3 were encountered in most squares, usually in

Level 4. Although charcoal flecking was noted in most levels in most units, much of it appears to have been the result of bioturbation from the three thermal features discovered in this block. Burned rocks were not common. The few artifacts recovered came the northernmost two squares and from the half square. In Stratum 3, the precursor of the appearance of bedrock was noted in the deep levels, but bedrock as such was not encountered. Thermal Features 10, 17, and 18 were exposed and excavated in Block 7 (Fig. 9.3). Chipped lithic debitage and a possible ground stone artifact (Table 9.6) constituted an average of 1.3 items per square meter of excavated area.

Block 8 (1.33 sq m)

Block 8 was established in two non-contiguous parts to investigate a stain exposed in the north side of Backhoe Trench 2 and another stain exposed near the surface about 1 m to the southwest. Only about one and one-third 1 by 1 m squares, in two separate but nearby locations, comprise Block 8. Both were excavated as single levels down to the top of the features. Thermal Features 19 and 20 were exposed and excavated in two separate 1 m squares along Backhoe Trench 2 in Block 8. No artifacts were recovered from the Block 8 excavations. Various types of samples were recovered from the features (Table 9.7).

Block 9 (6 sq m)

Block 9 was established in three separate units to investigate stains exposed in both sides of Backhoe Trench 1 (Fig. 9.4).

The four units in Block 9 vary in size, including 1 by 1.2 m, 1 by 2 m, and 0.8 by 2 m. Excavations were accomplished in 10 cm levels, with four levels in the 0.8 by 2 m unit, seven levels in one of the 1 by 1.2 m units, eight levels in the other 1 by 1.2 m unit, and 11 levels in the 1 by 2 m unit. Strata 1 and 2 were encountered in all units, usually first appearing in Level 4.

Although charcoal flecking was noted in most levels in most units, much of it appears to have been the result of bioturbation from the three thermal features discovered in this block. Burned rocks were not common. Stratum 3 sediments, the precursor of the appearance of bedrock, were noted mainly in the trench face—below the excavations—but bedrock as such was not encountered.

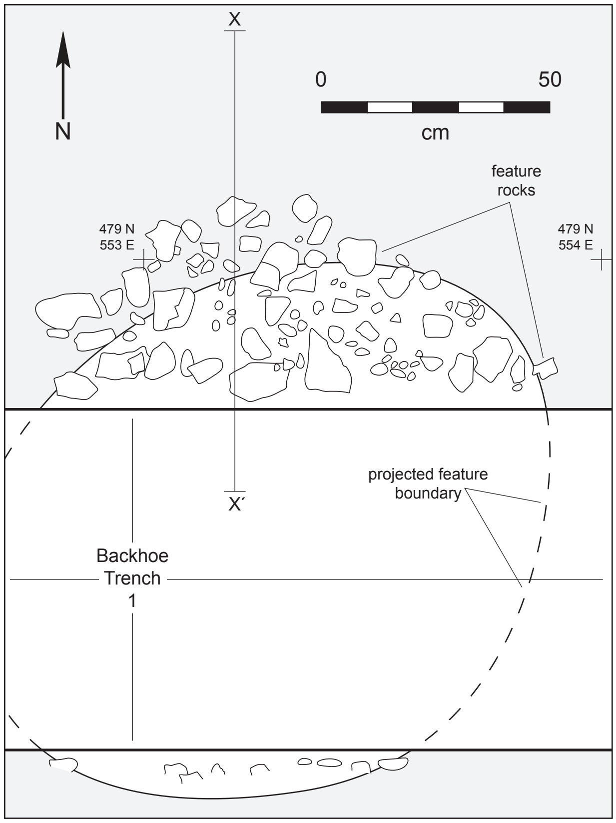

Figure 9.5a. LA 129216, Feature 11, plan (north and south halves).

Table 9.7. LA 129216, Block 8, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
C-14 sample	4
Dendro sample	3
Flotation sample	4
Total	**11**

Three features, one burned rock concentration (11) and two thermal pits (12 and 14), were exposed and excavated in Block 9. In this report, Hall offers interpolated OSL dates of ca. 8970 years for Feature 11 (Paleoindian 4, Plainview/Golondrina Period) (Fig. 9.5a and 9.5b) and ca. 10,600 years for Feature 12 (Paleoindian 3, Folsom/Midland period) (Fig. 9.6). These are by far the earliest dates recovered by the NM 128 project.

Three Golondrina points were the only Paleoindian points recovered by the project, but those came from sites LA 129217 and LA 129300, not LA 129216. Feature 14, with a radiocarbon date of AD 1030, belongs to the Neo-Archaic 1 period. Chipped lithic debitage and ground stone artifacts (Table 9.8)

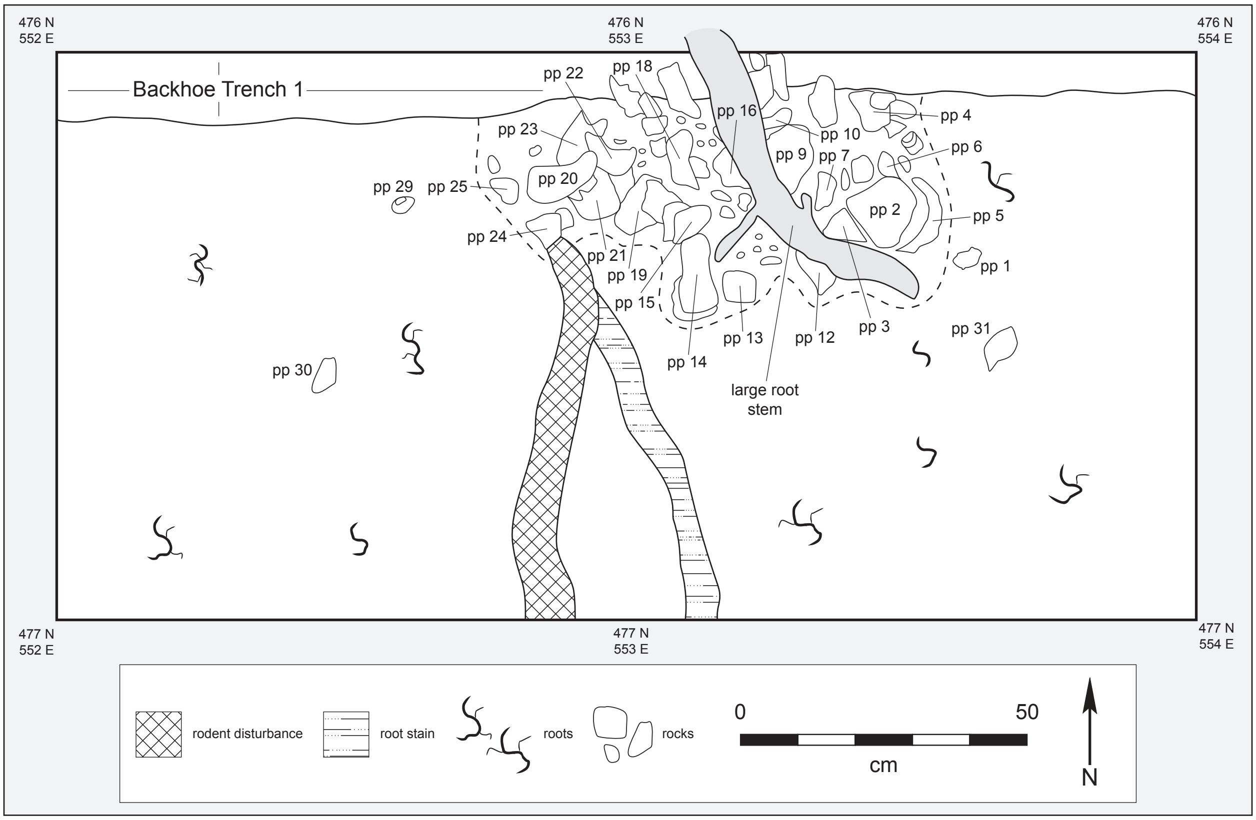

Figure 9.5b. LA 129216, Feature 11, plan (north and south halves).

Table 9.8. LA 129216, Block 9, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	9
Manos and metates	4
Animal bone	2
Mussel shell	3
Flotation sample	15
Pollen sample	6
Total	**39**

constituted an average of 2.2 items per square meter of excavated area.

Block 10 (4 sq m)

Block 10 was established to investigate two features exposed by mechanical equipment during the removal of a dune (Fig. 9.7a—9.7c). The four excavation units in Block 10 are 1 by 1 m in size. All units were excavated through Level 1, 0 to 10 cm below surface. Only Zone 1 sediments were encountered in the units. Two thermal pits, 15 and 16, were exposed and excavated in Block 10.

No artifacts were recovered from this block. However, several sediment samples were taken from the features (Table 9.9).

Block Summary

A summary of the findings for all blocks can be found in Table 9.10.

Anthrosol Presence and Distribution

One of the more interesting aspects of the fill at LA 129216 is the presence of an anthrosol, a human-generated sediment unit. As detailed by Hall in Chapter 24, there seems to be little reason to question whether this unit (Stratum 2) was generated by man. However, Hall's chemical tests revealed that total phosphorus (P) is not elevated as would be expected for anthropogenic sediment. While this situation is at first baffling, I suspect that the blackness of the unit may be caused by finely divided charcoal powder from the many thermal features, rather than from decaying vegetal, animal, and human matter.

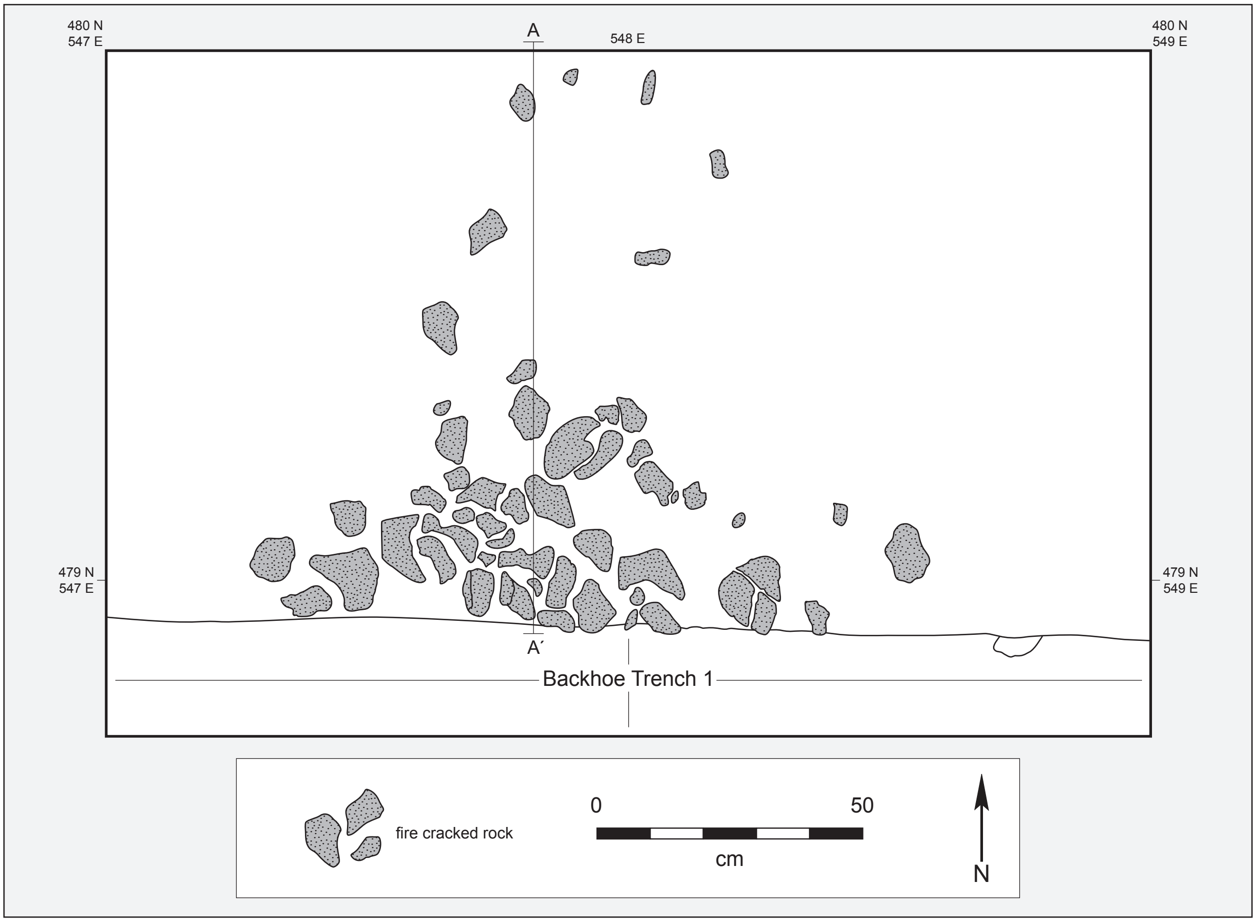

Figure 9.6. LA 129216, Feature 12, plan.

LA 129216 is only one of two sites (the other being LA 129214) investigated by this project to produce an anthrosol, the distribution of which is fairly wide within the site (Fig. 9.8).

Table 9.9. LA 129216, Block 10, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Flotation sample	3
Pollen sample	2
Total	**5**

Feature Descriptions

Feature 10: Thermal pit, rock, deep and very large
Provenience: Block 7 (BHT 2), 485N/482E
Elevation and Stratum: No data
Size and Shape: Unknown, 160+ by 74+ by 23+ ? cm (partly removed by BHT 2)
Definition: Better in some areas than in others; bottom is calcrete
Fill: Very dark gray-brown, with charcoal pieces
Bioturbation: Rodent, rootlet, insect
Artifacts: 39 lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 340 (Beta 258915)

Feature 11: Pit
Provenience: Block 9 (BHT 1), 479N/552–553E
Elevation and Stratum: 99.43–99.33, Stratum 3
Size and Shape: Irregular, 125+ by 114 by 10 cm (not complete)
Definition: Generally good
Fill: Mainly finely burned caliche/rock, with minimal associated sediment; absence of charcoal suggests that this was not a thermal feature, but geological evidence (see Hall's report in this volume) suggests it is cultural
Bioturbation: Rodent, root
Artifacts: None

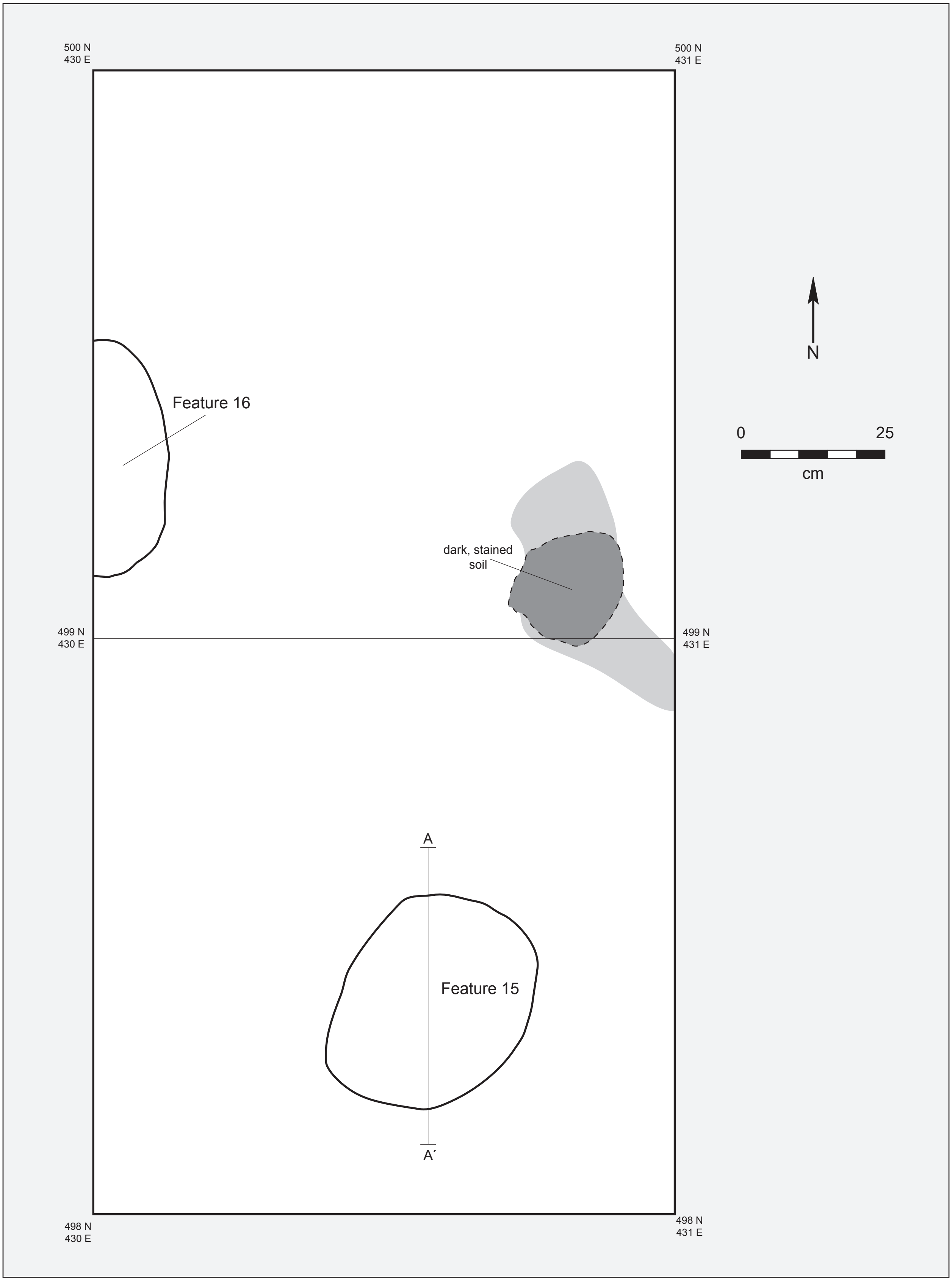

Figure 9.7a. LA 129216, Block 10, plan.

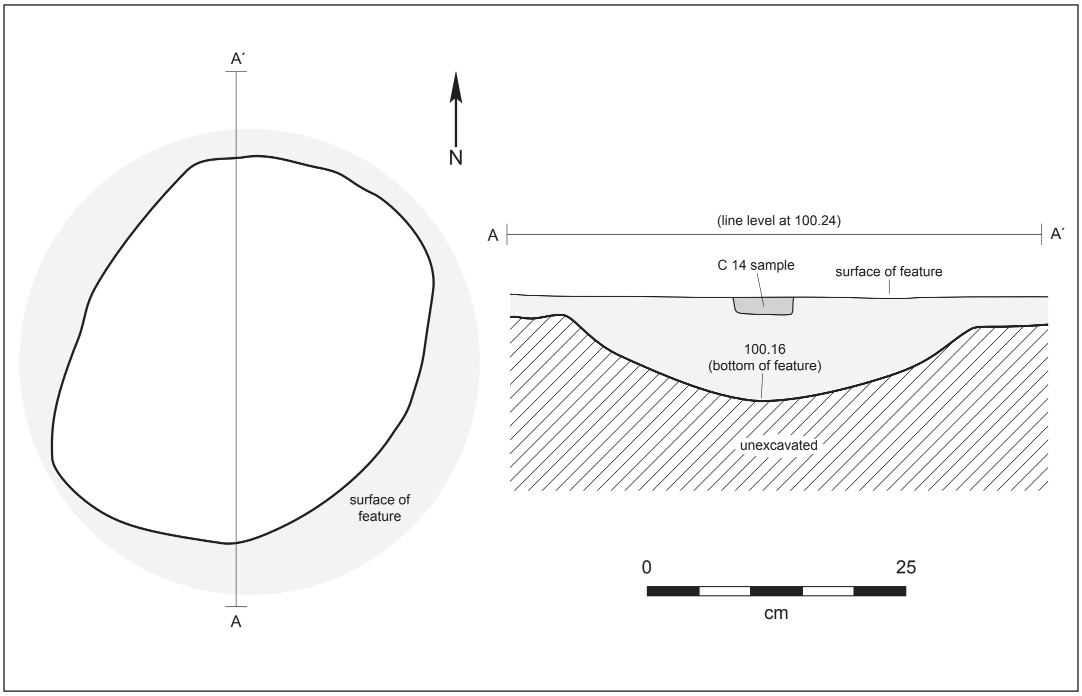

Figure 9.7b. LA 129216, Block 10, plan, Feature 15.

Samples: Flotation, pollen
Dates: Interpolated OSL date of 7020 BC (see Hall's report, this volume).

Feature 12: Thermal pit, rock, uncertain, very large
Provenience: Block 9 (BHT 1), 479N/547E
Elevation and Stratum: 99.32–99.16, Stratum 3
Size and Shape: Oval, 110 by 50+ by 14+ ? cm (partly removed by BHT)
Definition: Generally good
Fill: Burned rock, with minimal associated sediment and charcoal flecks
Bioturbation: None noted
Artifacts: Ground stone
Samples: Flotation, pollen
Dates: Interpolated OSL date of 8650 BC (see Hall's report, this volume).

Feature 13: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 506N/446E
Elevation and Stratum: 99.85–99.75
Size and Shape: Egg-shaped, 52 by 39 by 10 cm
Definition: Fair
Fill: Charcoal mottled sand, with charcoal pieces
Bioturbation: Rodent, rootlets
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 420 (Beta 258916)

Feature 14: Thermal pit, non-rock, shallow, small
Provenience: Block 9, 479N/553E
Elevation and Stratum: 99.52–99.45, Stratum 2
Size and Shape: Basically circular, 25 by 25 by 7 cm
Definition: Good, east margin oxidized
Fill: Reddish brown, with charcoal flecks and small pieces
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 1030 (Beta 258918)

Feature 15: Thermal pit, non-rock, shallow, small
Provenience: Block 10, 498N/430E
Elevation and Stratum: 100.25–100.16
Size and Shape: Oval, 38 by 36 by 9 cm
Definition: Good
Fill: Darkly stained sediment
Bioturbation: Root
Artifacts: None
Samples: Flotation
Dates: Intercept cal AD 900/920/950 (Beta 258919)

Feature 16: Thermal pit (bell-shaped), rock, deep, medium

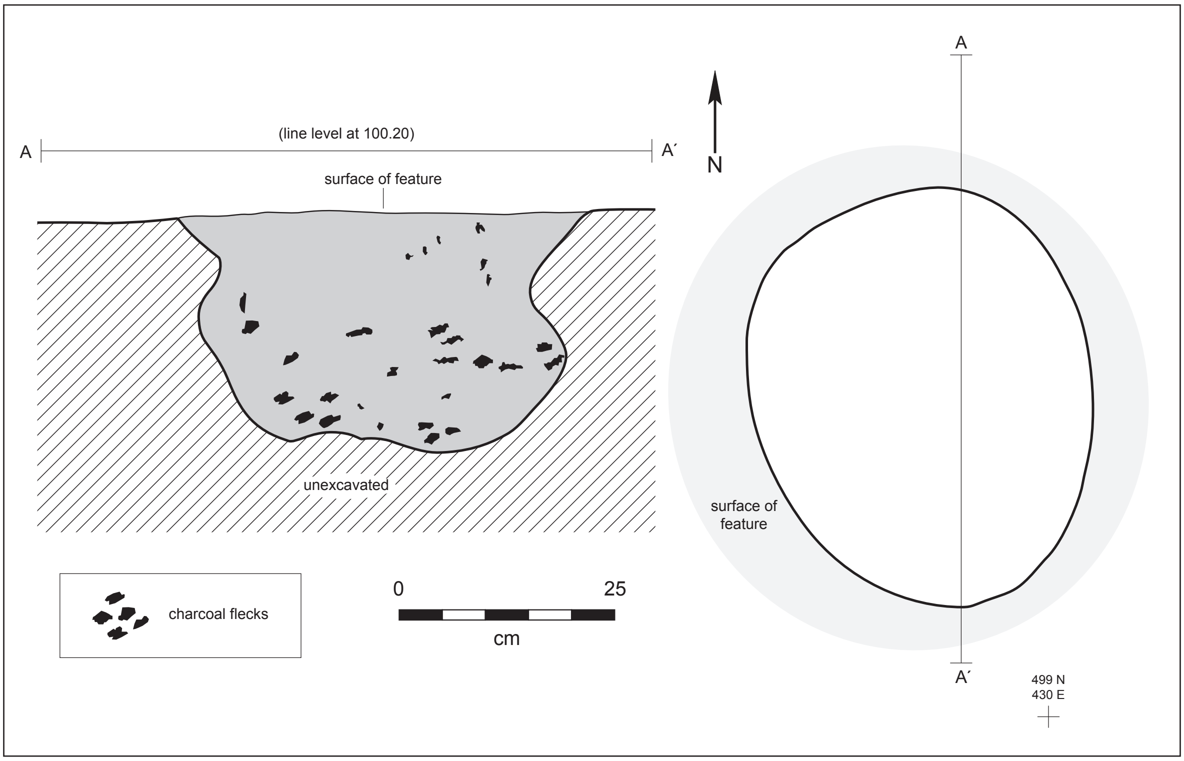

Figure 9.7c. LA 129216, Block 10, plan, Feature 16.

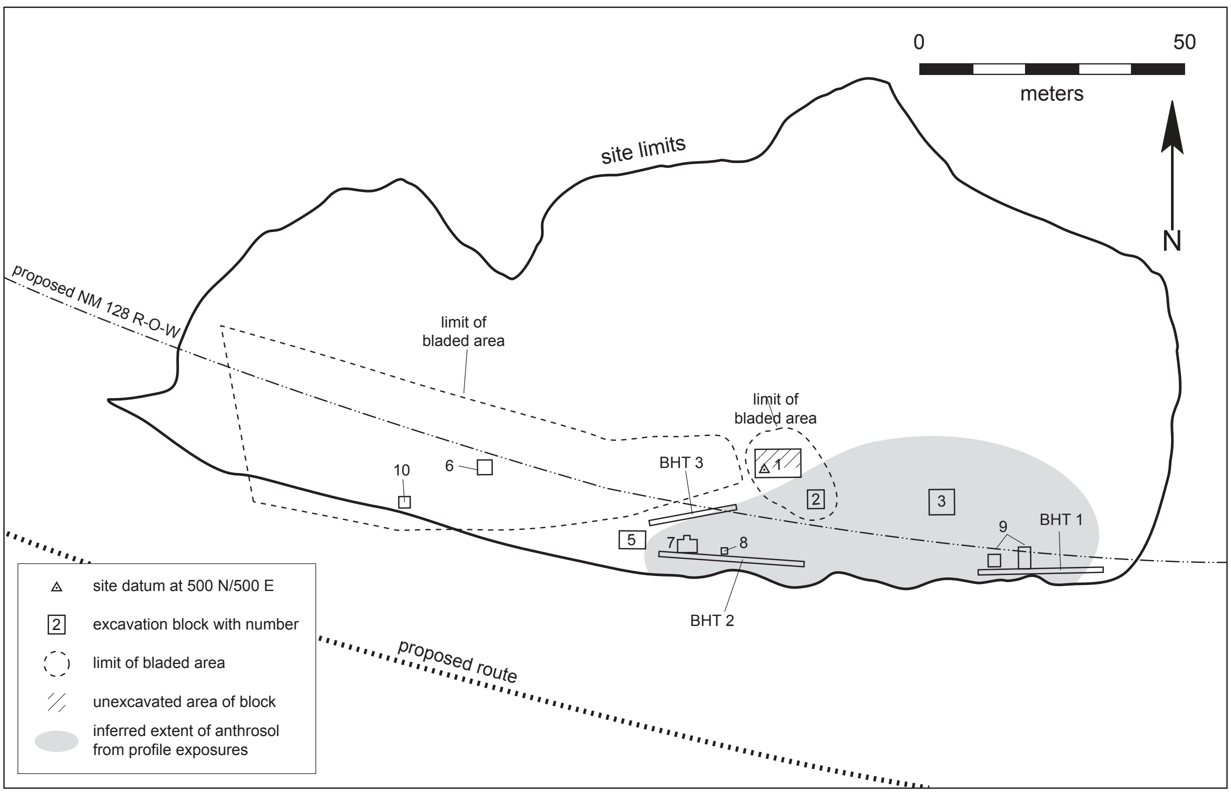

Figure 9.8. LA 129216, map of site showing reconstructed extent of anthrosol unit in excavated areas.

Table 9.10. LA 129216, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK NO.	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURAL/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	16.0	0	–	–	–	–	0.5
2	9.0	0	–	–	–	–	0.2
3	16.0	0	–	–	–	–	0.9
4	not excavated	–	–	–	–	–	–
5	15.0	0	–	–	–	–	0.1
6	4.0	1	1	–	–	–	0
7	6.5	3	3	–	–	–	1.3
8	1.3	2	2	–	–	–	0
9	6.0	3	3	–	–	–	2.2
10	4.0	2	1	–	1	–	0
Total	**77.8**	**11**	**10**	**0**	**1**	**0**	–

Provenience: Block 10, 499N/429E
Elevation and Stratum: 100.15–99.87, Stratum 3 to calcrete
Size and Shape: Egg-shaped with bell-shaped cross section; 48 by 36 by 28 cm
Definition: Good
Fill: Very dark gray-brown, with charcoal flecks
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 600 (Beta 258917)

Feature 17: Thermal pit, non-rock, deep, medium
Provenience: Block 7, 486N/483E
Elevation and Stratum: 100.67–100.47, Stratum 2
Size and Shape: Triangular with rounded corners, 52 by 43 by 20 cm
Definition: Fair, with diffuse boundaries
Fill: Dark brown, with abundant charcoal pieces
Bioturbation: Rodent, root, insect
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 390 (Beta 258921)

Feature 18: Thermal pit, non-rock, deep, large
Provenience: Block 7, 486–487N/484–485E
Elevation and Stratum: 100.65–100.45, Strata 2 and 3
Size and Shape: Oval, 86 by 68 by 20 cm
Definition: Fair, with diffuse boundaries
Fill: Dark brown, with abundant charcoal pieces
Bioturbation: Yes, but not specified
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 380 (Beta 258920)

Feature 19: Thermal pit, rock, very deep, medium
Provenience: Block 8, 486N/488E
Elevation and Stratum: 100.90–100.55, Stratum 2
Size and Shape: Oval, 60 by 50 by 35 cm
Definition: Good
Fill: Very dark gray, with charcoal pieces
Bioturbation: Root, rootlet
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 540 (Beta 232994)

Feature 20: Thermal pit, non-rock, very deep, medium
Provenience: Block 8, 486N/490E
Elevation and Stratum: 100.80–100.43, Stratum 3
Size and Shape: Oval, 64 by 56 by 37 cm
Definition: Good, with slightly diffuse boundaries; some oxidation
Fill: Dark reddish brown, with charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 440/490/520 (Beta 232995)

10 ⩡ LA 129217

Regge N. Wiseman and Donald E. Tatum

Site Description

In retrospect, sites LA 129217 and LA 129218 should have been recorded as a single site. Either singly or together, the result is a large site (Fig. 10.0) situated in the Los Medanos dunes near the western edge of Livingston Ridge. This ridge, including its subsidiary Forty-Niner Ridge, forms the east boundary of the Nash Draw Valley. The ridge is composed of Quaternary alluvial and bolson deposits. Its near summit at the site is 1,002 m (3,287 ft) amsl. The site was originally thought to represent a single component on the basis of two dart points.

The surface of LA 129217 is characterized by a series of 1 to 4 m high coppice dunes interspersed with deflation depressions (Fig. 10.1). The dunes are crowned by mesquite and shin-oak shrubs, interspersed with burned-rock features and artifacts in the blowouts. In addition to the mesquite and shin oak, on-site vegetation includes tufts of grama and dropseed grass (TRC Associates 2000).

LA 129217 measures 195 m northeast–southwest and 112 m northwest–southeast. Parts of the site lie on both sides of the existing alignment of NM 128. At the time of this project, the total site area (minus the part removed by the existing NM 128) is approximately 2.14 acres (0.87 ha), 1.65 acres (0.67 ha) (76.5 percent) of which lie within the project limits. Both the existing and proposed rights-of-way for NM 128 transect the site.

The site was initially recorded by TRC in 2000 during a cultural resource inventory for the New Mexico Department of Transportation (NMDOT). TRC identified nine surface survey features, six of which lay within the final route of the construction project (TRC Associates 2000).

Surface artifacts identified during the TRC survey included chipped stone debitage, mano and metate fragments, a pestle, a hammerstone, and two dart projectile points. The paucity of diagnostic artifacts recovered during site recording, probably the result of decades of artifact collecting by locals, made problematic the estimation of occupation dates. Pottery and arrow points were absent, corroborating the suggestion by two dart points that the occupations of this site belong to the Archaic period (OAS 2006). Subsequent data recovery by OAS confirmed the presence of buried remains dating to the Archaic period and possibly the Paleoindian period.

Surface Features

The initial survey (TRC Associates 2000) identified a total of nine possible surface survey features within the site (Fig. 10.2). After establishment of the final construction design, three of these surface survey features were included within the construction project (Table 10.1).

Grids for six excavation blocks were established to investigate three surface survey features, a burned-rock cluster found eroding out of the side of a dune, and two areas exposed by mechanical removal of dunes. Two hundred and three 1 by 1 m units were hand-excavated to depths between 10 and 70 cm below the present ground surface. Excavation was discontinued when a calcrete layer appeared or when culturally sterile levels were achieved. Only two subsurface features, both thermal pits, were discovered and excavated.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

No backhoe trenches were excavated at this site. However, the results from backhoe trenches excavated for neighboring site LA 129218 should also apply to LA 129217 because the two sites are es-

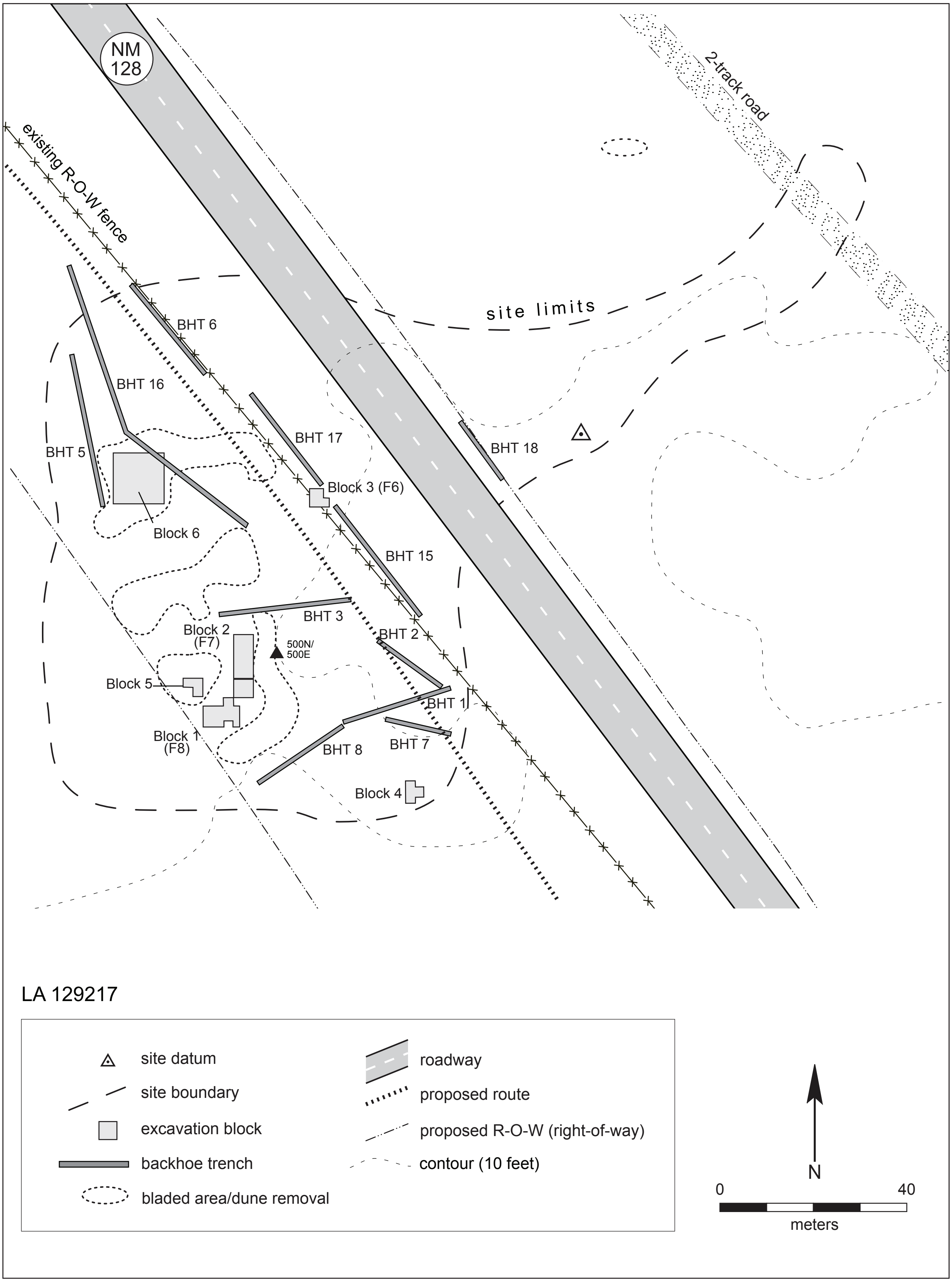

Figure 10.0. LA 129217, site map.

Figure 10.1. LA 129217, example of site surface, showing sand cover and dunes. Occasional rocks constitute Surface Survey Feature 8 (TRC Associates 2000).

sentially identical to each other in both setting and landform details.

Hand Excavation: Block Descriptions

Block 1 was established to investigate Surface Survey Feature 8 (TRC Associates 2000). The block has a non-symmetrical configuration composed of eleven 2 by 2 m units and one 1 by 2 m unit.

Block 1 (46 sq m)

Excavations in Block 1 were carried to various depths, with some units and parts of units going through only Level 1 (0 to 10 cm below surface) and others going through Level 7 (60 to 70 cm).

This variation in excavation depth reflects the fact that the fill of this site consists mainly of sands of at least two ages, the uppermost being fairly recent and the lowest being Pleistocene in age. Often the only decision as to whether to continue digging had to be made on the basis of the presence or absence of artifacts and burned-rock fragments on a level-by-level basis.

Table 10.1. LA 129217, surface survey features.

FEATURE NO.	OAS BLOCK NO.	FEATURE TYPE	SIZE (M) (TRC 2000)
6	3	burned caliche scatter	5 x 10
7	2	burned caliche scatter	5 x 6
8	1	burned caliche midden	8 x 10

Site data from TRC Associates 2000.

The constant question was how many non-artifact-bearing levels should have been excavated before work on the unit was to be terminated. In some places, such as the bottom of Level 3 in Unit 480N/489E, the presence of a number of burned rocks on the same plane suggested the presence of an occupation surface. Yet, no other indicators, such as color or compaction differences, accompanied this phenomenon.

Given the nature of sand, the effects of human treadage on sandy surfaces, and the ever-present action of plant roots and burrowing animals, we

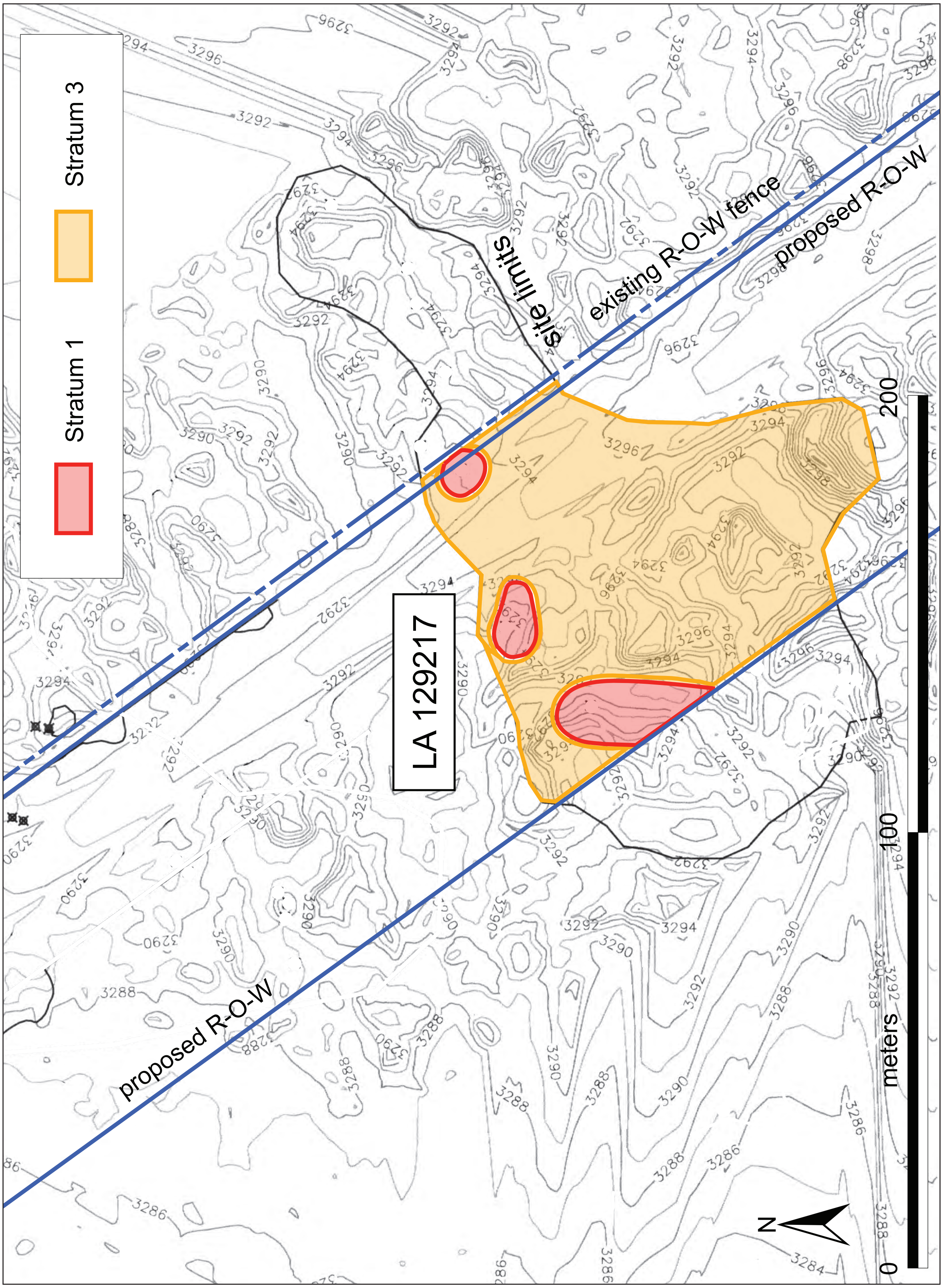

Figure 10.2. LA 129217, map showing distribution of surface sediment zones.

Figure 10.3. LA 129217, Block 4, prior to excavation.

should not expect to find good, sharp definition of occupation surfaces.

Burned-rock fragments were scattered across the block, especially on the surface, but organic staining was absent and charcoal flecking was rare.

No cultural features were found in spite of the possibilities observed during the survey (i.e., TRCs Surface Survey Feature 8).

Chipped lithic debitage and the ground stone items (Table 10.2) constituted an average of 2.2 items per square meter of excavated area.

Table 10.2. LA 129217, Block 1, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	98 *
Manos and metates	2
Burned rock with mineral	1
C-14 sample	1
Total	**102**

* Figure taken from excavation grid forms; however, only nine items were analyzed.

Block 2 (33 sq m)

Block 2 was established to investigate Surface Survey Feature 7 (TRC Associates 2000). The south end of Block 2 adjoins the north end of Block 1. Excavations in five units of Block 2 were carried through Level 2 (10 to 20 cm), two were excavated through Level 3 (20 to 30 cm), and one was excavated through Level 4 (30 to 40 cm).

The fill of this block consists mainly of loose sands and moist sands. In most units, excavations were discontinued after a non-artifact-bearing level. Thermal Feature 10 was exposed and excavated in this block. This feature did not correspond directly to the burned rock comprising Surface Survey Feature 7, unless of course, the rocks had been scattered away from Feature 10 during the occupation or following the abandonment of the location.

Table 10.3. LA 129217, Block 2, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	111
Flotation sample	1
Total	**112**

Charcoal was absent in the fill except in the one

Figure 10.4. LA 129217, Block 4, excavated.

feature, and burned rocks/caliche fragments were rare except on the surface.

An organic stain coming from under the dunes was the result either of a buried A soil horizon or an old natural burn. Chipped lithic debitage (Table 10.3) constituted an average of 3.37 items per square meter of excavated area.

Block 3 (10 sq m)

Block 3 was established to investigate Surface Survey Feature 6 (TRC Associates 2000). Excavations in Block 3 were carried through Levels 3 (20 to 30 cm below surface) and 4 (30 to 40 cm).

Burned-rock fragments were found scattered across the block, especially on the surface, but organic staining was absent and charcoal flecking was rare.

No cultural features were found in spite of the possibilities observed during the survey (i.e., TRCs Surface Survey Feature 6). Chipped lithic debitage and ground stone items (Table 10.4) constituted an average of 9.2 items per square meter of excavated area.

Table 10.4. LA 129217, Block 3, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	91 *
Ground stone	1
Animal bone	1
Total	**93**

* Figure taken from excavation grid forms; however, only 15 items were analyzed.

Table 10.5. LA 129217, Block 4, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	33
Total	**33**

Block 4 (10 sq m)

Block 4 was established at the far southeastern end of the site and west of the highway to investigate a buried soil A horizon exposed in the side of a dune and its relationship to cultural materials in the adjacent blowout (Figs. 10.3 and 10.4).

Table 10.6. LA 129217, Block 5, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	75
Projectile point	1
Manos and metates	1
Total	**77**

Table 10.7. LA 129217, Block 6, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	8
Animal bone	1
Total	**9**

Table 10.8. LA 129217, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK NO.	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURAL/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	46	0	–	–	–	–	2.2
2	33	1	1	–	–	–	3.4
3	10	0	–	–	–	–	9.2
4	10	0	–	–	–	–	3.3
5	12	0	–	–	–	–	6.4
6	92	1	1	–	–	–	0.1
Total	**203**	**2**	**2**	**0**	**0**	**0**	–

The bottom of the blowout (and the artifacts) were at a lower elevation than the A horizon. With one exception, excavations in Block 4 were carried through Levels 4 (30 to 40 cm below surface) and 5 (40 to 50 cm). The one exception was excavated only through Level 2 (10 to 20 cm) because it was located low on a slope of the dune. Work was terminated after the excavation of one full level, about 10 cm into the buried A horizon. Burned rocks and caliche were generally scattered throughout the block, but charcoal and cultural staining were absent. No cultural features were found in Block 4. Chipped lithic debitage and ground stone items (Table 10.5) constituted an average of 3.3 items per square meter of excavated area.

Block 5 (12 sq m)

Block 5 was established to investigate another instance of cultural materials being observed in the side of a dune nearly 1 meter above an adjacent blowout. After the initial testing was completed, the dune was mechanically removed down to just above what turned out to be a buried soil A horizon bearing cultural materials. Three 2 by 2 m units arranged in an L-shape were established and hand excavation commenced with remnant Stratum 7 (dune sand) deposits. Excavations were carried through Level 6, from about 50 to 60 cm below surface. Burned rocks/caliche were generally found scattered throughout the block, but charcoal and cultural staining were absent. No cultural features were found in Block 5. Chipped lithic debitage and a projectile point (Table 10.6) constituted an average of 6.4 items per square meter of excavated area.

Block 6 (92 sq m)

Block 6 was established after a dune was mechanically removed down to just above a buried soil A horizon. Twenty-three 2 by 2 m units were established, and hand excavation commenced with remnant Stratum 1 deposits, a few remnant Stratum 2 deposits, and continued into mostly Stratum 7 deposits. In most units, excavations were carried through Levels 2 (10 to 20 cm below surface) or 3 (20 to 30 cm), but the 526N and 528N units were excavated only through Level 1, 0 to 10 cm. Burned rocks/caliche were few in number and generally scattered throughout the block. Charcoal and cultural staining was absent. Thermal Feature 11 was exposed and excavated in Block 6. The few pieces of chipped lithic debitage (Table 10.7) constitute an average of 0.1 items per square meter of excavated area.

Block Summary

A summary of findings for all blocks can be found in Table 10.8.

Hand Excavation: Feature Descriptions

Feature 10: Thermal pit, non-rock, shallow, large
Provenience: Block 2, 496N/488E
Elevation and Stratum: 97.03–96.88
Size and Shape: Oval?, 77 by 32 by 16 cm
Definition: Not specified beyond being heavily rodent disturbed
Fill: Black
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 11: Thermal pit, non-rock, shallow, small
Provenience: Block 6, 520N/467E
Elevation and Stratum: 96.68–96.60, Stratum 3
Size and Shape: Trilobed, 38 by 36 by 8 cm
Definition: Good
Fill: Dark brown, with no visible pieces of charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

11 ⩡ LA 129218

Regge N. Wiseman and Donald E. Tatum

Site Description

As mentioned in Chapter 10, sites LA 129217 and LA 129218 should have been recorded as a single site (Fig. 11.0). Either singly or together, the result is a large site situated in the Los Medanos dunes near the western edge of Livingston Ridge. This ridge, plus its subsidiary Forty-Niner Ridge, form the east boundary of the Nash Draw Valley (Fig. 11.1). The ridge is composed of Quaternary alluvial and bolson deposits. Its near-summit at the site is 1,002 m (3,287 ft) above mean sea level. The site was thought to represent a single component on the basis of one dart point.

The surface of LA 129218 is characterized by a series of 1 to 4 m high coppice dunes interspersed with deflation depressions, or "blowouts" (Figs. 11.2a and 11.3). The dunes are crowned by mesquite and shin-oak shrubs. In addition to the mesquite and shin-oak, on-site vegetation includes tufts of grama and dropseed grass (TRC Associates 200).

LA 129218 measures 135 m (442 ft) northeast–southwest and 79 m (259 ft) northwest–southeast. Parts of the site lie on both sides of the old alignment of NM 128. At the time of this project, the total site area is approximately 3.13 acres (1.27 ha), 1.33 acres (0.54 ha) (42.4 percent) of which lies within the project limits. Both the existing and new rights-of-way for NM 128 transect the site.

The site was initially recorded by TRC (TRC Associates 2000) during a cultural resource inventory for the New Mexico Department of Transportation (NMDOT). It was re-evaluated by SWCA a few years later (Railey et al. 2009). TRC identified seven surface survey features from surface indicators, four of which lay within the final alignment of the construction project.

Surface artifacts identified during the TRC survey recorded the presence of chipped stone debitage, a retouched tool, 1 projectile point, and 21 ground stone fragments (TRC Associates 2000). The paucity of diagnostic artifacts recovered during site recording, probably the result of decades of artifact collecting by locals, made problematic the estimation of occupation dates. The presence of a dart point suggested Middle to Late Archaic period occupation.

Surface Features

The initial survey (TRC Associates 2000) identified a total of seven features within the site. After establishment of the final design, four of these were included within the construction project (Table 11.1).

Grids for 11 excavation blocks were eventually established to investigate the four surface survey features, an area among a series of features to examine this interstitial space, an area of scattered burned rock/caliche that had not received previous feature designation, three areas exposed by mechanical removal of dunes, and a feature exposed in the side of a trench. Sixty-five 2 by 2 m units and one 1 by 2 m unit were hand-excavated to depths from 10 to 80 cm below the present ground surface, though most went only 30 cm deep.

Excavation was discontinued when the calcrete layer appeared or when culturally sterile levels were achieved. Eleven subsurface features, all thermal pits, were discovered and excavated.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

LA 129218 occupies a position between the south side of Livingston Ridge and the west edge of the Los Medanos dune field. The NM 128 relocation corridor crosses the southern half of the site.

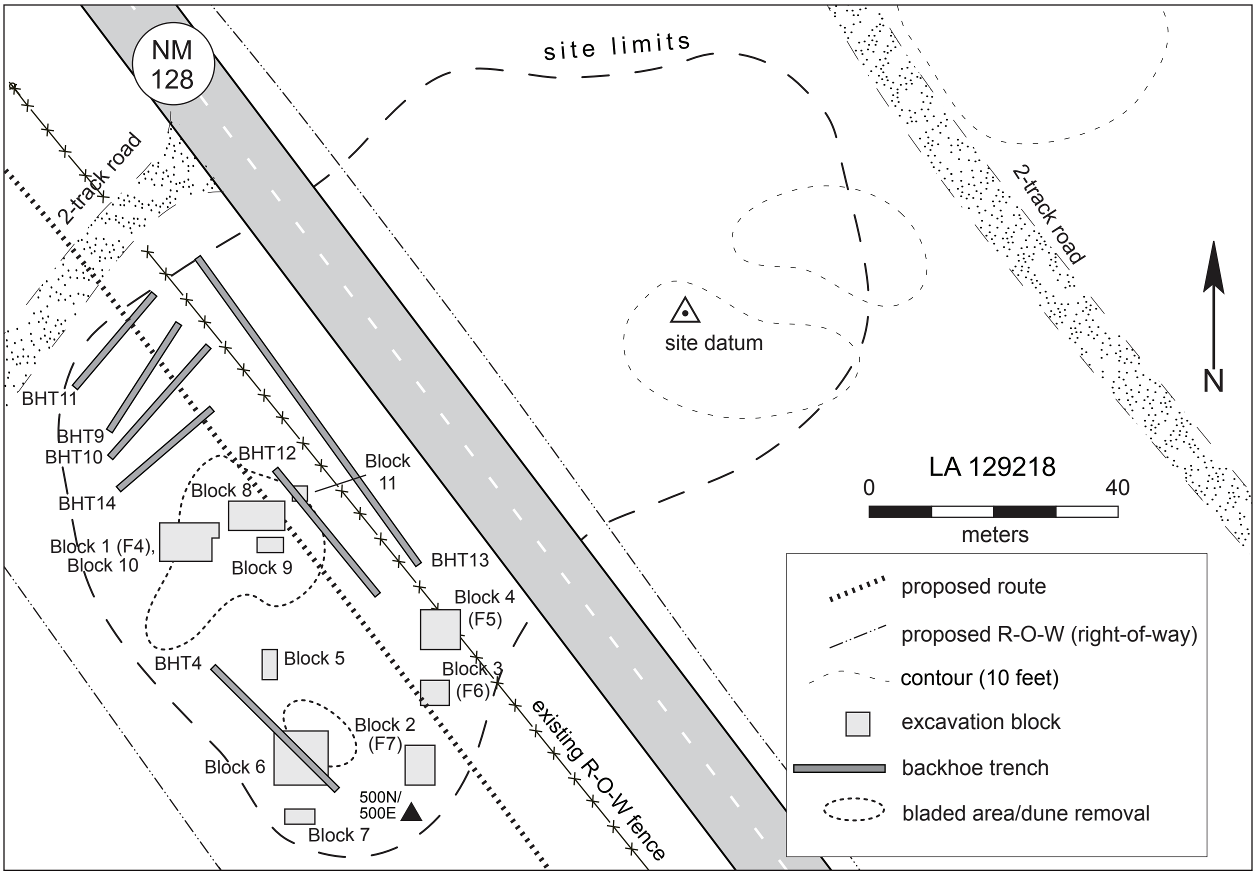

Figure 11.0. LA 129218, site map.

Archaeological Surface Sediment Zone and Trench Distribution

The majority of the northwest-southeast oriented LA 129218/NM 128 relocation corridor crossing was occupied by archaeological surface sediment Zone 3 deposits, with three exceptions at locations where fire-cracked rock concentrations were on the surface. Surface sediment Zone 1 deposits occurred along the central part of the corridor crossing. Seven backhoe trenches and two dune removal areas were excavated to explore relationships between areas with surface visibility of archaeological materials and subsurface cultural and geomorphic deposits in surface sediment Zones 1, 2, and 3 (Fig. 11.2a).

Table 11.1. LA 129218, surface survey features.

FEATURE NO.	OAS BLOCK NO.	FEATURE TYPE	SIZE (M) (TRC 2000)
4	1	burned caliche concentration	0.5 x 0.5
5	4	burned caliche midden	8 x 8
6	3	burned caliche scatter	2 x 2
7	2	burned caliche concentration	3 x 4

Site data from TRC Associates 2000.

Soils, Stratigraphy, Lithology of Trenches and Bladed Areas

Soils are mixed alluvial and eolian sand of the Kermit-Berino complex (USDA-NRCS, 2009). Texturally, they are fine sand underlain by fine sandy loam. The Kermit-Berino is a Typic Torripsamment of the Haplargids-Torripsamments association. The Typic Torripsamments occupy the gently rolling dune topography, have unconsolidated surface layers of non-calcareous to slightly calcareous, brown to reddish brown fine sand underlain by deep deposits of fine sand highly susceptible to wind erosion (Maker et al. 1978).

In the northwest half of the site, stratigraphic profiles in six backhoe trenches—BHT 9 through BHT 14—showed relatively shallow deposits of Unit 1 sand that terminated on the indurate calcrete of the Mescalero Paleosol. The surface sediment con-

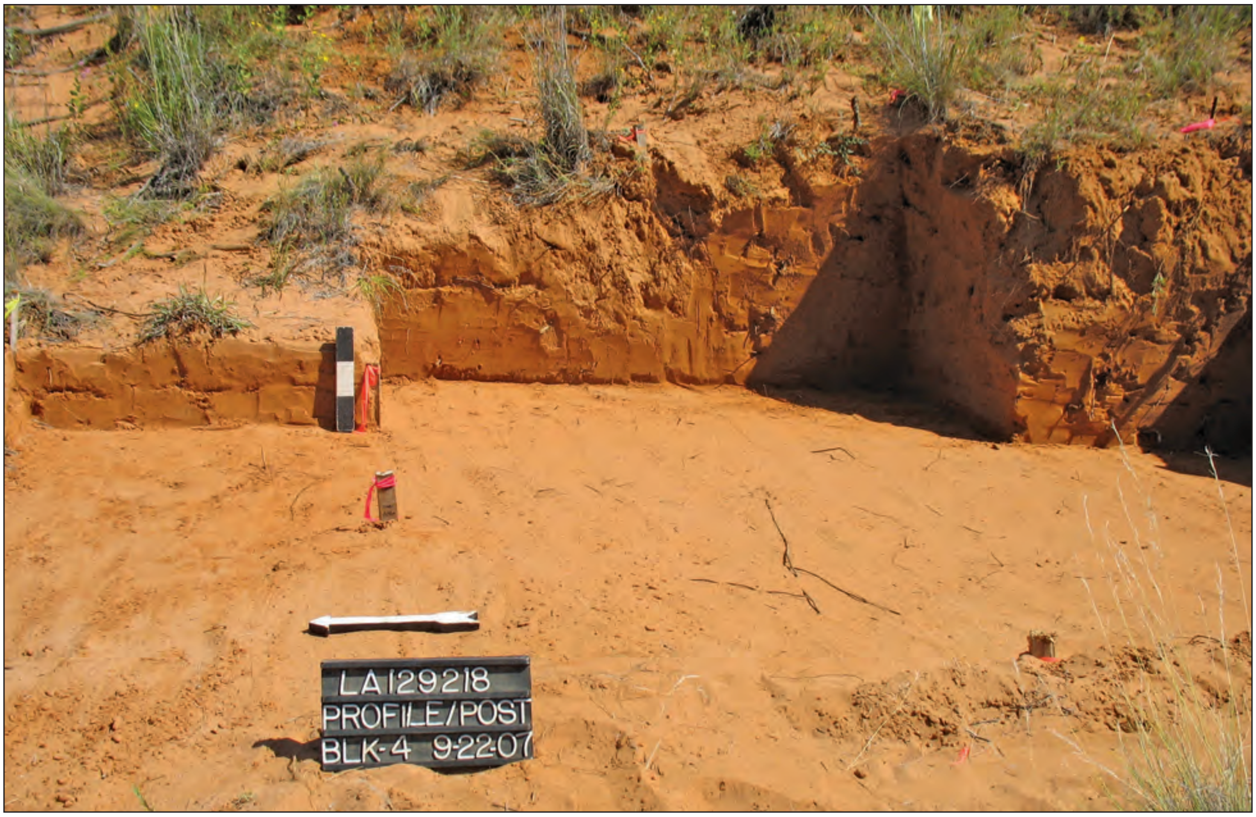

Figure 11.1. LA 129218, example of high dunes at the site. Block 4 excavated, facing east.

sisted of relatively recent deposits of dune-forming eolian sand that was underlain by well-consolidated, yellow-brown sand with sparsely distributed inclusions of small chert, carbonate, and sandstone pebbles. Localized bioturbation from root, insect, and rodent activity was highly prevalent in this stratum.

Preceded by a diffuse boundary, the underlying Bk horizon was heralded by gradually increasing amounts of carbonate precipitate in the soil, resulting in weak sand-grain cementation and carbonate filament development in the reddish brown, fine to medium sandy matrix. Increasing development of carbonate precipitate imparted a stronger structure and paler coloration to the sediment. The Bk was underlain by a Ck horizon, indicated by a sharp increase in percentage by volume of highly weathered and fragmented, rounded to subrounded caliche granules, pebbles, and cobbles derived from the underlying calcrete of the Mescalero Paleosol. This concentration of weathered carbonate colluvium and alluvium in a shallow depositional horizon across the site indicates a period of erosion and deflation that occurred prior to, or early in the stage of, deposition of the Unit 1 sand. Excavation of the trenches ceased at the calcrete.

In Backhoe Trench 11, a modern trash pit with partially burned and melted aluminum cans, plastic, glass, paper, and burned wood fragments was uncovered. One prehistoric thermal pit feature (Feature 23) was exposed in the center of BHT 12.

Approximately 500 sq m of dune deposit and overburden were mechanically excavated from an area encompassing Zone 1. The sand sheet on this part of the site was thin (30 to 40 cm) and terminated at indurate calcrete. Six thermal pit features were exposed in the mechanically bladed area (Features 12–17).

Excavations provided evidence that sediments in the southeastern half of the site were deeper than deposits to the north. Trench 6 was between the southeast end of LA 129218 and the northwest end of LA 129217. The stratigraphic profile revealed a recent surface deposit of eolian sand underlain by Los Medanos sand. The diffuse boundary of Los Medanos was characterized by gradually increasing clay content, increasing amounts of carbonate precipitate, and more well-developed soil

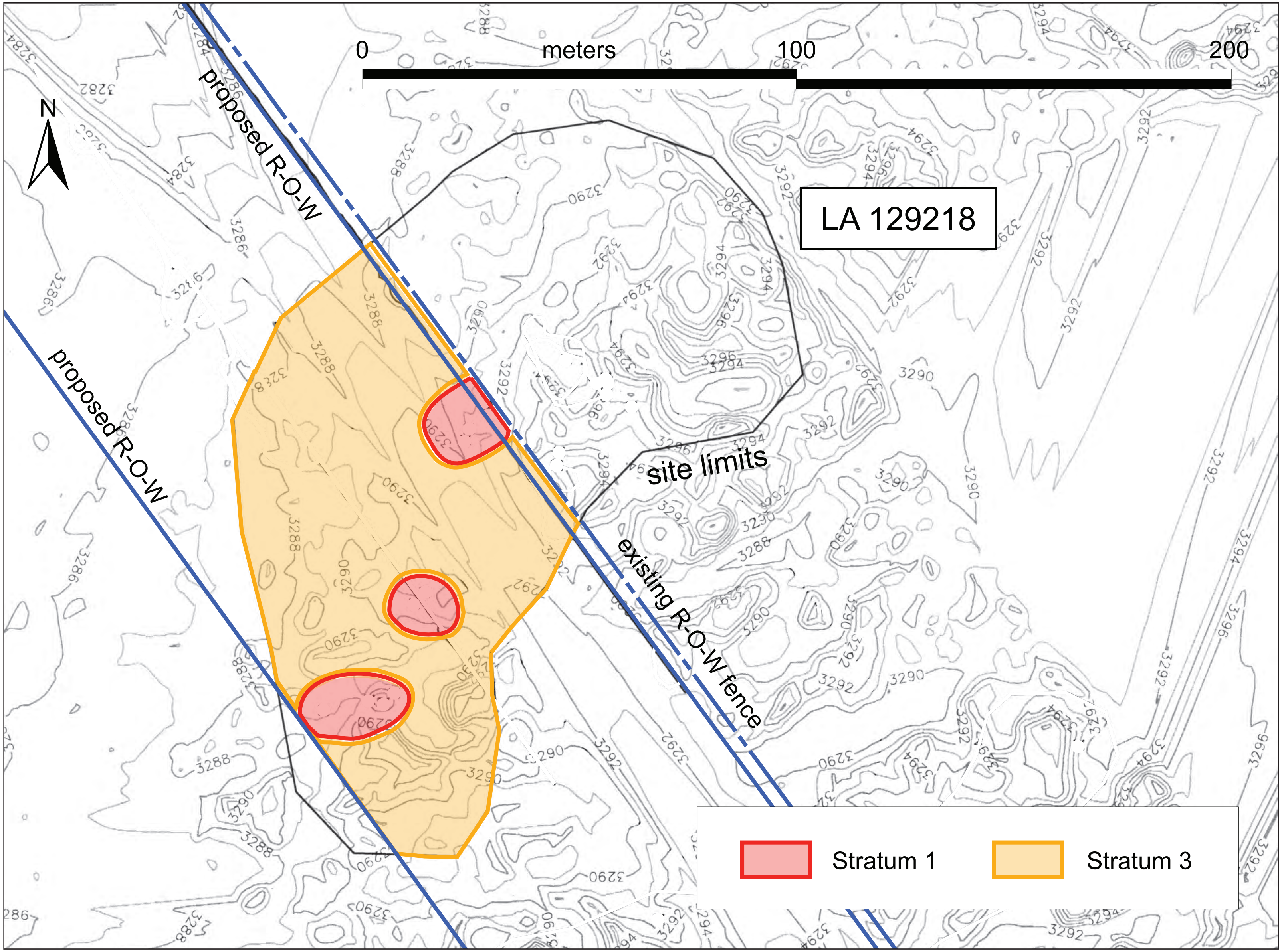

Figure 11.2a. LA 129218, map showing distribution of surface sediment zones

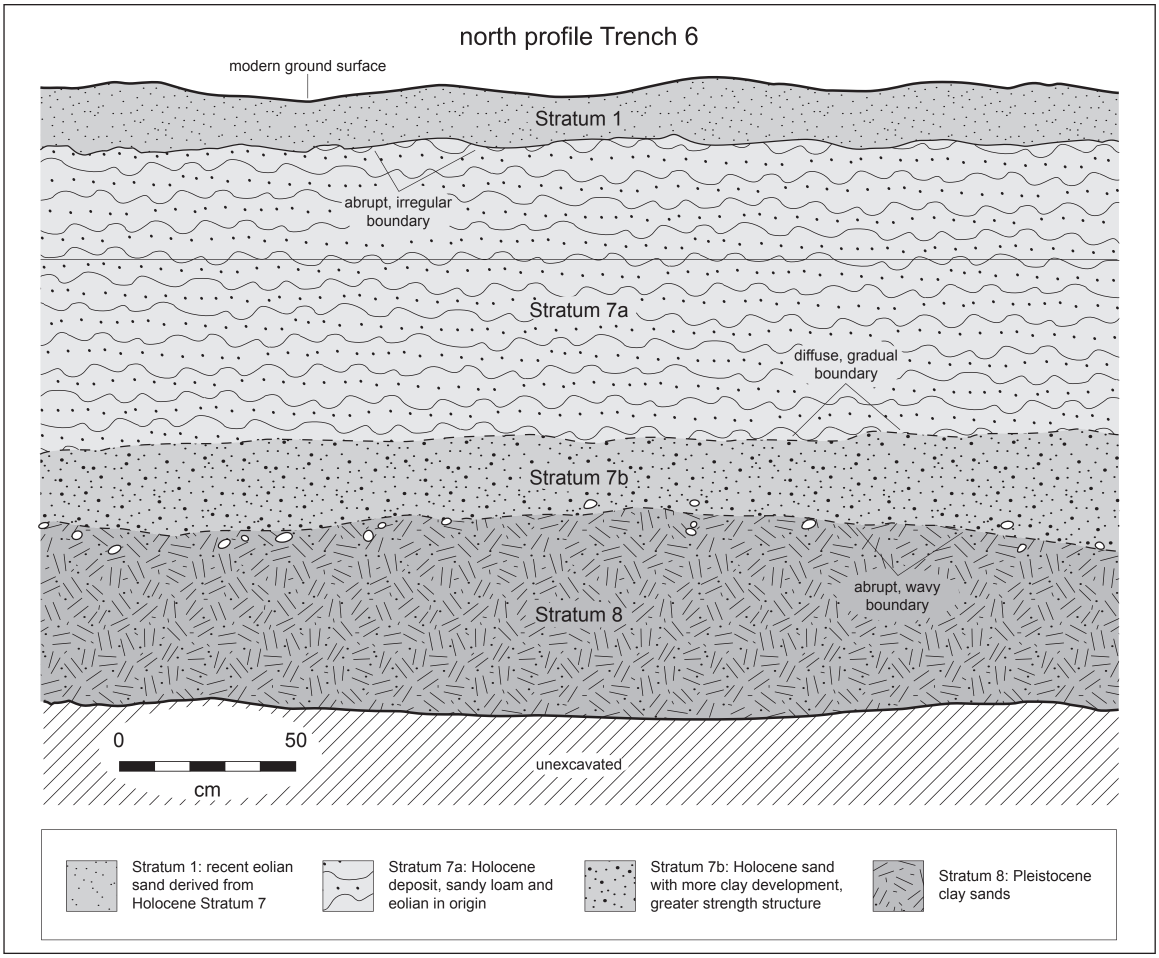

Figure 11.2b. LA 129218, BHT 6, north wall, profile.

structure. These developments marked the upper depositional horizon of the Unit 1 sand. The Unit 1 boundary was abrupt, wavy, and partially defined by a sparsely distributed proximation of small, subrounded and sub-angular chert pebbles. The inclusions were concentrated along the boundary, indicating an erosional surface. Unit 1 was immediately underlain by a B horizon, a Pleistocene deposit of clay-rich, fine red sand, and the Unit 2 sand (Hall 2007a, this report) (Fig. 11.2b).

Trench 4 was placed in the southeastern end of the corridor crossing. It bisected a thick dune deposit of fine sand. The west end of the profile showed a disturbed area in the dune deposit that was filled with mixed sand, indicating a bisecting cut in the dune that had subsequently collapsed. Nearby vegetation anomalies revealed several traces of a former two-track road leading southwest from the dune.

The upper profile showed a thick layer of historically redeposited Los Medanos sand. The upper part of the layer was found to be colluvium free. Sparsely distributed chert and carbonate pebbles occurred in proximity to the abrupt boundary, indicating a period of reduced sedimentation or erosion.

The underlying deposit was a buried A horizon, distinctly darker than Los Medanos sand because of accumulated organic residue and clay mineral content. Poorly sorted, pebbly inclusions of chert and carbonate were common within this soil. Lithic artifacts and two thermal pit features (Features 10, 11) were recovered from the buried A horizon. The upper surface of the buried A horizon was the surface of origin for the features, indicating a buried former ground surface. The lower boundary of the buried A, though abrupt and clear, had the small-scale irregularities indicative of root, insect, and worm activity, signifying landform stability and vegetative growth during the time of the paleosol

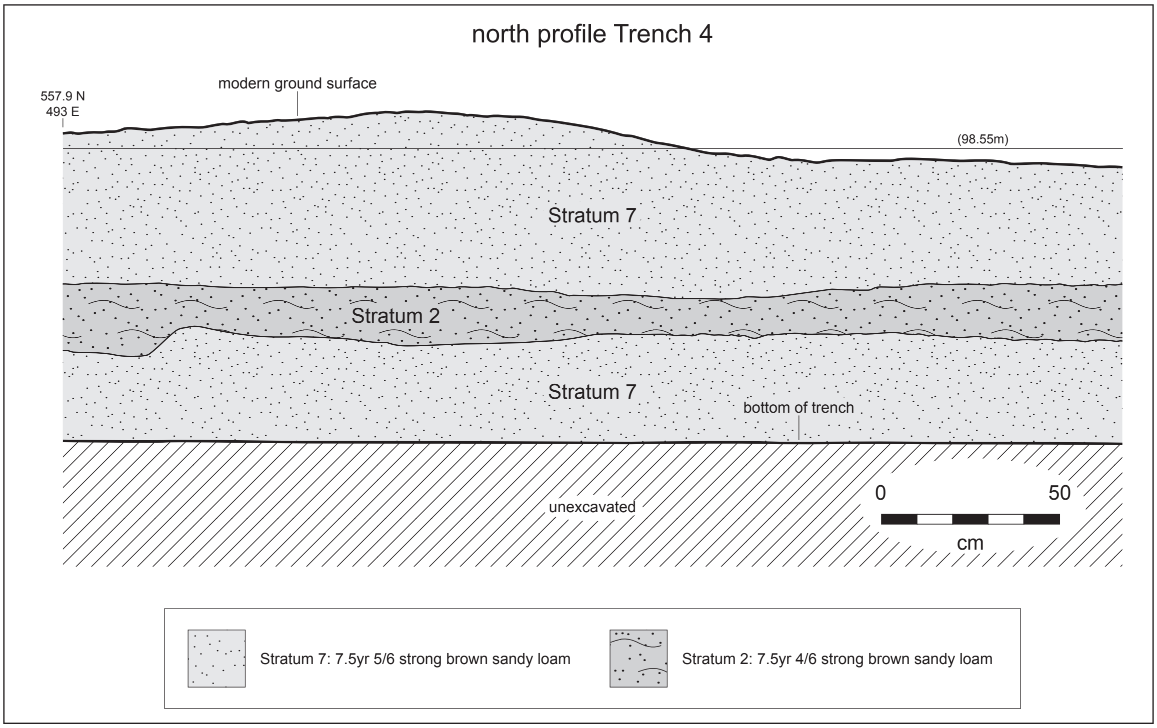

Figure 11.2c. LA 129218, BHT 4, north, profile.

development. The buried A horizon was immediately underlain by Los Medanos sand (Fig. 11.2c).

Chronology Discussion

The main strata of archaeological importance on LA 129218 were Los Medanos sands and the Unit 1 sand. An Optically Stimulated Luminescence (OSL) sample collected on the neighboring archaeological site (LA 129217) from near the top of the Los Medanos sand dated to 2140 ± 130 years BP. An OSL sample collected at the same locality from the Unit 1 sand dated to 4110 ± 230 years BP (Hall this report).

Eight thermal pit features (Features 8, 10–14, 16, and 23) were discovered during mechanical excavations on the site. Seven of the features occurred at similar elevations in the same shallow sand deposit of the bladed Zone 1 area near the middle of the corridor. Six of the features (8, 13–16, 23) were chronometrically dated. Features 14, 16, and 23 yielded a suite of Early to Middle Archaic dates between 4310 and 4690 BC. Features 8, 12, and 13 had a range of dates between 900 and 1210 AD. The chronometric data indicate that the sand in this part of the site predates the fourth millennium BC. Comparison of dates obtained from OSL samples at LA 129217 with the Early to Middle Archaic dates from the features indicates that the sand deposit predates, or is concurrent with, the deposition of the Unit 1 sand. Elevation data from the six dated features suggest that the ground surface available for inhabitants to utilize more than 6000 years ago was also available less than 1000 years ago, perhaps because of very low net depositional gain in the immediate vicinity of the features. Feature 11, recovered from the buried A horizon deposit in BHT 4, was chronometrically dated to 980 to 1160 AD, indicating that development of the A horizon occurred prior to this time.

Conclusion

Eight backhoe trenches and one surface-scraped area were excavated to explore relationships between areas with archaeological materials exposed at the ground surface and subsurface cultural and geomorphic deposits in archaeological Zones 1 and 3. No archaeological features were visible on the surface in the areas that were mechanically excavated. Mechanical excavation on the site led to the discovery of eight subsurface archaeological features, a buried A horizon, and associated artifacts.

Figure 11.3. LA 129218, Block 4, ready for excavation, showing blowout and vegetation, facing west.

The discovery of subsurface archaeological deposits in mechanically excavated areas with no archaeological features exposed on the surface indicates that presence or absence of such materials on the surface does not accurately predict presence or absence of intact subsurface archaeological deposits.

Strata exposed in backhoe trenches included a widespread, recent eolian surface deposit. In the northwestern part of the corridor crossing, recent surface deposits were immediately underlain by shallow eolian sands abruptly terminating on the calcrete of the Mescalero Paleosol. In the southeastern part of the corridor crossing, the sand deposits were thicker and more massive and concealed an isolated remnant of buried A soil horizon.

Six thermal pit features originating just below the surface of the shallow sand deposit in the northwest part of the site were selected for chronometric dating, yielding a split range of dates. Three features dated between 900 and 1210 AD; three dated between 4310 and 4690 BC. All of the features were proximally located, had similar surface-of-origin elevations, and were intrusive into the same sand deposit. In comparison with OSL sediment dates taken from the adjacent site, the ages of the older features indicate that the time of deposition of the sand predates Los Medanos sand and may be contemporaneous with the deposition of Unit 1 sand.

Hand Excavation: Block Descriptions

Block 1 (48 sq m)

Block 1 was established to investigate Surface Survey Feature 4 (TRC Associates 2000) (Fig. 11.4). Excavations in Block 1 were generally carried through Level 3, where Strata 1 and 7 were encountered. Stratum 2, present elsewhere on the site, was not seen in this block.

Work in all units was terminated upon the discovery of calcrete. Since the upper surface of the calcrete undulated, the higher parts were usually encountered in the lower part of Level 1 (0 to 10 cm below surface) or the upper part of Level 2 (10 to 20 cm). Often, where Level 3 could be excavated, its horizontal extent was limited to small pockets in the top of the calcrete (Fig. 11.5).

Burned rock/caliche fragments were most

Figure 11.4. LA 129218, Block 1, excavated, showing extent and shallowness of calcrete bedrock.

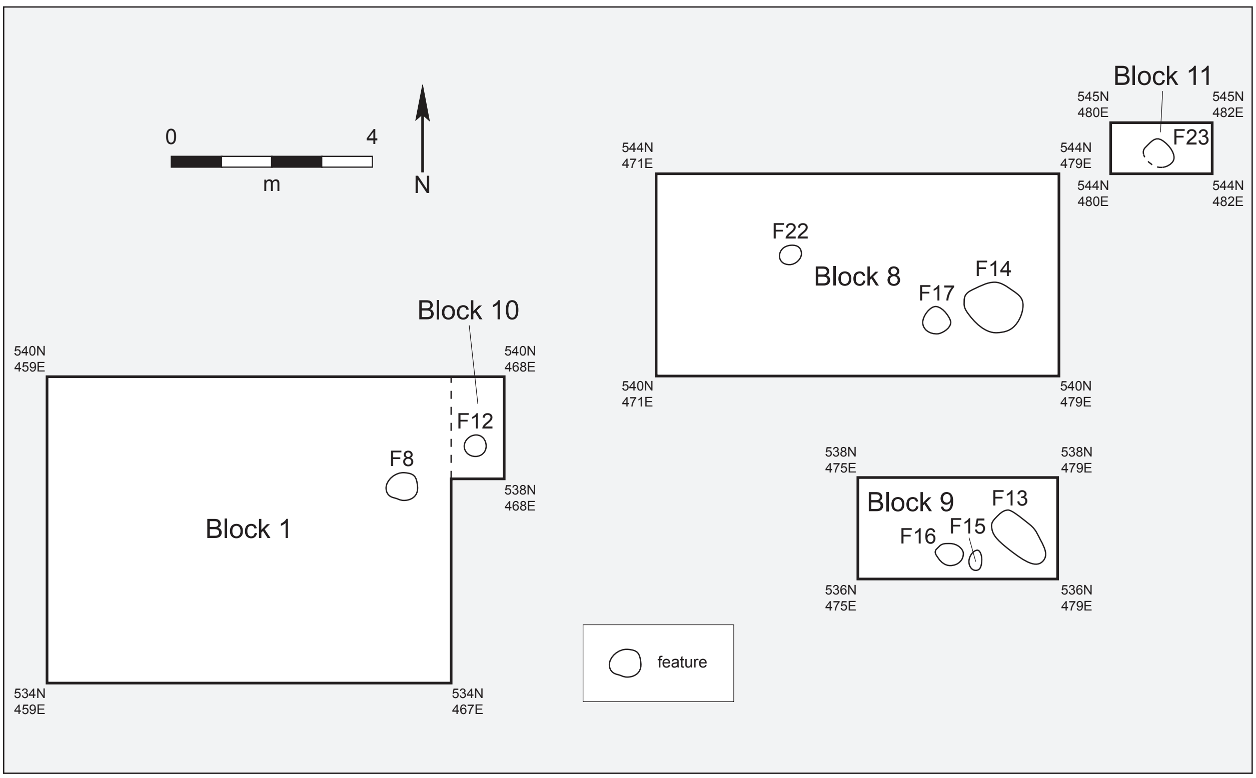

Figure 11.5. LA 129218; plan of Blocks 1, 8, 9, 10, and 11.

common on the surface of the block prior to commencement of excavation; Surface Survey Feature 4 was situated in the northwest corner of the block in 2 by 2 m units, 536N/459E and 538N/459E. Otherwise, occasional pieces were found subsurface scattered here and there across the block. A few glass and metal fragments were also recovered from and near the surface in some places. Cultural staining and charcoal flecking were generally absent.

Thermal Feature 8 was found and excavated in Block 1 (Figs. 11.6 through 11.9). It is located 5 m east of Surface Survey Feature 4 and may not have been in any way related to it. Chipped lithic debitage and pottery sherds (Table 11.2) constituted a combined an average of 0.6 items per square meter of excavated area.

Table 11.2. LA 129218, Block 1, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	12
Pottery sherds	15
Animal bone	12
Mussel shell	1
C-14 sample	1
Flotation sample	1
Pollen sample	1
Total	**43**

Block 2 (24 sq m)

Block 2 was established to investigate Surface Survey Feature 7 (TRC Associates 2000). Excavations in four units of Block 2 were carried through Level 2 (10 to 20 cm), and two were excavated through Level 3 (20 to 30 cm). The fill of this block consists mainly of compact sand (Fig. 11.10).

Variable numbers of burned rocks/caliche fragments were found in each excavation unit. Charcoal and organic staining was altogether absent. No cultural features were encountered in this block, Surface Survey Feature 7 notwithstanding. Chipped lithic debitage (Table 11.3) constituted an average of 1.2 items per square meter of excavated area.

Table 11.3. LA 129218, Block 2, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	28
Manos and metates	1
Total	**29**

Block 3 (16 sq m)

Block 3 was established to investigate Surface Survey Feature 6 (TRC Associates 2000). Excavations in the four 2 by 2 m units of Block 2 were carried through Level 2 (10 to 20 cm) throughout each unit, but were restricted to the southwest quadrant of each unit for Level 3 (20 to 30 cm) because of the appearance of calcrete in this level. The fill in these blocks consists mainly of compact sand.

Variable numbers of burned rocks/caliche fragments were found in each excavation unit. Charcoal and organic staining was absent altogether. No cultural features were encountered in this block, Surface Survey Feature 6 notwithstanding. Chipped lithic debitage (Table 11.4) constituted an average of 3.2 items per square meter of excavated area.

Table 11.4. LA 129218, Block 3, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	46
Manos and metates	4
Polishing stone	1
Total	**51**

Block 4 (36 sq m)

Block 4 was established to investigate Surface Survey Feature 5 (TRC).

Excavations in Block 4 were conducted in nine 2 by 2 m units. In six of the units, excavations were carried through Level 2 (10 to 20 cm), in two units through Level 3 (20 to 30 cm), sometimes only in one of the four squares of a unit, and in one unit through Level 4 (30 to 40 cm). In some cases, some of levels were actually thicker and deeper, because the units in question were situated on the side of a dune, and it was desired to keep the unit bottoms level. The fill of this block consists mainly of loose sand, in large part due to rains. No hardpan or calcrete was encountered anywhere in this block.

Several burned rocks/caliche fragments were found in each excavation unit, but none were concentrated in a manner suggesting a feature. Charcoal and cultural staining was absent altogether. No cultural features were encountered in this block,

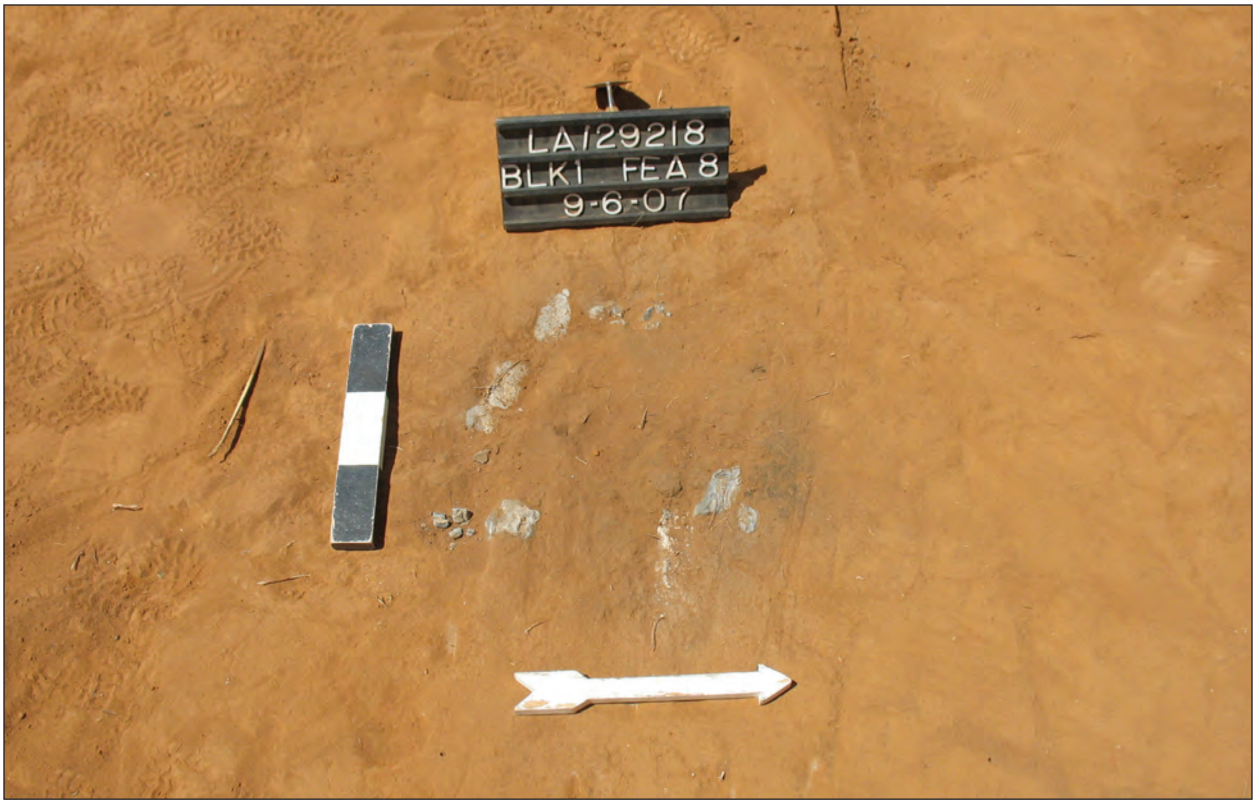

Figure 11.6. LA 129218, Feature 8, a rock thermal pit, prior to excavation, with rocks and stained fill barely showing.

Figure 11.7. LA 129218, Feature 8, excavated, with rocks in still place.

Figure 11.8. LA 129218, Feature 8, excavated, with rocks removed.

Figure 11.9. LA 129218, Feature 8, profile of fill.

Surface Survey Feature 7 notwithstanding. Excavations in the side of the dune in this block demonstrate that the cultural level in this area of the site lies above the blowout bottoms. Chipped lithic debitage (Table 11.5) constituted an average of 0.6 items per square meter of excavated area.

Table 11.5. LA 129218, Block 4, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	19
Manos and metates	2
Total	**21**

Block 5 (24 sq m)

Block 5 was established in a well-vegetated blowout with minimal surface artifacts to investigate whether intact cultural deposits lay below the modern surface but still within the area of the depression.

Excavations in Block 5 were conducted in six 2 by 2 m units. Excavations were carried through various depths, with the deepest going to 80 cm. The main purpose of this unit was to explore a part of the site that had very few artifacts on the surface, yet had potential for depth and, possibly, undisturbed cultural deposits. Calcrete was encountered near the surface in the northern part of the block, but overall, hardpan and/or calcrete were not seen anywhere else. Instead of cultural deposits, only four pieces of lithic debitage and no burned rocks/caliche, charcoal, or cultural stains were noted in the entirety of the block.

The fill of this block exhibited four basic strata (described from top to bottom) with a thin surface layer of Stratum 1 (loose sand), followed by a thicker layer of Stratum 7 (compacted reddish eolian sand), a second layer of Stratum 1 (earlier deposit of loose sand), and, finally, Stratum 2, in this case a buried weak A soil horizon that produced three flakes but otherwise lacked cultural deposits. No cultural features were encountered in Block 5.

Chipped lithic debitage (Table 11.6) constituted an average of 0.1 items per square meter of excavated area.

Table 11.6. LA 129218, Block 5, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	3
Total	**3**

Block 6 (64 sq m)

Block 6 was established after a feature was discovered in the side of Backhoe Trench 4 and an adjacent dune had been mechanically removed to provide access (Fig. 11.11). Dune removal included the upper part of Stratum 7 reddish sands down to a point 20 cm above the start of Stratum 2 (buried weak soil A horizon containing cultural remains).

Excavations in Block 6 were conducted in 16 2 by 2 m units. Excavations were carried through various depths, with the deepest going to 40 cm. The main purpose of this unit was to uncover the feature exposed in the side of BHT 4 and to explore the surrounding area for more features and other remains.

The fill of this block exhibited two basic strata (described from top to bottom), with a scraped surface beginning deposit of Stratum 7 (reddish, compact sand) followed by Stratum 2 (brown sand containing features and some artifacts, burned rock/caliche, etc.). Excavations were carried to calcrete in only one square at the cessation of excavations in this block.

Thermal Features 10 and 11 were encountered in Block 6.

Table 11.7. LA 129218, Block 6, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	14
Pottery sherd	1
Manos and metates	1
Flake tool	1
C-14 sample	2
Flotation sample	2
Pollen sample	2
Total	**23**

Table 11.8. LA 129218, Block 7, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	8
Polishing stone	1
Total	**9**

Figure 11.10. LA 129218, Block 2, excavated, showing bedrock calcrete and overlying sand unit.

Chipped lithic debitage, potsherd, piece of ground stone, and flake tool combined to (Table 11.7) constitute an average of 0.3 items per square meter of excavated area.

Block 7 (8 sq m)

Block 7 was established to investigate a small, loose concentration of burned rock/caliche at the southern edge of the site. This concentration had not been previously identified as a possible feature by any of the previous surveys.

Excavations in Block 7 were conducted in two 2 by 2 m units. Excavations were carried through various depths with the shallowest through Level 3 (20 to 30 cm below surface) and the deepest through Level 5 (40 to 50 cm). The fill of this block consisted solely of Stratum 7, like that described in the profile of nearby Backhoe Trench 4. The sediment of this stratum was primarily coarse sand that gradually increased in clay content with depth.

Burned rock/caliche fragments were generally present across the block and throughout the levels but were especially common in Levels 2 and 3 (10 to 30 cm below surface). Charcoal and cultural staining were both absent. Few artifacts were found scattered throughout the block. Calcrete was not encountered.

No features were defined in Block 7, in spite of the frequent occurrence of burned rock/caliche fragments.

Chipped lithic debitage and a polishing stone (Table 11.8) combined to constitute an average of 1.1 items per square meter of excavated area.

Block 8 (32 sq m)

Block 8 was established to investigate features uncovered by the mechanical removal of a dune (Fig. 11.5).

Excavations in Block 8 were conducted in eight 2 by 2 m units. They were carried through two (10 to 20 cm below surface) to three (20 to 30 cm) levels, a difference caused by the uneven surface left by the dune-removal process. The fill of this block included Strata 1, 2, and 7, with 1 and 7 conforming rather well to standard definitions. Stratum 2, on the other hand, was the cultural stratum, but it is quite thin

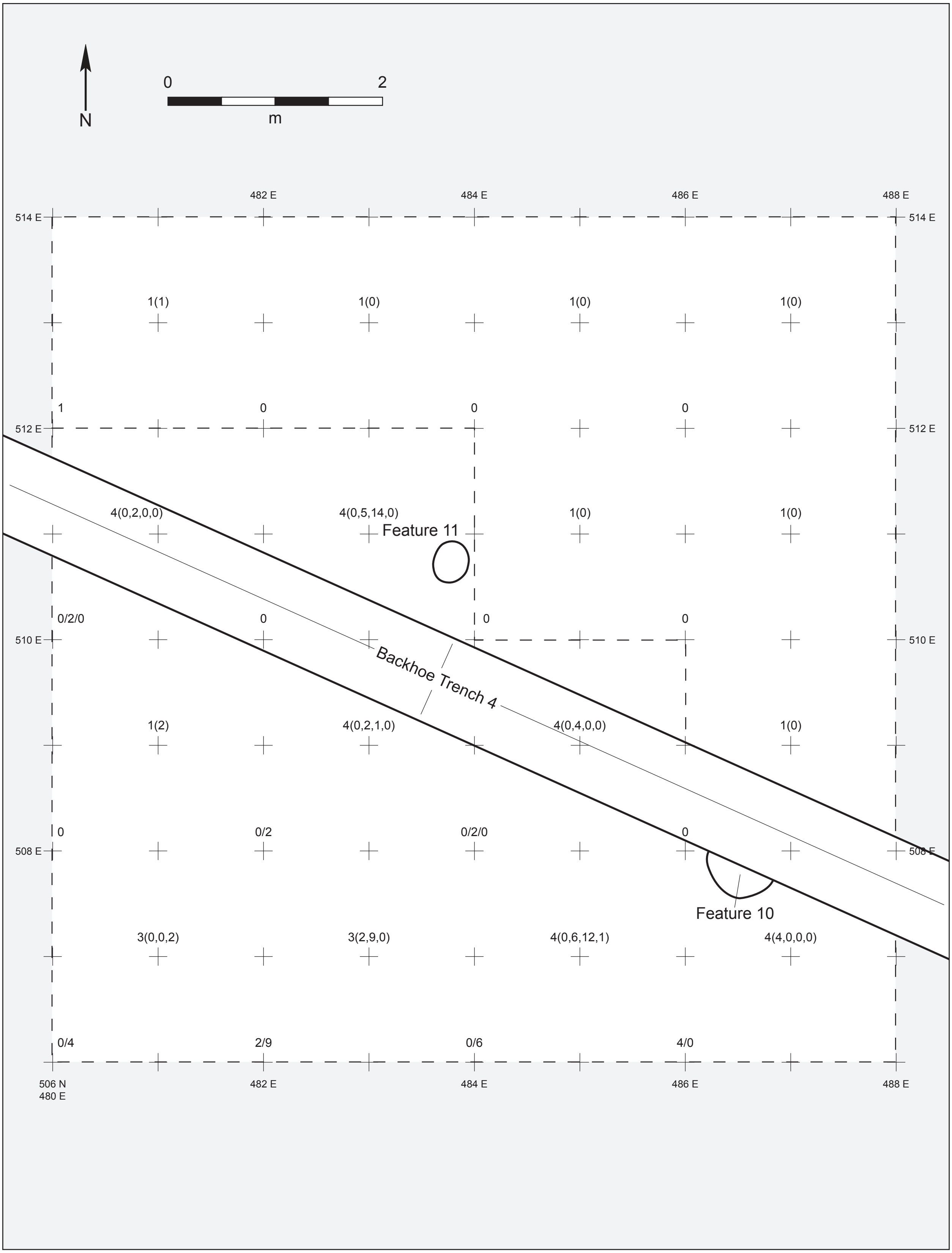

Figure 11.11. LA 129218, Block 6, plan.

(a few centimeters, average) and generally lacks the charcoal flecking and cultural staining that characterized Stratum 2 at several other sites (as at LA 129214, for instance).

Burned rock/caliche fragments were generally rare. Calcrete was beginning to appear at the bottom of some units and at the bottom of features after excavations were terminated. Thermal Features 14, 17, and 22 were exposed and excavated in Block 8 (Fig. 11.12). Chipped lithic debitage (Table 11.9) constituted an average of less than 0.1 items per square meter of excavated area.

Block 9 (8 sq m)

Block 9 was established proximate to Block 8 to investigate features uncovered by the mechanical removal of the same dune (Fig. 11.5). Excavations in Block 9 were conducted in two 2 by 2 m units. They were carried through one (0 to 10 cm below surface) to two (10 to 20 cm) levels, as required, to expose and excavate the block's features.

Stratigraphic associations noted for Block 8 also pertain to this block, with the exception of the fact that the thin Stratum 2, noted in Block 8, was not noticeably present in Block 9. Thermal Features 13, 15, and 16 were exposed and excavated in Block 9.

No artifacts were recovered from Block 9, but several samples were taken from the features (Table 11.10).

Block 10 (2 sq m)

Block 10 was established next to Block 8 in order to investigate a single feature uncovered by the mechanical removal of the same dune (Fig. 11.5).

Excavation of Block 10 was conducted in a single 1 by 2 m unit. Once the feature was cleared, the unit was excavated 10 cm down to calcrete.

Thermal Feature 12 was exposed and excavated in Block 10. Chipped lithic debitage and a potsherd (Table 11.11) combined to constitute an average of 1.5 items per square meter of excavated area.

Block 11 (2 sq m)

Block 11 was established to expose a feature profiled in the north face of Backhoe Trench 12 (Fig. 11.5).

Excavation in Block 11 was conducted in a single 1 by 2 m unit.

Table 11.9. LA 129218, Block 8, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
C-14 sample	3
Dendro sample	1
Flotation sample	6
Pollen sample	5
Total	**15**

Table 11.10. LA 129218, Block 9, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
C-14 sample	3
Dendro sample	1
Flotation sample	6
Pollen sample	5
Total	**15**

Table 11.11. LA 129218, Block 10, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	2
Pottery sherd	1
C-14 sample	1
Flotation sample	1
Pollen sample	1
Total	**6**

Table 11.12. LA 129218, Block 11, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	1
C-14 sample	1
Flotation sample	1
Pollen sample	1
Total	**4**

Thermal Feature 23 was exposed and excavated in Block 11.

Chipped lithic debitage (Table 11.12) constituted an average of 0.5 items per square meter of excavated area.

Block Summary

A summary of findings for all blocks can be found in Table 11.13.

Figure 11.12. LA 129218, Feature 14, a large, very deep, rock thermal pit in Block 8.

Hand Excavation: Feature Descriptions

Feature 8: Thermal pit, rock, shallow, medium
Provenience: Block 1, 537N/465E
Elevation and Stratum: 97.69–97.6, Stratum 7 to calcrete
Size and Shape: Circular, 56 by 54 by 7 cm
Definition: Fair to good
Fill: Dark reddish brown, with charcoal
Bioturbation: Root, rootlet
Artifacts: Mineral sample
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: Intercept cal AD 1030 (Beta 258922)

Feature 9: Voided

Feature 10: Thermal pit, non-rock, deep, medium
Provenience: Block 6 (BHT 4), 507N/486E
Elevation and Stratum: 98.04–97.80
Size and Shape: Oval, 60 by 55 by 25 cm
Definition: Good
Fill: Very dark, with some charcoal
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 11: Thermal pit, non-rock, shallow, medium
Provenience: Block 6, 510N/483E
Elevation and Stratum: 98.20–98.05
Size and Shape: Irregular oval, 42 by 40 by 15 cm
Definition: Good
Fill: Sand stained with charcoal; fairly abundant charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1030 (Beta 258923)

Feature 12: Thermal pit, non-rock, shallow, medium
Provenience: Block 10, 538N/467E

Table 11.13. LA 129218, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK NO.	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURE/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	48	1	1	–	–	–	0.6
2	24	0	–	–	–	–	1.2
3	16	0	–	–	–	–	3.2
4	36	0	–	–	–	–	0.6
5	24	0	–	–	–	–	0.1
6	64	2	2	–	–	–	0.3
7	8	0	–	–	–	–	1.1
8	32	3	3	–	–	–	<0.1
9	8	3	3	–	–	–	0
10	2	1	1	–	–	–	1.5
11	2	1	1	–	–	–	0.5
Total	**224**	**11**	**11**	**0**	**0**	**0**	–

Elevation and Stratum: 97.83–97.69
Size and Shape: Circular, 43 by 42 by 18 cm
Definition: Very good; oxidation in places
Fill: Strong brown, with charcoal flecking
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1010 (Beta 258924)

Feature 13: Thermal pit, non-rock, deep, medium
Provenience: Block 9, 536N/477E
Elevation and Stratum: 98.16–97.90, Stratum 7
Size and Shape: Oval, 64 by 62 by 26 cm
Definition: Generally good, but with somewhat diffuse upper boundaries; oxidation also present
Fill: Strong brown, with localized concentrations of charcoal
Bioturbation: Extensive rodent, root, insect
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 1050/1090/1130/1140/1140 (Beta 258925)

Feature 14: Thermal pit, rock, very deep, large
Provenience: Block 8, 540N/477E
Elevation and Stratum: 98.20–98.05, Stratum 7 to calcrete
Size and Shape: Irregular oval, 70 by 56 by 38 cm
Definition: Good
Fill: Stratified, but otherwise not described, except for a charcoal lens near top of the fill
Bioturbation: "Minimal" rodent
Artifacts: Five lithic debitage
Samples: Flotation, pollen
Dates: Intercept cal 4540 BC (Beta 258926)

Feature 15: Thermal pit, non-rock, shallow, medium
Provenience: Block 9, 536N/477E
Elevation and Stratum: 98.10–98.04, Stratum 7
Size and Shape: Football-shaped, 41 by 24 by 6 cm
Definition: Good
Fill: Dark brown, with some charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 16: Thermal pit, rock, very deep, medium
Provenience: Block 9, 536N/475E
Elevation and Stratum: 98.09–97.67, Stratum 7
Size and Shape: Oval orifice and a globular-pot-shaped cross section (rounded with a short, sharply out-curved neck); 61 by 52 by 42 cm
Definition: Good
Fill: Very dark brown to gray-brown, with some charcoal
Bioturbation: Rodent
Artifacts: One lithic debitage?
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal 4340 BC (Beta 258927)

Feature 17: Thermal pit, rock, deep, medium
Provenience: Block 8, 540N/475E
Elevation and Stratum: 98.00–97.78, Stratum 7
Size and Shape: Irregular oval, 63 by 59 by 22 cm

Definition: Good
Fill: Dark brown, with charcoal bits
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 18–21: Voided

Feature 22: Thermal pit, non-rock, deep, small
Provenience: Block 8, 542N/473E
Elevation and Stratum: 97.92–97.67, Stratum 7
Size and Shape: Irregular diamond-shaped, 36 by 33 by 26 cm
Definition: Generally good, with diffuse upper boundaries
Fill: Dark brown, with charcoal flecks
Bioturbation: Root
Artifacts: None
Samples: Flotation
Dates: None

Feature 23: Superimposed thermal pits, both non-rock
Provenience: Block 11 (BHT 12), 544N/480E
Elevation and Stratum: 97.90–97.47
Size and Shape: Oval; upper basin: 41 by 30+ by 20 cm (not complete); lower basin: 33 by 28 by 30 cm (complete)
Definition: Both good
Fill: Upper basin: dark brown, with some charcoal; lower basin: very dark brown, with charcoal pieces
Bioturbation: Root
Artifacts: Lithic debitage
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal 4350 BC (Beta 258928); please note that the provenience of the upper or lower basin is not specified; dating may pertain to the lower basin, as the notes on the profile sheet indicate that more charcoal was present.

12 ⚶ LA 129222

Regge N. Wiseman and Donald E. Tatum

Site Description

LA 129222 is a small to medium site situated on a low terrace between the playas on the floor of Nash Draw (Fig. 12.0). This location is on the east side of the Nash Draw Valley near the foot of Forty-Niner Ridge. The terrace is composed primarily of gypsum, a remnant of Quaternary alluvial and bolson deposits. Its summit is 916 m (3,005 ft) above mean sea level and it is 3 m (10 ft) above the flats surrounding the site. The OAS evaluation of the site suggested multicomponency, but only a single component could be identified on the basis of a single sherd of Chupadero Black-on-white (Fig. 12.1).

The surface of LA 129222 has a thin cover of sand overlying gypsic material (Fig. 12.2 and 12.3a). Three burned-rock features and a light scatter of artifacts exposed define the site surface. On-site vegetation is sparse and includes scattered creosote bushes and occasional bunches of dropseed grass, crucifixion thorn, and snakeweed (TRC Associates 2000).

LA 129222 measures 122 m (400 ft) north–south and 138 m (452 ft) east–west. At the time of this project, the total site area is approximately 4.15 acres (1.68 ha), with approximately 2.1 acres (0.85 ha) (50 percent) lying within project limits.

The location was initially recorded by TRC in 2000 during a cultural resource inventory for the New Mexico Department of Transportation (NMDOT). TRC identified three surface survey features from surface indicators, none of which lay within the construction project. However, one of the surface survey features had been located near the south right-of-way limit, within a 10 m buffer zone, presenting the possibility that it extended subsurface into the project and would require further attention in the future (TRC Associates 2000; OAS 2006).

Surface artifacts identified during the TRC survey recorded the presence of chipped stone debitage and a single potsherd. Very few diagnostic artifacts were recovered during site recording and made highly problematic the estimation of occupation dates. The presence of a single potsherd suggested a Formative period occupation sometime between AD 1125 and 1375 (TRC Associates 2000; OAS 2006). However, it is believed that the end date should be extended to approximately AD 1475 (Snow 1986).

Surface Features

The initial survey by TRC identified Feature 3 as lying within the 10 m buffer zone of the project limits (Table 12.1).

Grids for six excavation blocks were established to investigate the following phenomena: the surface survey feature just mentioned, two burned rock and caliche concentrations not previously assigned surface survey feature numbers, three lithic concentrations, and a small burned-rock concentration, with artifacts. A mixture of 2 by 2 and 1 by 2 m units, for a total of 218 sq m (2,346 sq ft), was hand-excavated to depths between 10 and 50 cm below the present ground surface, with most going only 20 to 30 cm deep. Excavation was discontinued when culturally sterile levels were reached. Four subsurface features were discovered and excavated —including two thermal features, one posthole, and one pit.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

LA 129222 occupies a low, northwest-trending bench at the western end of a series of steppes and terraces descending south and west from Livingston Ridge and Forty-Niner Ridge. The site is bordered by a playa to the north and west.

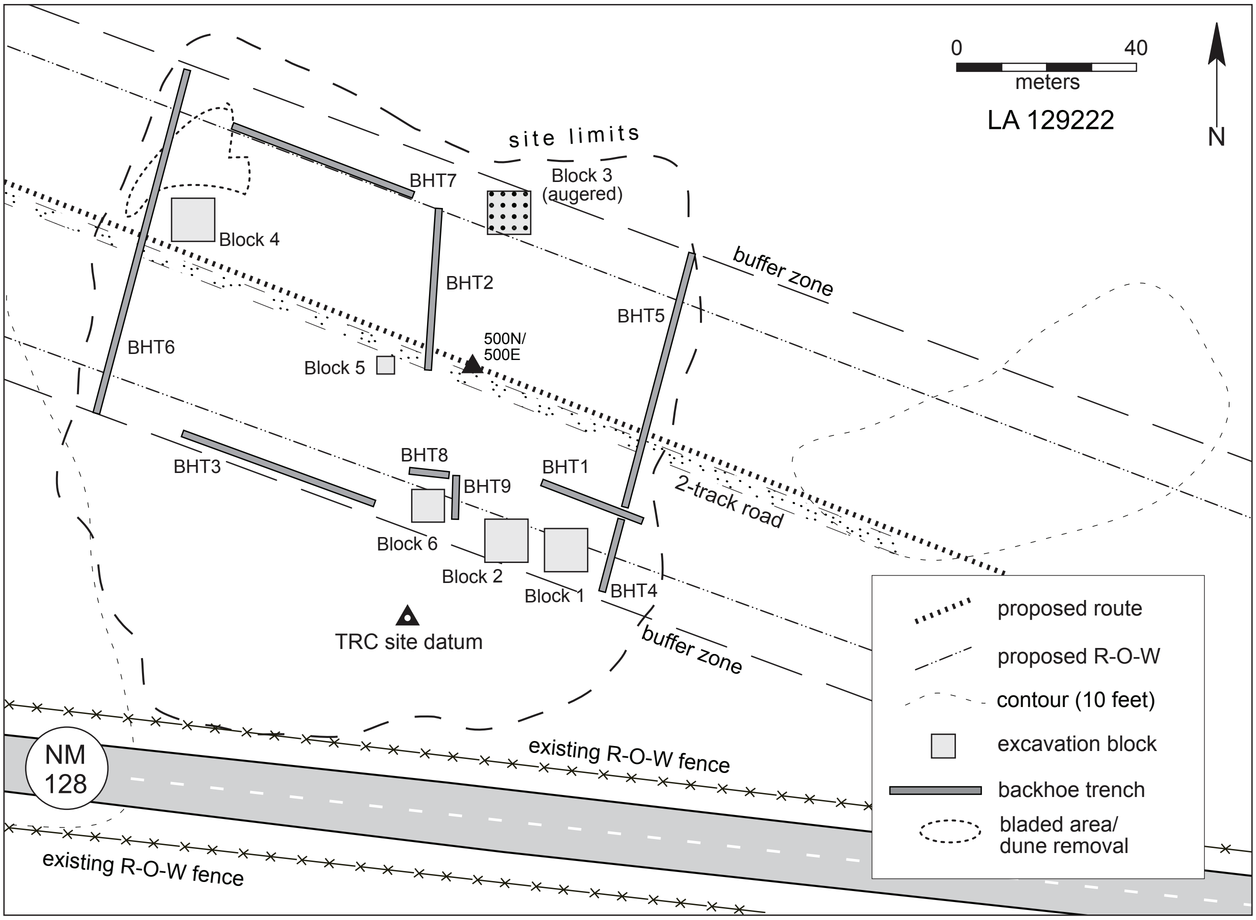

Figure 12.0. LA 129222, site map.

Archaeological Surface Sediment Zone Distribution

The archaeological site/highway relocation corridor crossing was occupied by archaeological surface sediment Zone 2.

Soils, Stratigraphy, Lithology of Trenches and Bladed Areas

Soils at the site were classified as the Reeves-Gypsum, a Gypsiorthid-Torriorthent-Gypsum Land-associated thermic soil complex of loam, clay loam; and gypsiferous material derived from weathered gypsum (USDA-NRCS 2009; Maker et al. 1978).

Nine backhoe trenches and three bladed areas were excavated to explore the relationship between surface visibility of archaeological materials and subsurface cultural and geomorphic deposits in Zone 2. No archaeological materials were revealed in the backhoe trenches.

Stratigraphic profiles of the trenches showed a thin deposit (0 to 50 cm thick) of brown, fine, sandy silt with a slight clay mineral accumulation and a clear, broadly scaled, wavy boundary.

The stratum of primary archaeological importance, the silt deposit, was characterized as "an eolian depression fill" (Hall 2007a). It was immediately underlain by an evaporite deposit composed of massive, earthy to crystalline-textured, Permian gypsum and calcium carbonate (Maker et al. 1978). The eolian silt deposit was thickest where deposited into swales in the gypsum resulting from erosion and cavity collapse (Figs. 12.3b through 12.3d). No archaeological materials were discovered in the backhoe trenches.

On LA 129222, overburden removal was successfully used to help confirm that some of the areas chosen for block excavation because of artifact scatters on the surface did not have sufficient silt deposits to support subsurface archaeological deposits. During the overburden removal process,

Figure 12.1. LA 129222, site overview, facing north.

Table 12.1. LA 129222, surface survey features excavated.

FEATURE	OAS BLOCK NO.	FEATURE TYPE	SIZE (M) (TRC 2000)
3	6	burned caliche/ash concentration	1 x 1

Site data from TRC Associates 2000.

the upper silt layer was removed down through its contact with the underlying gypsum deposit.

In the northwest portion of the corridor crossing, Thermal Feature 2 was discovered. Its outline visibly contrasted with the surrounding light-colored gypsum. Feature 2 originated in the silt layer and terminated in the gypsum deposit. An AMS sample was obtained from the feature, yielding an intercept date of 980 AD. No additional archaeological deposits were discovered in any of the other bladed areas.

Conclusions

Nine backhoe trenches and three bladed areas were excavated in order to explore the relationship between areas with archaeological materials exposed at the ground surface and areas with subsurface cultural and geomorphic deposits in Zone 2. No archaeological features were visible on the surface in the areas that were mechanically excavated. No cultural features were discovered in the backhoe trenches. One thermal pit feature was discovered in the northwest part of the corridor crossing during overburden removal. The discovery of a subsurface archaeological feature in an area with no cultural deposits on the surface indicates that presence or absence of such materials on the surface might not accurately predict presence or absence of intact subsurface archaeological deposits.

As revealed in the backhoe-trench profiles, stratigraphy across the site consisted of a thin deposit of brown, sandy eolian silt, with moderate clay-mineral accumulation and a clear, broadly scaled, wavy boundary. This stratum was of primary archaeological importance and was immediately underlain by a composite evaporite deposit of massive,

Figure 12.2. LA 129222, site overview, showing gypy nature of much of the surface in and around the site.

earthy- to crystalline-textured gypsum and calcium carbonate. No archaeological materials were discovered in the backhoe trenches.

During the overburden removal process, Thermal Feature 2 was uncovered in the northwest portion of the corridor crossing. Feature 2 yielded an AMS intercept date of 980 AD. The date obtained from Feature 2 was the only date obtained from LA 129222. No other archaeological deposits were revealed in the overburden removal areas.

Hand Excavation: Block Descriptions

Block 1 (48 sq m)

Block 1 was initially established as a single 10 by 10 m unit to investigate a surface lithic concentration. Ultimately, only twelve 2 by 2 m squares were selected for excavation (Fig. 12.4).

Excavation of the 10 2 by 2 m units in Block 1 was carried through Level 4, 30 to 40 cm). The remaining two units were excavated through Levels 1 and 3 only. Only Stratum 2 sediments, in this case, semi-compacted sand, were encountered. Charcoal flecks and staining were absent, and only occasional small pieces of burned caliche were noted. A possible posthole, Feature 3, was exposed and excavated in Block 1 (Figs. 12.5 and 12.6). Chipped lithic debitage, a projectile point, and a fragment of a possible ground stone artifact (Table 12.2) constituted an average of 0.7 items per square meter of the excavated area.

Block 2 (54 sq m)

Block 2 was established as a single 10 by 10 m unit, with an extra 1 by 2 m unit attached to the southeast corner of the grid. The block investigated two burned-rock concentrations discovered during the surface-artifact collection phase. Ultimately, only 13 2 by 2 m squares and the single 1 by 2 m unit were excavated (Fig. 12.7). Excavation in eleven 2 by 2 m units in Block 1 was carried through Level 3, 20 to 30 cm. The remaining two units were excavated through Level 2. Only Stratum 2 sediments, of semi-compacted sand, were encountered. Charcoal flecks and staining were absent, but small pieces of burned caliche were scattered throughout

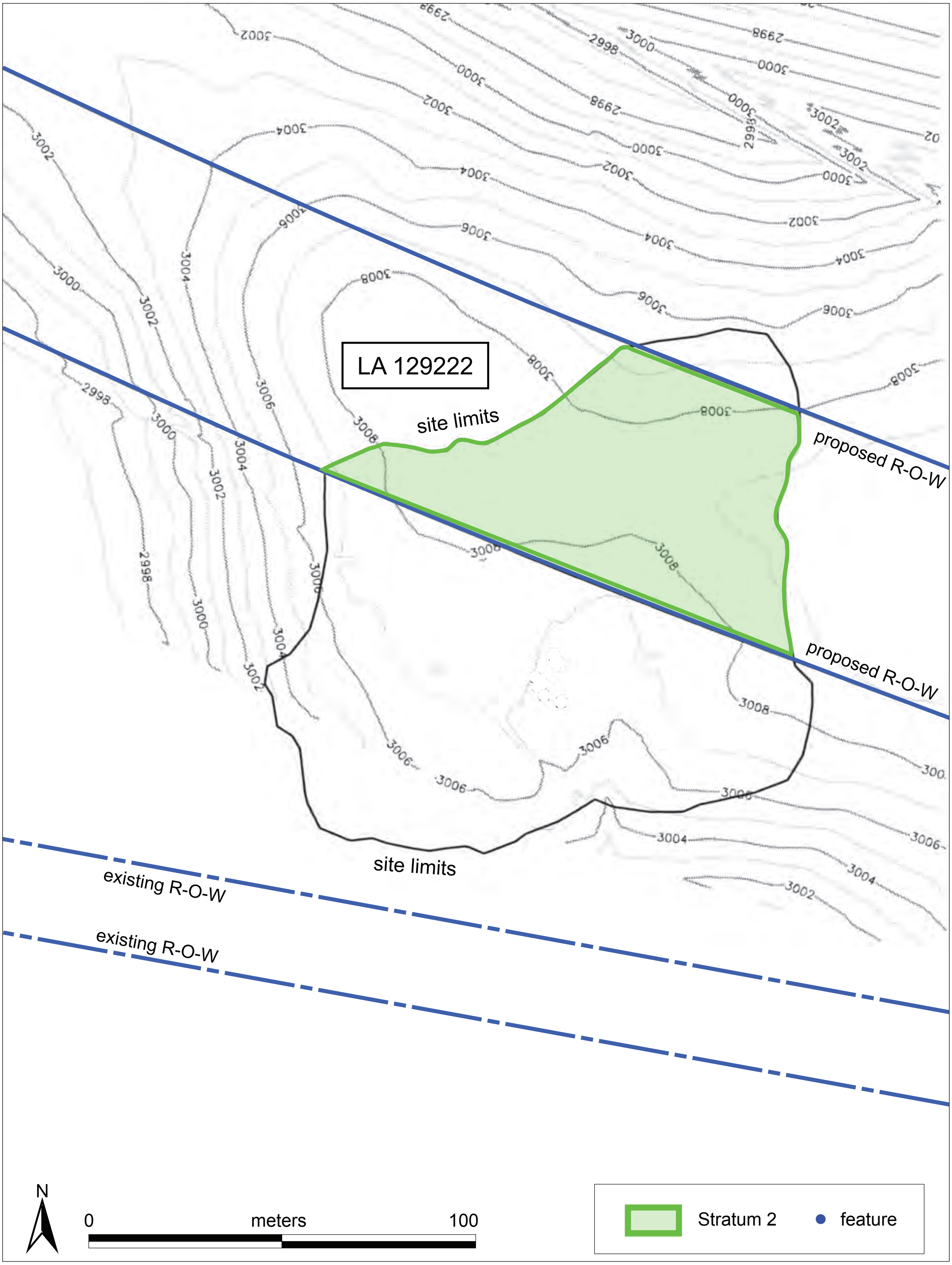

Figure 12.3a. LA 129222, map showing distribution of surface sediment zones.

Figure 12.3b. LA 129222, BHT 1, south wall. Eolian fill occupies the top 50 cm, underlain by earthy-textured gypsum.

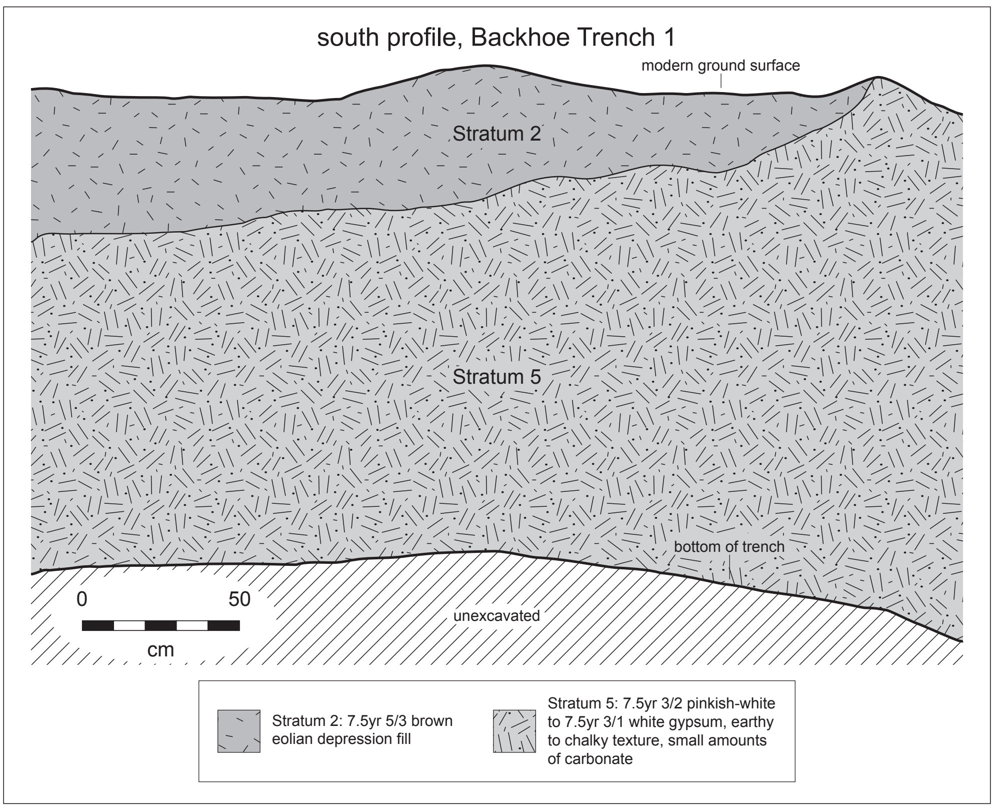

Figure 12.3c. LA 129222, BHT 1, south wall, profile.

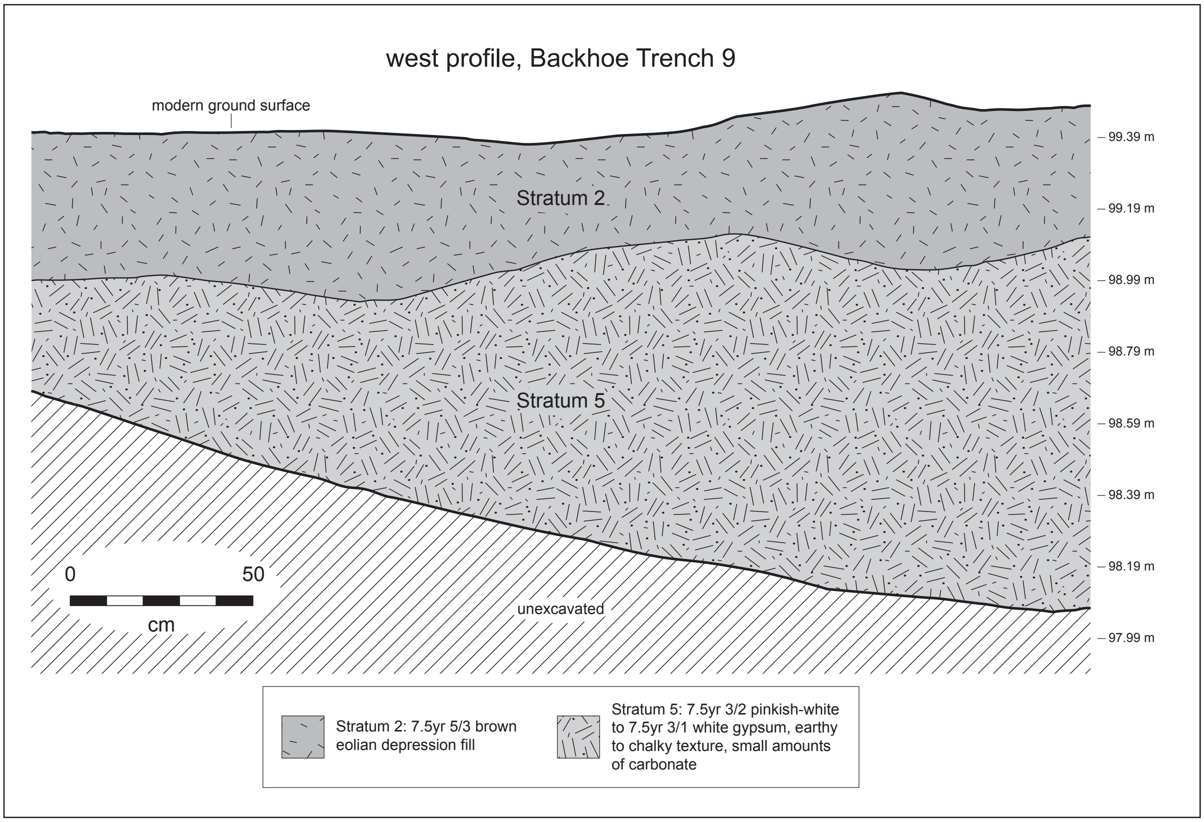

Figure 12.3d. LA 129222, BHT 9, west wall, profile.

most quadrants of most units. Cultural items were almost totally restricted to the first level (0 to 10 cm) below surface. Two features, a thermal pit (4) and a storage pit (7), were exposed and excavated in Block 2. Chipped lithic debitage, a projectile point, ground stone artifacts, and a pottery sherd (Table 12.3) constituted an average of 1.2 items per square meter of excavated area.

Block 3

This 10 by 10 m block was established around a surficial lithic artifact concentration. Originally intended for hand excavation, examination of the surface of the block indicated to project geomorphologist Steve Hall that predominant surface sediments are of the Pleistocene period, with gypsic, lake-bed deposits, and (cultural) Zone 2 remnants visible as small, scattered patches across the block. The decision was made to suspend hand excavations pending the drilling of a series of auger probes, one to each 2 by 2 m unit, to evaluate this assessment. Twenty-five bores were drilled to an average depth of 20 cm below the surface, but all proved devoid of cultural indicators. No further excavation was conducted in this block.

Table 12.2. LA 129222, Block 1, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	30
Ground stone?	1
Projectile point	1
Selenite	1
Flotation	1
Total	**34**

Block 4 (64 sq m)

Block 4 was established to investigate a lithic scatter discovered during instrument mapping of the site. Since this scatter extended beyond the originally defined limits of the site, the boundary was redefined and the site enlarged somewhat. Originally established as a single 10 by 10 m grid, only 16 2 by 2 m units were ultimately excavated (Fig. 12.8). Mechanical scraping of a non-symmetrical area measuring approximately 20 m (65 ft) north–south by

Figure 12.4. LA 129222, Blocks 1 (foreground) and 2 (background), excavated, facing west.

Figure 12.5. LA 129222, Block 1, Feature 3, post hole, prior to excavation.

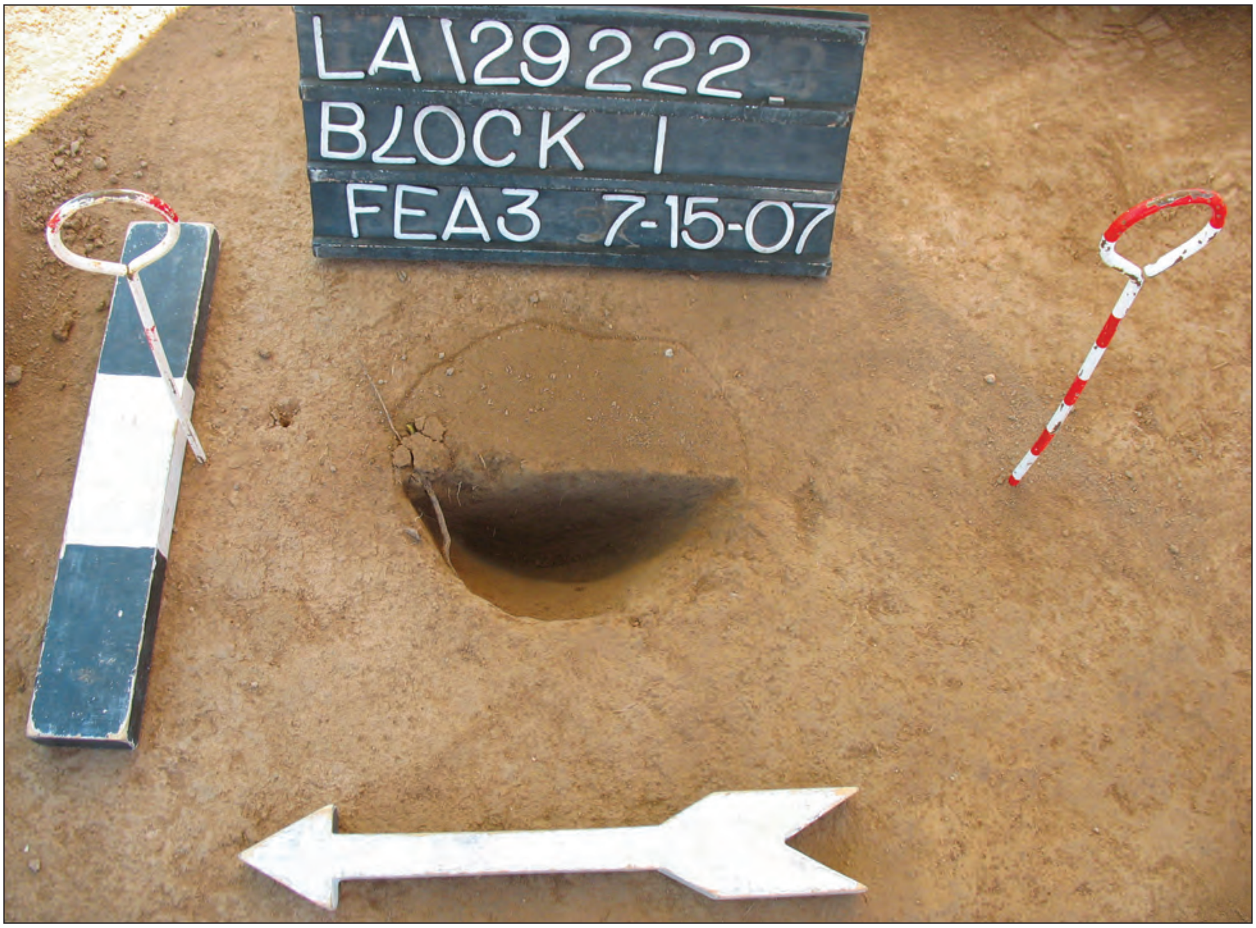

Figure 12.6. LA 129222, Block 1, Feature 3, profile.

25 m (82 ft) east–west—a site just a bit north of Block 4—exposed a small thermal feature. Excavations in Block 4 were carried through Level 1, 0 to 10 cm. The block is characterized primarily by Stratum 5 sediments (gypsic lake-bed deposits) with patches of Strata 2 sediments (semi-compacted sand) here and there.

Charcoal flecks and staining were absent, but small pieces of burned caliche were scattered throughout most quadrants of most units. Cultural items were almost completely restricted to the first level, about 0 to 10 cm below the surface. Thermal Pit 2 (Fig. 12.9) was exposed and excavated in Block 4. An animal bone and a flotation sample also were recovered from this block (Table 12.4).

Table 12.3. LA 129222, Block 2, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	60
Manos and metates	1
Pottery sherd	1
Projectile point	1
Animal bone	1
Mussel shell	16
Flotation sample	3
Pollen sample	1
Total	**84**

Block 5 (16 sq m)

Block 5 was established to investigate a small concentration of burned rocks/caliche. Excavations in three of the 2 by 2 m units were carried through Level 1 (0 to 10 cm) because the Stratum 2 sediments were thin, 5 cm average, and overlie Stratum 5, made up of gypsic lake-bed deposits. The fourth 2 by 2 m unit was excavated through Level 2 (10 to 20 cm) because it contained a thicker deposit of Stratum 2 sediments.

Charcoal flecks and staining were absent, but a few small pieces of burned caliche were scattered throughout the block. The small concentration of

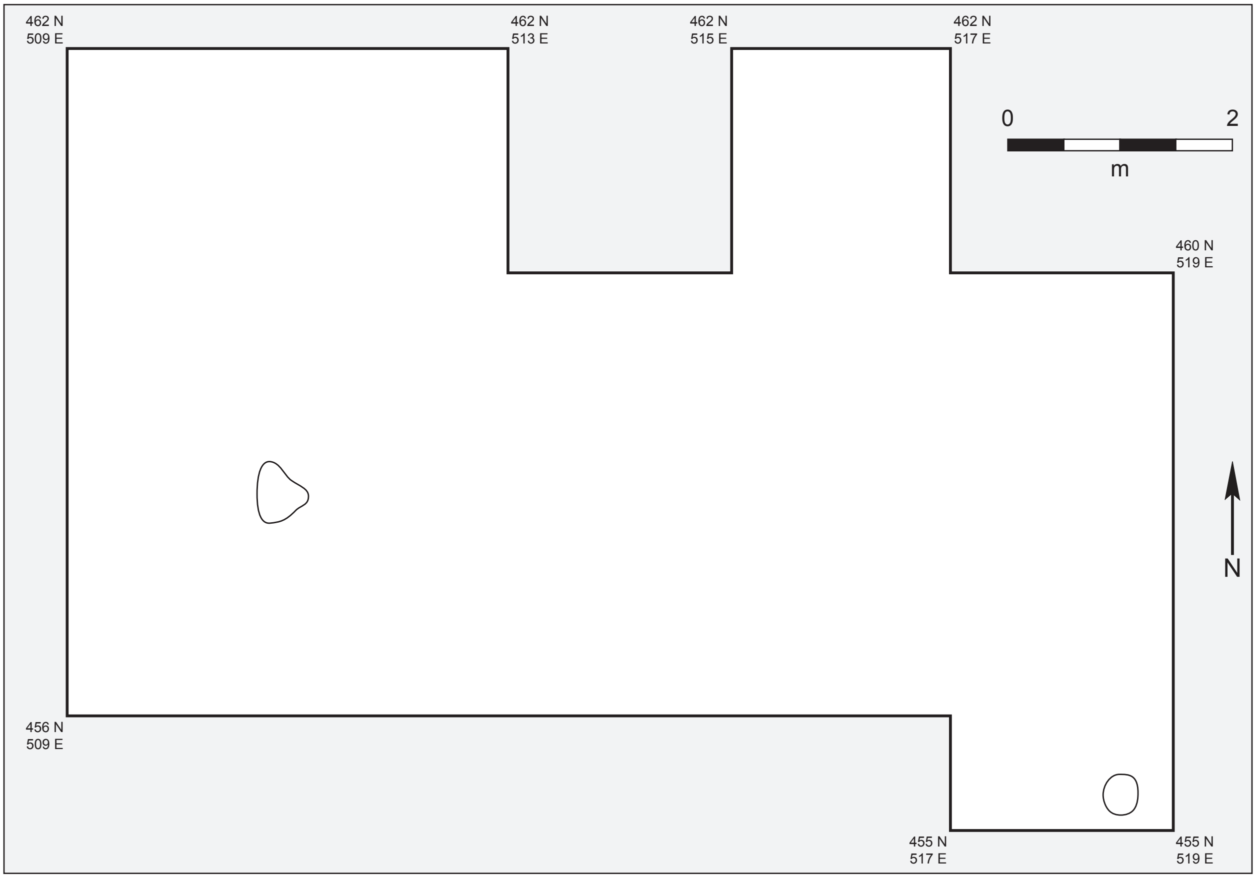

Figure 12.7. LA 129222, Block 2, plan.

burned rocks/caliche that led to the investigation of this block was not sufficiently coherent as a group to designate it as a feature. No artifacts were recovered from Block 5, nor were any samples of lithic debitage (Table 12.5).

Table 12.4. LA 129222, Block 4, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Animal bone	3
Flotation sample	1
Total	**4**

Block 6 (36 sq m)

Block 6 was established to investigate TRCs Surface Survey Feature 3 (TRC Associates 2000).

Excavations in three of the four 2 by 2 m units were carried through Level 1 (0 to 10 cm) because the Stratum 2 sediments were thin (5 cm average) and overlie Stratum 5, made up of gypsic lake-bed deposits). The fourth unit was excavated through Level 2 (10 to 20 cm) because it contained a thicker deposit of Stratum 2 sediments.

Charcoal flecks and staining were absent, but a few small pieces of burned caliche were scattered across the block. The small concentration of burned rocks/caliche that inspired the investigation of this block was not sufficient to designate unit as a feature.

Table 12.5. LA 129222, Block 6, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	21
Total	**21**

Chipped lithic debitage constituted an average of 0.6 items per square meter of excavated area.

Block Summary

A summary of findings for all blocks can be found in Table 12.6.

Figure 12.8. LA 129222, Block 4, excavated to gypsum.

Figure 12.9. LA 129222, Feature 2, a non-rock thermal pit dug into gypsum.

Table 12.6. LA 129222, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK NO.	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURE/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	48.0	1	–	–	–	1	0.7
2	54.0	2	1	–	1	–	1.2
3	(100.0)	auger probes only, no squares excavated	–	–	–	–	–
4	64.0	1	1	–	–	–	0
5	16.0	0	–	–	–	–	0
6	36.0	0	–	–	–	–	0.6
Total	**218.0**	**4**	**2**	**0**	**1**	**1**	–

Feature Descriptions

Feature 2: Thermal pit, non-rock, uncertain
Provenience: Block 4, 530N/426E
Elevation and Stratum: 99.54–99.47, Stratum 2
Size and Shape: Irregular oval, 37+ by 32+ by 7+ cm; discovered by mechanical scraping
Definition: Fair
Fill: Dark gray, with charcoal flecking
Bioturbation: Rodent, root, rootlet
Artifacts: None
Samples: Flotation, burned rock
Dates: Intercept cal AD 980 (Beta 258929)

Feature 3: Posthole
Provenience: Block 1, 454N/527E
Elevation and Stratum: 99.22–99.11, Stratum 2
Size and Shape: Irregular oval, 19 by 19 by 9 cm
Definition: Fairly good
Fill: "Slightly darker and less compact" than surrounding fill; dark brown, with charcoal flecks
Bioturbation: Rodent, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 4: Thermal pit, non-rock, shallow, medium
Provenience: Block 2, 455N/518E
Elevation and Stratum: 99.29–99.20, Stratum 2
Size and Shape: Oval, 39 by 35 by 9 cm
Definition: Poor
Fill: Reddish gray
Bioturbation: Root, rootlet
Artifacts: One lithic debitage
Samples: Flotation, pollen, burned rock
Dates: None

Feature 7: Pit
Provenience: Block 2, 457N/510E
Elevation and Stratum: 98.95–98.76, Stratum 2
Size and Shape: Triangular with rounded corners; 53 by 45 by 19 cm
Definition: Good
Fill: Dark brown, with charcoal flecks
Bioturbation: Rodent
Artifacts: None
Samples: Flotation
Dates: None

13 ⚶ LA 129300, Nash Draw Site

Regge N. Wiseman and Donald E. Tatum

Site Description

LA 129300 is a medium-sized, multicomponent site situated at the south end of a mid-valley terrace remnant. The visual effect is that of a low knoll at the bottom of the Nash Draw Valley (Figs. 13.0 and 13.1). The northern extent of LA 129300 is defined by the railroad cut and its tracks. However, the terrace remnant on which the site is situated continues north of the railroad to site LA 113044 (Cunnar 1997). It seems quite likely that, prior to the building of the railroad and cut, most survey archaeologists would have recorded LA 113044 and LA 129300 as a single site. The terrace remnant and the valley bottom are made up of Quaternary alluvial and bolson deposits. The summit of the knoll is 905 m (2,970 ft) amsl and 2 to 3 m (7 to 10 ft) above the valley bottom to the west, south, and east.

The LA 129300 site surface is covered with a thin mantle of sand that supports a mesquite and creosote scrub community. The east-, south-, and west-facing slopes have occasional 1 m high stabilized coppice dunes crowned by mesquite shrubs (Fig. 13.2a). The slopes are largely deflated and/or slope-washed to the point that hardpan and occasional calcrete deposits are exposed in many places; here artifacts and burned rock are numerous. In addition to the dominant creosote and mesquite, onsite vegetation includes crucifixion thorn, four-wing saltbush, acacia, dropseed grass, broom snakeweed, grama, yucca elata, and prickly pear cactus (OAS 2006).

LA 129300 measures 165 m (541 ft) north–south (*not including* area part to the north that had been designated LA 113044; see earlier comment) by 125 m (410 ft) east–west. Its north margin is defined by a linear arrangement of caliche/calcrete boulders that derived from and follows the railroad cut. Total site area is approximately 1.9 acres (0.77 ha), 0.54 acres (0.22 ha) (28.8 percent) of which lies within the project limits. Artifacts are found here and there atop the terrace remnant but are especially common on the western, southern, and eastern slopes. However, the densest concentrations of cultural materials, and all but three features identifiable from surface indications prior to commencement of excavation, lay outside the proposed right-of-way for NM 128.

The site was initially recorded by Gibson (1996) of Western Cultural Resource Management, Inc., (WCRM) for an El Paso Natural Gas pipeline. Additional information was recorded by TRC Associates (2000) as part of a cultural resource inventory for the current construction project of the New Mexico Department of Transportation (NMDOT). The reassessment of the construction project, conducted by SWCA in 2006, did not include a reassessment of LA 129300.

Originally, 15 features were identified across the site by the TRC. These included six burned caliche and ash-stained middens, eight burned caliche and burned-rock concentrations, and one burned caliche midden without ash stains (TRC Associates 2000:Table 6.17).

Surface artifacts identified during the TRC survey recorded the presence of chipped stone debitage and cores, 15 marginally retouched tools, 22 mano and metate fragments, one Archaic period projectile point, one hammerstone, and 25 pottery sherds. The pottery included undifferentiated brown ware and eight red-slipped brown ware sherds. The paucity of diagnostic artifacts recovered during site recording, probably the result of decades of artifact collecting by locals, made problematic the estimation of occupation dates. However, occupations dating from the Archaic and Formative periods were thought to be represented (OAS 2006). Formative period residential structures could also be present.

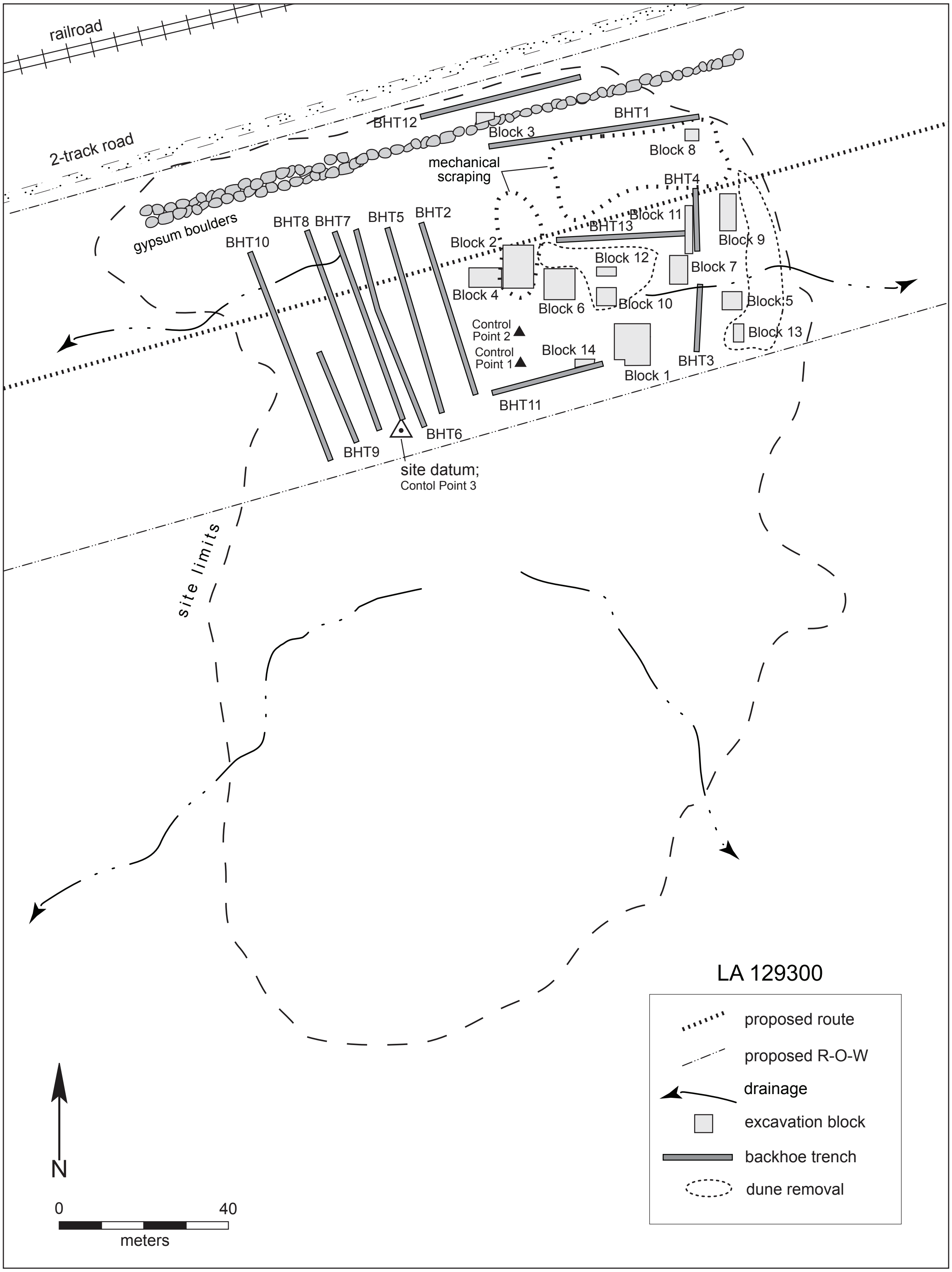

Figure 13.0. LA 129300, site map.

Table 13.1. LA 129300, surface survey features excavated on this project.

FEATURE NO	OAS BLOCK NO.	FEATURE TYPE	SIZE (M) (TRC 2000)
1	3	burned caliche concentration	0.75 x 1
9	1	burned caliche and ash concentration	15 x 8
15	4	burned caliche concentration	2 x 2

Site data from TRC Associates 2000.

Surface Features

The initial survey of LA 129300 by TRC (2000) and the 2006 assessment by OAS identified a total of three features (1, 9, and 15) within the new project limits (Table 13.1).

Grids for 14 excavation blocks were eventually established to investigate surface survey features and all subsurface features discovered during work at the site. Many of those features were discovered only after heavy equipment was brought in to scrape some parts of the site surface and to dig trenches. A mixture of 2 by 2 m and 1 by 2 m units, for a total of 344 sq m (3,702 sq ft), was hand-excavated to depths from 10 to 110 cm below the present ground surface. While most digs went only 20 to 40 cm deep, those in Block 7 commonly went 60 to 70 cm deep. Excavation was discontinued when a calcrete layer was encountered or when culturally sterile levels were located. Twenty-six subsurface features were discovered and excavated. Of these, 23 were thermal features, two were pits, and one was a posthole.

Depositional History and Mechanical Excavation of Trenches

Donald E. Tatum

LA 129300 occupies a low, north-south trending rise at the western edge of Tamarisk Flat. It is bordered to the west and to the south by playa depressions. The NM 128 relocation corridor crosses the north end of the site.

Archaeological Surface Sediment Zone Distribution

About 70 percent of the site was occupied by archaeological surface sediment Zone 2. The southeast quarter of the site was surface sediment Zone 3. Three circular surface sediment Zone 1 loci, each roughly 20 m in diameter, occupied positions along the north edge, the middle, and south edge of the right-of-way crossing. Thirteen backhoe trenches and three surface-bladed areas were excavated to explore the relationship between surface visibility of archaeological materials and subsurface cultural and geomorphic deposits in surface sediment Zones 1, 2, and 3.

Soils, Stratigraphy, and Lithology of Trenches and Bladed Areas

Soils on the site are classified as Pajarito loamy fine sand, an eroded soil derived from mixed alluvium and/or eolian sands that occupy both level and slightly sloping landforms. The Pajarito grades into fine sandy loam with depth. The soil association of the area is of the Gypsiorthids-Torriorthents-Gypsum Land (USDA-NRCS 2009; Maker et al. 1978).

The majority of the site was capped by a thin, loose, unconsolidated, recent sandy eolian deposit. The fine- to medium-grained sand that forms the deposit was locally derived through erosion and deflation of the substrate. Plentiful inclusions of organic clastic material—such as rodent and rabbit feces, and vegetative matter incorporated into the eolian deposit—indicate recent reworking and deposition. The boundary of the eolian sand was irregular and abrupt due to erosion and bioturbation.

Seven trenches (BHT 2 and BHT 5–BHT 10) were excavated in Zone 2 along the gradually sloping west end of the archaeological site/highway relocation corridor. Two trenches (BHT 1 and BHT 12) were excavated in Zone 2 in the northeast part of the corridor crossing (Fig. 13.2a). The stratigraphic profiles of these trenches revealed that the eolian surface deposit was immediately underlain by shallow, heavily eroded, Bk horizon soils (Fig. 13.2a).

The Bk matrix consisted of fine- to medium-

Figure 13.1. LA 129300, northern portion of site, where excavations took place.

grained sand with thread- and film-like carbonate precipitates, weak grain cementation, high volumes of carbonate granules, and weathered and fragmented calcrete pebbles and cobbles. The Bk boundary was abrupt and irregular. It was underlain by a C horizon soil derived from the unevenly eroded and broken calcrete of the Mescalero Paleosol. Under the Paleosol, the trenching exposed a sandy clay and broken-gypsum deposit derived from the reddish hued, Permian Rustler Formation. No archaeological deposits were discovered in these trenches (Figs. 13.2b through 13.2e).

Four backhoe trenches (BHT 3, 4, 11, and 13) were excavated in Zone 2 and Zone 3 areas in the southeast quadrant of the relocation corridor crossing. This part of the site encompassed the top of the knoll and the gradual, east-facing slope leading to the eastern edge of the site. Stratigraphic profiles revealed deeper and less-eroded eolian sand deposits. The profiles also showed recent eolian deposits extending several centimeters below the surface. The surface eolian layer was immediately underlain by a slightly consolidated sandy Bw horizon with brown, fine- to medium-grained sandy matrix and sparsely distributed inclusions of carbonate pebbles. Bioturbation was prevalent in this stratum, the result of root, rodent, and insect activity.

Preceded by a diffuse boundary, the underlying Bk horizon was heralded by gradually increasing amounts of carbonate precipitate in the soil, resulting in weak sand-grain cementation and carbonate-filament development in the reddish brown, fine to medium, sandy matrix. Increasing development of carbonate precipitate imparted a stronger structure and paler coloration to the sediment. The boundary of the Bk with the underlying calcrete of the Mescalero Paleosol was preceded by a sharp increase in percentage by volume of highly weathered and fragmented, rounded to sub-rounded, caliche granules, pebbles, and cobbles. This concentration of weathered carbonate colluvial and alluvial material in a shallow depositional horizon across the site indicates a period of erosion and deflation that occurred prior to, or early in, the deposition of the Unit 1 sand. Excavation of the trenches ceased when calcrete was reached.

Thermal pit Feature 32 was discovered in the

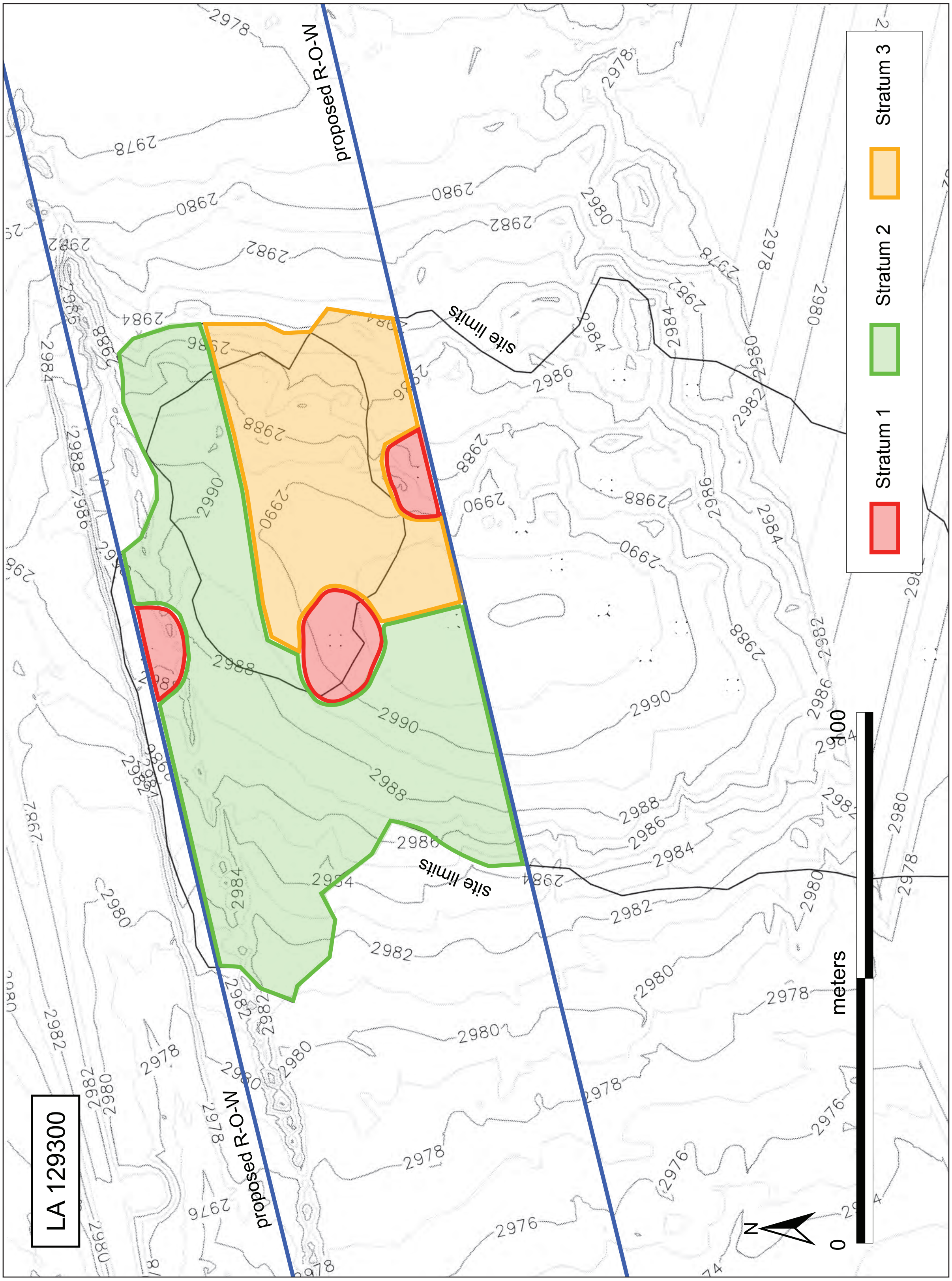

Figure 13.2a. LA 129300, map showing distribution of surface sediment zones.

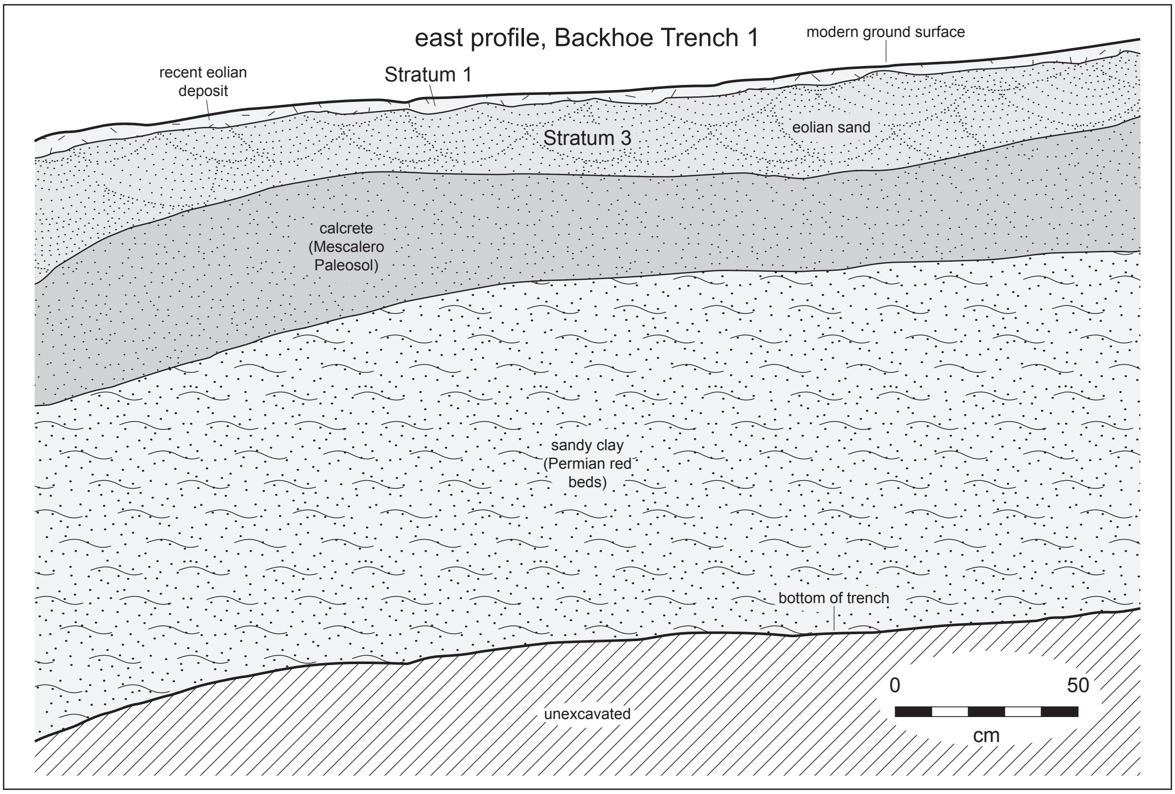

Figure 13.2b. LA 129300, BHT 1, east wall, profile.

Figure 13.2c. LA 129300, BHT 1, east wall, redeposited eolian sand occupies the upper 3 to 5 cm, underlain by heavily eroded Bk horizon loamy sand and eroded Mescalero Paleosol Ck horizon (pinkish-white layer).

Figure 13.2d. LA 129300, BHT 2, south wall, redeposited eolian sand occupies the upper 3 to 5 cm, underlain by heavily eroded Bk horizon loamy sand and eroded Mescalero Paleosol Ck horizon (pinkish-white layer).

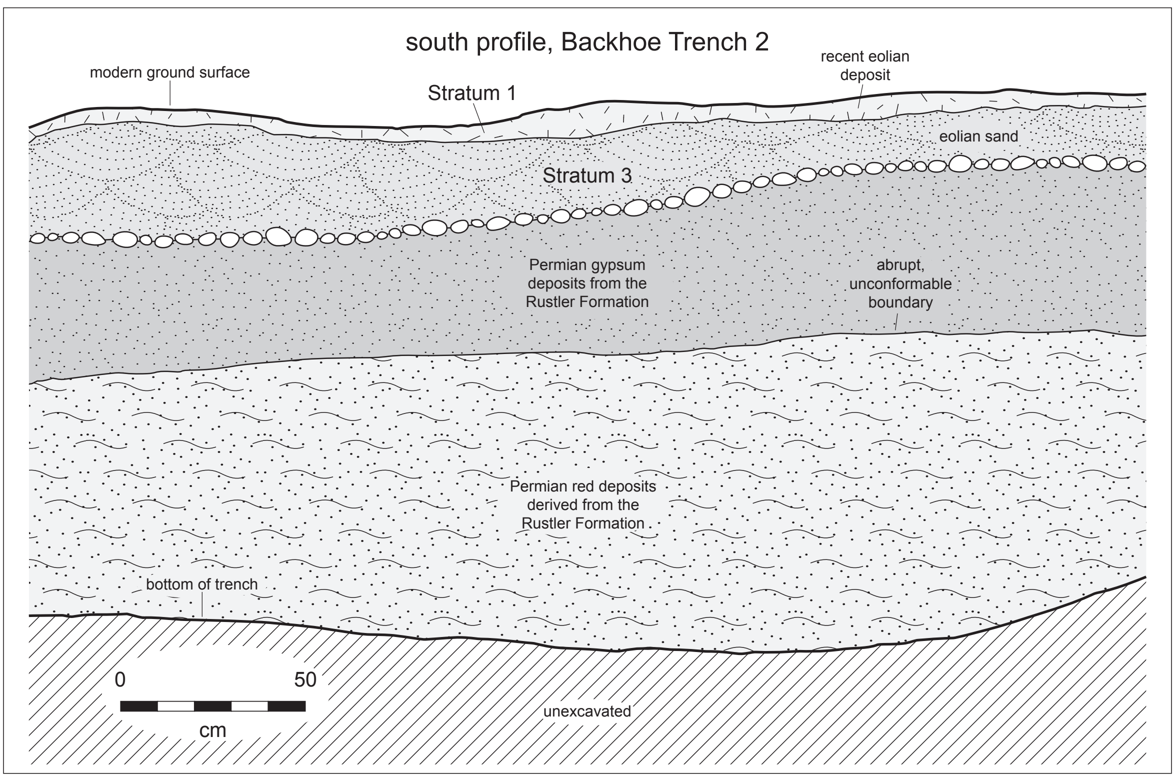

Figure 13.2e. LA 129300, BHT 2, south wall, profile.

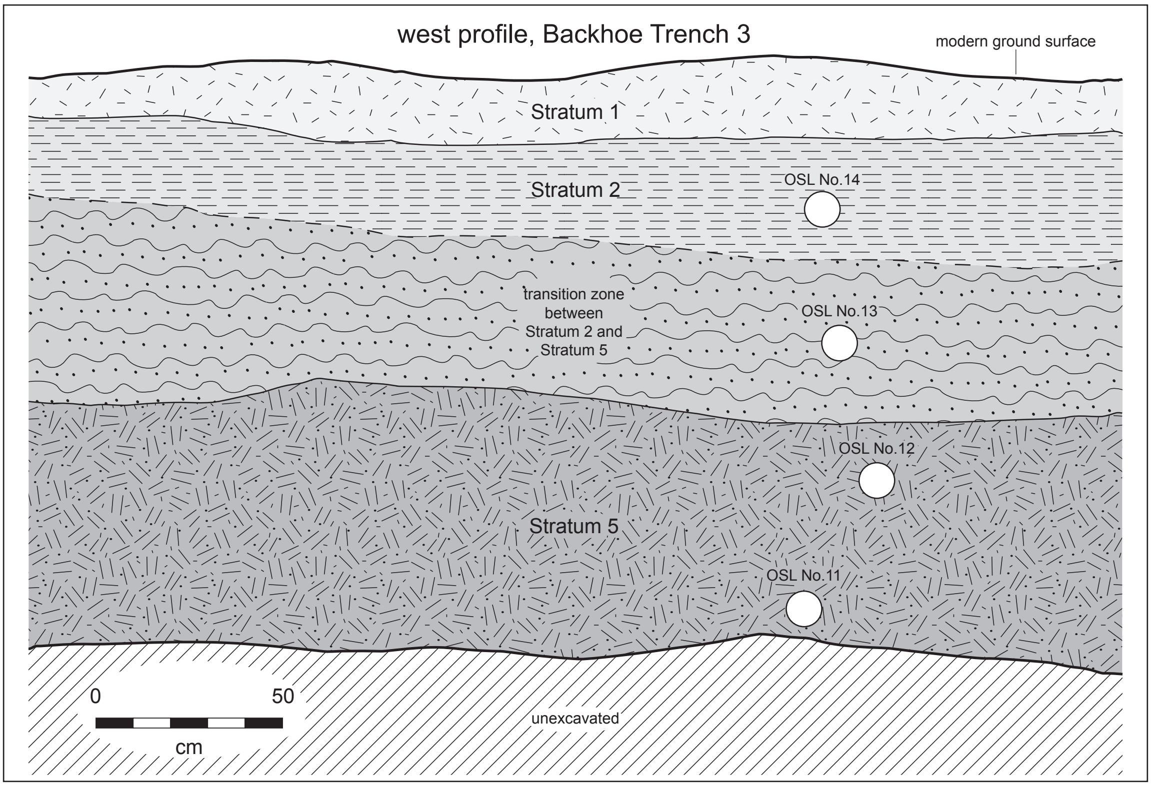

Figure 13.2f. LA 129300, BHT 9, west wall, profile.

north wall of BHT 11. Four thermal pit features (28, 29, 30, and 35) were discovered in the west wall of BHT 4.

One overburden removal area was excavated in Zone 2 at the northeast part of the corridor crossing, uncovering Feature 18, a thermal pit. The second bladed area covered part of Zone 3 across the east end of the APE, exposing thermal pit Feature 40 in the southeast corner of the crossing. A third bladed area spanned Zones 1, 2, and 3 near the center of the crossing. Thermal pit Features 23, 25, and 26 were discovered in the eastern edge of this bladed area.

Chronology Discussion

The main stratum of archaeological importance on LA 129300 was the Bw sand. An Optically Stimulated Luminescence (OSL) sample collected in BHT 3 from the upper Bw horizon dated to 5680 BP, indicating a time of deposition contemporaneous with that of the Unit 2 eolian sand present at the majority of the sites investigated during the NM 128 data recovery (Fig. 13.2f). A second OSL sample, collected from near the bottom of the diffuse Bw/Bk boundary, yielded a date of 19,100 BP, while an OSL sample from the top of the Bk dated 36,000 BP (Hall this report).

The majority of archaeological features discovered at the site originated in Bw sand and terminated either in the Bw or the Bk. Seven features discovered during mechanical excavations originated in Bw sand. Six of these features (25–26, 32, 37–38, and 40) were selected for AMS dating and yielded a range of dates between AD 420 and AD 980.

Four features (23, 28, 29, and 30) discovered during the mechanical excavations originated in the diffuse transition zone of the Bw/Bk boundary. Feature 23, discovered in the overburden-removal area in the middle of the eastern half of the corridor crossing, was AMS sampled, resulting in a calibrated date of 4320 to 4230 BC. A fifth thermal pit feature originating in the Bk sand (Feature 20) was discovered during hand excavation of Block 4. This feature was AMS sampled and returned a date of 4680 to 4460 BC.

Early to Middle Archaic dates from two features, originating in the Bk sand and the Bk/Bw transition, suggest a period of sand sheet stability and the existence of a subaerial surface available for human occupation during this time. Elevational data for three proximally situated thermal pits originating in the lower Bk/Bw transition (BHT 4) could also indicate a buried surface from the same time period. Features 28, 29 and 30 had upper elevations within a 6 cm range of each other.

The five thermal features originating in the Bk had very diffuse matrices and boundaries. They contained inclusions of calcium carbonate precipitate characteristic of Bk horizon soil development in the surrounding sediment, possibly indicating that the features were used and abandoned prior to, or concurrent with, the development of the Bk horizon.

Because Thermal Features 28, 29, and 30 originated in the Bk sand, had a narrow range of elevations for their points of origin, and had matrix characteristics (carbonate precipitate, highly diffused charcoal component) similar to two other features AMS dated to the Early to Middle Archaic, it is probable that these three features would also date to that time period.

Conclusions

Thirteen backhoe trenches and three surface-bladed areas were excavated to explore the relationship between areas with archaeological materials exposed at ground level and subsurface cultural and geomorphic deposits in Zones 1, 2, and 3. No archaeological features were visible on the surface in mechanically excavated areas. The discovery of 10 subsurface archaeological features in the backhoe trenches and surface-bladed areas indicates that the presence or absence of such materials on the surface does not accurately predict the presence or absence of intact subsurface archaeological deposits.

Strata exposed in the backhoe trenches included a widespread, recent eolian surface deposit. In the central, eastern, and southeastern portions of the corridor crossing, the surface eolian deposit was immediately underlain by Bw horizon sands. With depth, the Bw gradually transitioned into a sandy, Bk horizon that was immediately and unconformably underlain by the calcrete of the Mescalero Paleosol. In the western half of the corridor crossing, the Bw sand deposit was eroded away, leaving the surface eolian sand directly on top of the Bk. The sand constituent for the Bw and Bk horizons was derived from the Unit 2 eolian sand deposit.

Six thermal pit features originating in the Bw sand were selected for AMS dating, yielding a range of dates from AD 420 to AD 980. Atomic mass spectrometer dates were obtained from two features originating in the Bk sand, yielding a range of dates between 4230 to 4680 BC. This range of dates is consistent with an OSL date of 3673 BC obtained from the upper Unit 2 sand deposit (Bw).

All features originating in the Bk had sediment inclusions consistent with the surrounding Bk horizon, including development of carbonate precipitate in the matrix. These attributes indicate a likelihood that all features originating in the Bk should date to a time period predating, or concurrent with, the development of the Bk horizon.

Hand Excavation: Block Descriptions

Block 1 (80 sq m)

Block 1 was established to investigate Surface Survey Feature 9 (TRC Associates 2000) (Fig. 13.3). Excavations in Block 1 (Fig. 13.4) varied in depth from 40 to 50 cm, with a few units as shallow as 10 to 20 cm due to the shallowness of the calcrete. In the deeper units, fill included all three strata, with Stratum 1 being made up of loose surface sediments, Stratum 2 being made up of more consolidated sediments containing cultural items and features or at least the upper portions of the features, and Stratum 3 being made up of reddish sediments that contained a few cultural items and the bottom portions of some features (Fig. 13.5). A small number of burned-rock fragments occurred throughout most of the units and levels, but charcoal flecks and darkly stained soils were mainly restricted to the vicinity of the features. Calcrete was encountered primarily around the periphery of the block, especially in the southeast quadrant, in the northwest corner, and at the west-central margin.

Features 16, 17, 19, and 21, exposed and excavated in Block 1, are thermal pits.

A variety of artifacts and samples were recovered from Block 1 (Table 13.2). Chipped lithic debitage, pottery sherds, ground stone fragments, hammerstones, and polishing stones combined to constitute an average of 1.6 items per square meter of excavated area.

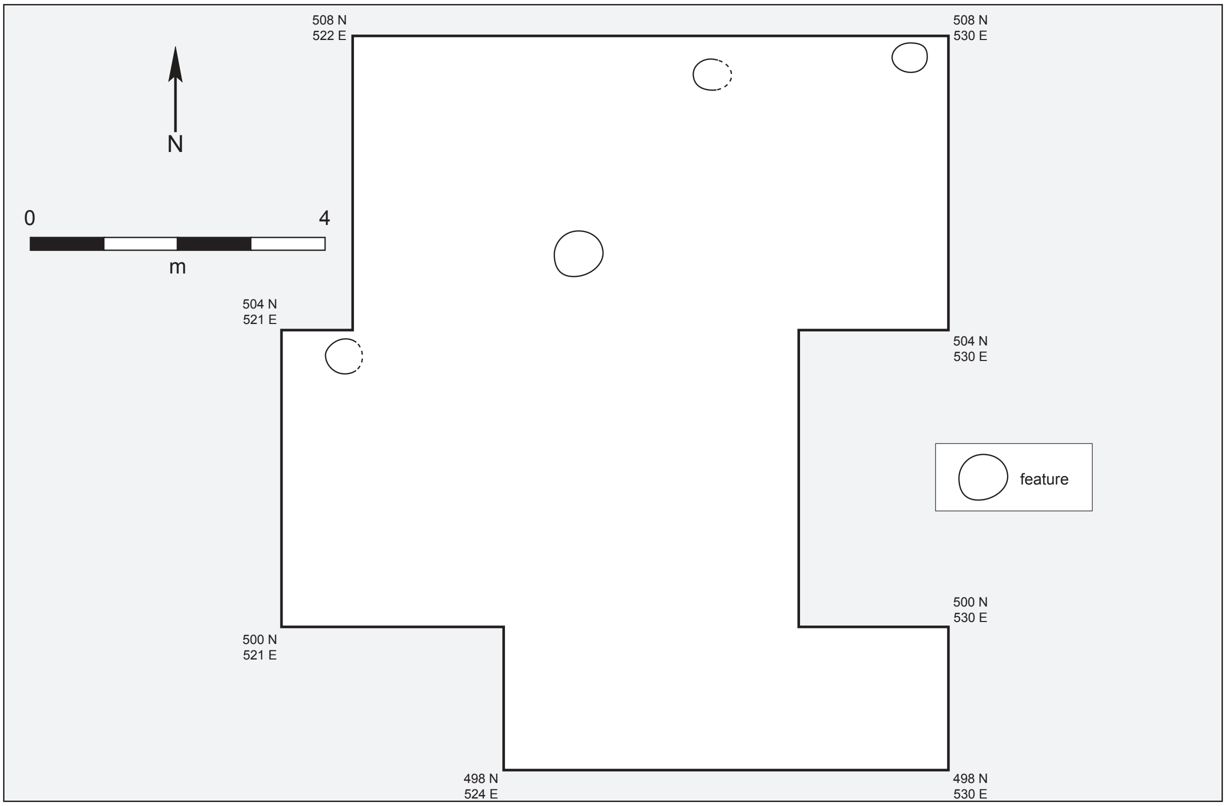

Figure 13.3. LA 129300, Block 1, plan.

Figure 13.4. LA 129300, Block 1, excavated.

Figure 13.5. LA 129300, Block 1, profile of west face.

Block 2 (70 sq m)

The grid for Block 2 was set up next to Block 4 following removal of a dune. This block was not excavated due to the obvious proximity of calcrete to the scraped surface.

Block 3 (6 sq m)

Block 3 was established to investigate Surface Survey Feature 1 (TRC Associates 2000).

Excavations in Block 3 were carried through Level 3 (0 to 30 cm) where work was terminated in Stratum 3 sediments. Stratum 1 sediments, or loose surface sediments, were absent in this block. Burned-rock fragments were present in some number, but were generally restricted to the upper half of Level 2 (10 to 15 cm below the surface). Charcoal, appearing either as flecking or as a stain, was restricted to the vicinity of the thermal feature. Calcrete was not directly encountered in any of the units, but the presence of abundant gravels and cobbles comprised of decomposed calcrete in Level 3 fill indicate its proximity.

Table 13.2. LA 129300, Block 1, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	112
Pottery sherds	7
Manos and metates	1
Projectile point	1
Polishing stone	8
Stone tool	1
Mussel shell	3
Sandstone fragment	2
C-14 sample	6
Flotation sample	10
Pollen sample	11
Total	**162**

Thermal Feature 1 was exposed and excavated in Block 3.

The chipped lithic debitage (Table 13.3) recovered from Block 3 fill constituted an average of 0.8 items per square meter of excavated area.

Figure 13.6. LA 129300, Feature 15, thermal rocks which may belong to underlying thermal pit in Feature 20.

Block 4 (32 sq m)

Block 4 was established to investigate Surface Survey Feature 15 (TRC Associates 2000).

Excavations in Block 4 squares were carried through various levels, with three units being terminated after the first level (0 to 10 cm below the surface), one unit after the second level (10 to 20 cm), three units after Level 3 (20 to 30 cm), and one unit after Level 4 (30 to 40 cm).

Stratum 1 sediments, or loose surface sediments, were mostly absent in this block. Most levels in most units were terminated within Stratum 2 sediments, with Stratum 3 sediments being encountered in two units. While burned-rock fragments were fairly common throughout these units, vertical distribution was largely restricted to the two uppermost levels. Charcoal was restricted to the one definite thermal feature, and dark organic staining was lacking altogether in this block. Calcrete was not directly encountered in any of the units (Figs. 13.6 through 13.8).

Thermal Feature 20 and one possible Thermal Feature 15 were exposed and excavated in Block 4.

Table 13.3. LA 129300, Block 3, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	4
Manos and metates	1
Flotation sample	4
Pollen sample	3
Total	**12**

Chipped lithic debitage (Table 13.4) recovered from Block 4 fill constituted an average of 2.2 items per square meter of excavated area.

Block 5 (16 sq m)

Block 5 was established to investigate a small concentration of burned caliche on the modern ground surface.

Excavations in Block 5 were among the deepest at LA 129300. In two units they were carried out through Level 6 (0 to 60 cm below the surface), and in two additional units continued through Levels 8 (70 to 80 cm) and 9 (80 to 90 cm).

Figure 13.7. LA 129300, Feature 20, thermal pit, prior to excavation.

Figure 13.8. LA 129300, Feature 20, excavated. This feature produced a calibrated intercept date of 4540 BC (Beta 258931), the earliest ^{14}C date obtained during the project.

Stratum 1 sediments, or loose surface sediments, were mostly absent in this block, and where they were noted, they were thin, no more than 5 cm thick. Stratum 2 sediments were encountered in Levels 2 (10 to 20 cm) and 3 (20 to 30 cm). Stratum 3 sediments usually began around Levels 5 (40 to 50 cm) and 6 (50 to 60 cm), and was also where scattered charcoal flecks and burned-rock fragments were most often noted.

Small numbers of burned-rock fragments and rare charcoal flecks occurred in Levels 2, 3, 4, and 6. Excavations in all units were terminated at the Stratum 3 sediments layer that was composed of yellowish-red sand and gravels. Calcrete was not observed in any of the units.

One large pit feature (39) was exposed and excavated in Block 5.

Chipped lithic debitage and ground stone items (Table 13.5) from Block 5 constituted an average of 1.4 items per square meter of excavated area.

Table 13.4. LA 129300, Block 4, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	70
Manos and metates	1
C-14 sample	1
Flotation sample	2
Pollen sample	3
Total	**77**

Table 13.5. LA 129300, Block 5, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	20
Ground stone	2
Animal bone	8
Total	**30**

Block 6 (36 sq m)

Block 6 was established to investigate a section of the site that had only Zone 1 sediments on the surface. No artifacts or other cultural indicators were present (Figs. 13.9 and 13.10).

Excavations in Block 6 were carried to varying depths by unit, with the shallowest going only to Level 2 (10 to 20 cm below the surface) and the deepest to Level 5 (40 to 50 cm). Stratum 2 sediments were mostly encountered within the first level (0 to 10 cm) of each unit.

In most instances, Stratum 3 sediments were encountered within Level 3 (20 to 30 cm). Calcrete was not encountered in any of the units, although high gravel, pebble, and cobble counts in the lowest levels of the deepest units signified that bedrock was near.

Stratum 2 sediments contained the majority of cultural items. Burned rocks, charcoal flecks, and organic staining were not particularly common in this instance.

Two features, a posthole (22) and a posthole or small pit (24) were found and excavated in Block 6.

Chipped lithic debitage, a projectile point, lithic tools, an ornament, and miscellaneous artifacts (Table 13.6) recovered from Block 6 constituted an average of 1.8 items per square meter of excavated area.

Table 13.6. LA 129300, Block 6, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	56
Projectile point	1
Lithic tool	4
Ornament	1
Miscellaneous artifact	1
Animal bone	2
Mussel shell	1
Flotation sample	2
Total	**68**

Block 7 (32 sq m)

Block 7 was established to investigate two phenomena: an area of small stains beside a small drainage rill and the transition from a calcrete substrate as encountered in Block 1 to a red-sand substrate as encountered in Blocks 5 and 9 (Fig. 13.11).

Excavations in Block 7 were carried to varying depths depending on modern surface contour, with all excavations ending at the same level plane. Thus, some excavations continued through five levels, others through six levels, and some through seven.

Stratum 2 sediments were mostly encountered within the first level (0 to 10 cm) of every unit. In most instances, Stratum 3 sediments were encountered in Level 4 or Level 5, 30 to 50 cm deep.

The red-yellow or yellow-red sand unit in Stratum 5 was encountered about 60 cm down, and

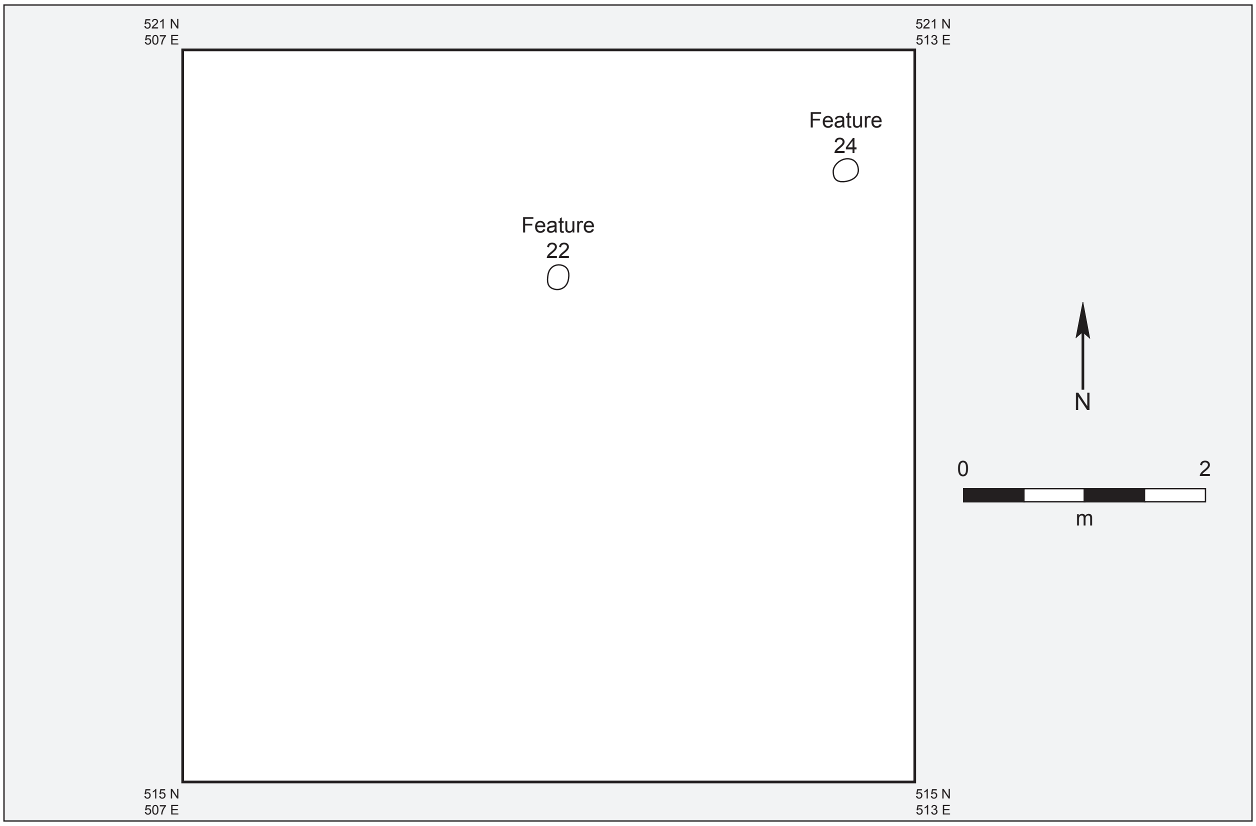

Figure 13.9. LA 129300, Block 6, plan.

Figure 13.10. LA 129300, Block 6, at ready for excavation.

was found to overlie section of calcrete at a depth of about 65 to 74 cm in the northernmost units (Fig. 13.12). Stratum 2 sediments contained the majority of cultural items; occasional charcoal flecks observed in zone may ultimately have derived via bioturbation.

Seven features (36–38, 41–44) found and excavated in Block 7 were all thermal pits.

Chipped lithic debitage, ground stone, and polishing stone artifacts (Table 13.7) recovered from Block 7 constituted an average of 1.7 items per square meter of the excavated area.

Block 8 (4 sq m)

Block 8 was established to investigate a feature exposed by mechanical dune removal at the northeastern corner of the site.

Excavations in Block 8 were confined to the feature exposed by heavy equipment. No units other than the feature were excavated.

Feature 18, a thermal pit, was excavated in Block 8.

No collections, other than various fill and carbon samples, were recovered from Block 8 (Table 13.8).

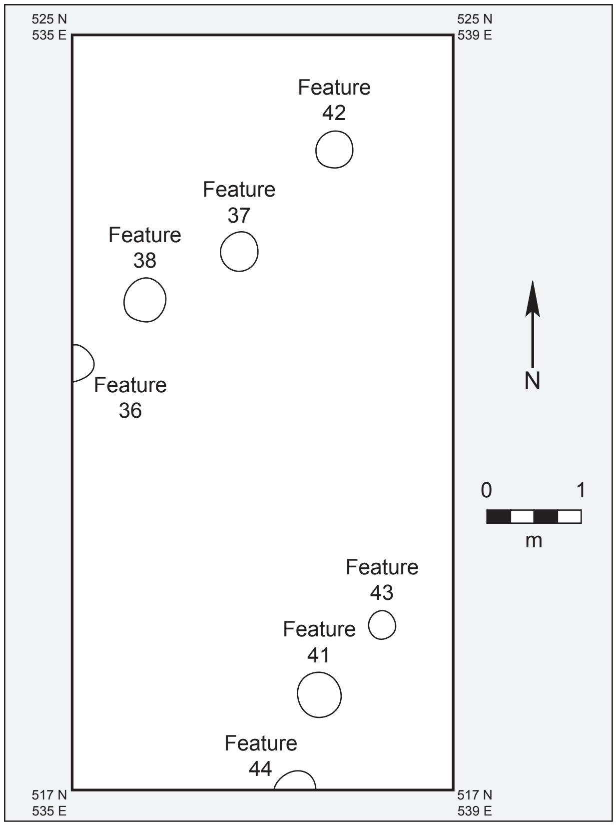

Figure 13.11. LA 129300, Block 7, plan.

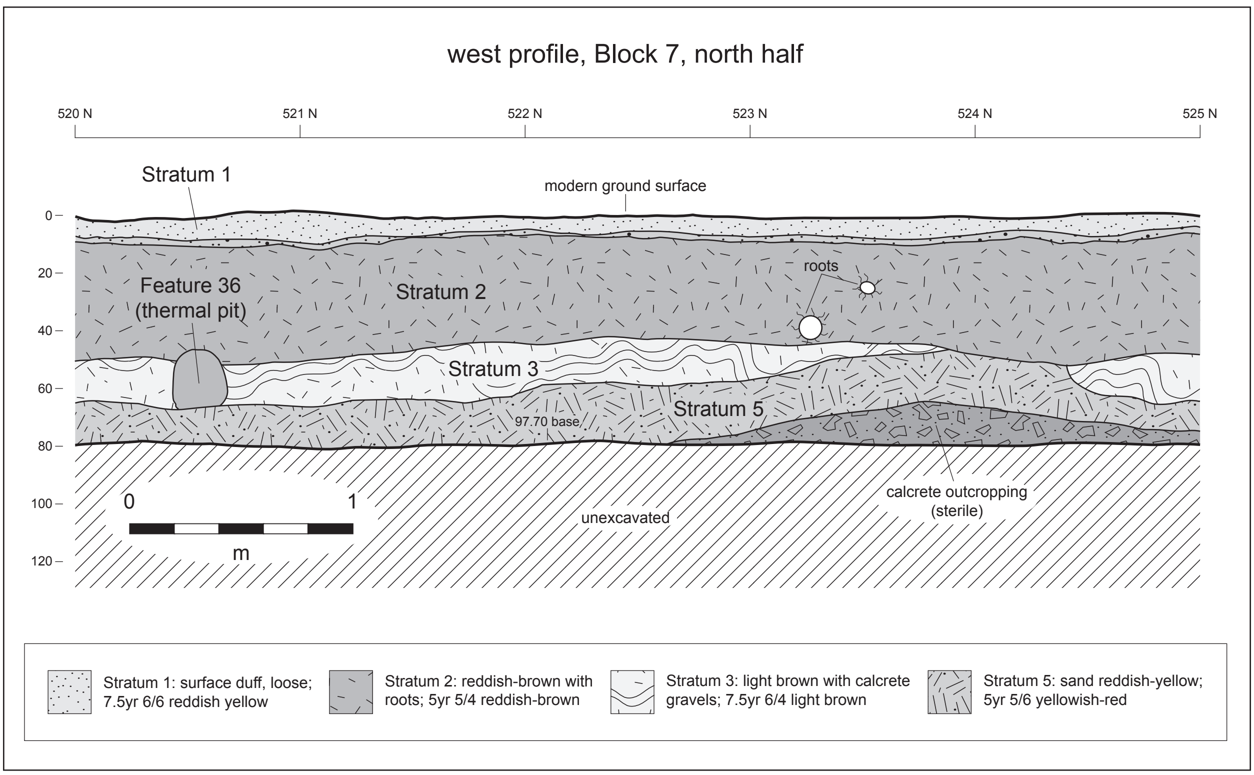

Figure 13.12. LA 129300, Block 7, profile of west face.

Table 13.7. LA 129300, Block 7, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	43
Ground stone	8
Polishing stone	4
C-14 sample	5
Flotation sample	8
Pollen sample	9
Total	**77**

Table 13.8. LA 129300, Block 8, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
C-14 sample	1
Flotation sample	1
Pollen sample	1
Total	**3**

Table 13.9. LA 129300, Block 9, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	43
Ground stone	5
Polishing stone	4
Total	**52**

Table 13.10. LA 129300, Block 10, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	1
Mussel shell	3
C-14 sample	1
Archaeomagnetic sample	1
Flotation sample	2
Pollen sample	2
Total	**10**

Block 9 (32 sq m)

Block 9 was established to investigate the continuity of cultural remains at the boundary of a deflation depression, or "blowout", and at a dune at the east end of the site that sat low on the east slope of the terrace.

The first activity in the block was to remove the dune material down to a level common with the adjacent blowout, so that excavations by level would be consistent across the block. All three strata were present across the block, with Stratum 1 materials being mainly relegated to the upper part of the first level. Stratum 2 sediments began in either the first (0 to 10 cm), second (10 to 20 cm), or third levels (20 to 30 cm). Stratum 3 sediments undulated greatly, appearing first in a variety of levels, with the shallowest in the third, 20 to 30 cm, and the deepest in the sixth level, 50 to 60 cm.

Burned caliche/rocks were sparsely scattered throughout the block, and charcoal was basically absent. Stratum 3 sediments in this block consisted of the yellow/red sand noted in Blocks 5 and 7, though in Block 5 it was designated Zone 5 (Fig. 13.13).

No features were found in Block 9.

Chipped lithic debitage, ground stone, and polishing stone artifacts (Table 13.9) recovered from Block 9 constituted an average of 1.6 items per square meter of the excavated area.

Block 10 (16 sq m)

Block 10 was established to investigate a thermal feature exposed by the mechanical removal of a dune (Fig. 13.14).

Although Block 10 was initially laid out in a 4 by 4 m configuration focused on a thermal feature, excavations were limited to a much smaller area in order to expose the feature, then expanded somewhat to excavate a second feature found near the first.

Excavation depths, restricted to single (0 to 10 cm) and double (10 to 20 cm) levels, as needed, encountered only Stratum 2 sediments.

Thermal Features 23 and 34 (Figs. 13.15 and 13.16) were excavated in Block 10. The archaeomagnetic sample recovered from one of these features is rock, rather than clay. It was not analyzed.

Chipped lithic debitage (Table 13.10) recovered from Block 10 fill constituted an average of 0.1 artifacts per square meter the excavated area.

Block 11 (4 sq m)

Block 11 was established to excavate four features exposed in the west side of Backhoe Trench 4. Only very small portions of each feature remained in the face of the trench.

A 2 by 8 m block of squares was set up along the west side of Backhoe Trench 4, but only the four squares lying directly over the features were excavated.

Figure 13.13. LA 129300, Block 9, profile of west face, at northwest corner of block.

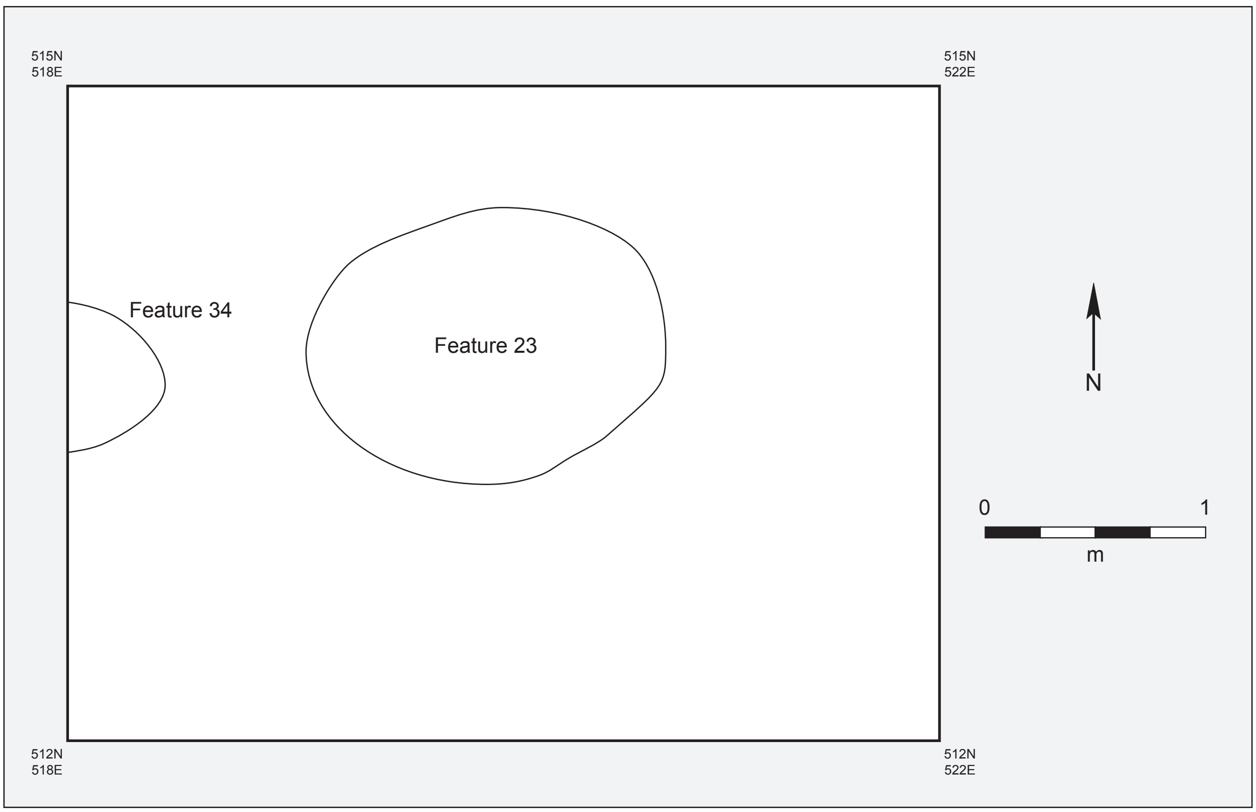

Figure 13.14. Block 10, plan.

Table 13.11. LA 129300, Block 11, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	6
Ground stone	1
Animal bone	20
Flotation sample	4
Total	**31**

Table 13.12. LA 129300, Block 12, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	2
Miscellaneous artifact	1
Mussel shell	12
C-14 sample	1
Flotation sample	2
Pollen sample	1
Total	**19**

Table 13.13. LA 129300, Block 13, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	9
Mano	1
Projectile point	1
Hammerstone	1
C-14 sample	1
Archaeomagnetic sample	1
Flotation sample	1
Pollen sample	1
Total	**16**

Table 13.14. LA 129300, Block 14, artifact and sample summary.

ARTIFACT TYPE/SAMPLE	COUNT
Lithic debitage	7
Pottery sherd	3
Mussel shell	2
C-14 sample	1
Flotation sample	1
Total	**14**

Excavations were accomplished by the removal of overlying fill as a single cut, down to the level of the individual feature. These cuts could be as deep as 35 to 40 cm. The features were then excavated and recorded.

Feature 28, a posthole, and an additional three thermal pits—29, 30, and 35—were excavated in Block 11.

The chipped lithic debitage (Table 13.11) and ground stone recovered from Block 11 fill constituted an average of 1.8 artifacts per square meter of excavated area.

Block 12 (8 sq m)

Block 12 was established to excavate two features exposed by the mechanical removal of a dune (Fig. 13.17).

A 2 by 4 m block of squares was set up over the features. Excavations proceeded through two levels (0 to 20 cm below the surface) in each 2 by 2 m unit. Strata 2 and 3 sediments were remove. Calcrete clasts were encountered at the bottom of Level 2 in most parts of both units. Charcoal flecks and staining were confined to the features.

Thermal Pits 25 and 26 were excavated in Block 12.

Chipped lithic debitage and a miscellaneous artifact (Table 13.12) represented an artifact density of a mere 0.4 artifacts per square meter of excavated area.

Block 13 (6 sq m)

Block 13 was established to excavate a feature exposed by the mechanical removal of a dune.

Although this block was initially set up as two 2 by 2 m squares, half of one square was not excavated, reducing the number of 1 m squares in the block to a total of six.

Excavations proceeded through Levels 3 and 4, 0 to 40 cm below the surface, in each unit. Strata 2 and 3 sediments were excavated in the process, with Stratum 5 sediments, the yellow/red sand unit of Blocks 5, 7, and 9, being encountered at the bottom of the units.

Charcoal flecks and staining were confined to the feature and to areas of obvious rodent intrusion.

Thermal Feature 40 was excavated in Block 13. This large, shallow, rock thermal pit (Fig. 13.18) produced a calibrated radiocarbon intercept date of AD 890 (Beta 258939). An archaeomagnetic sample collected from this feature is rock, rather than clay, and was not analyzed.

Chipped lithic debitage and individual formal

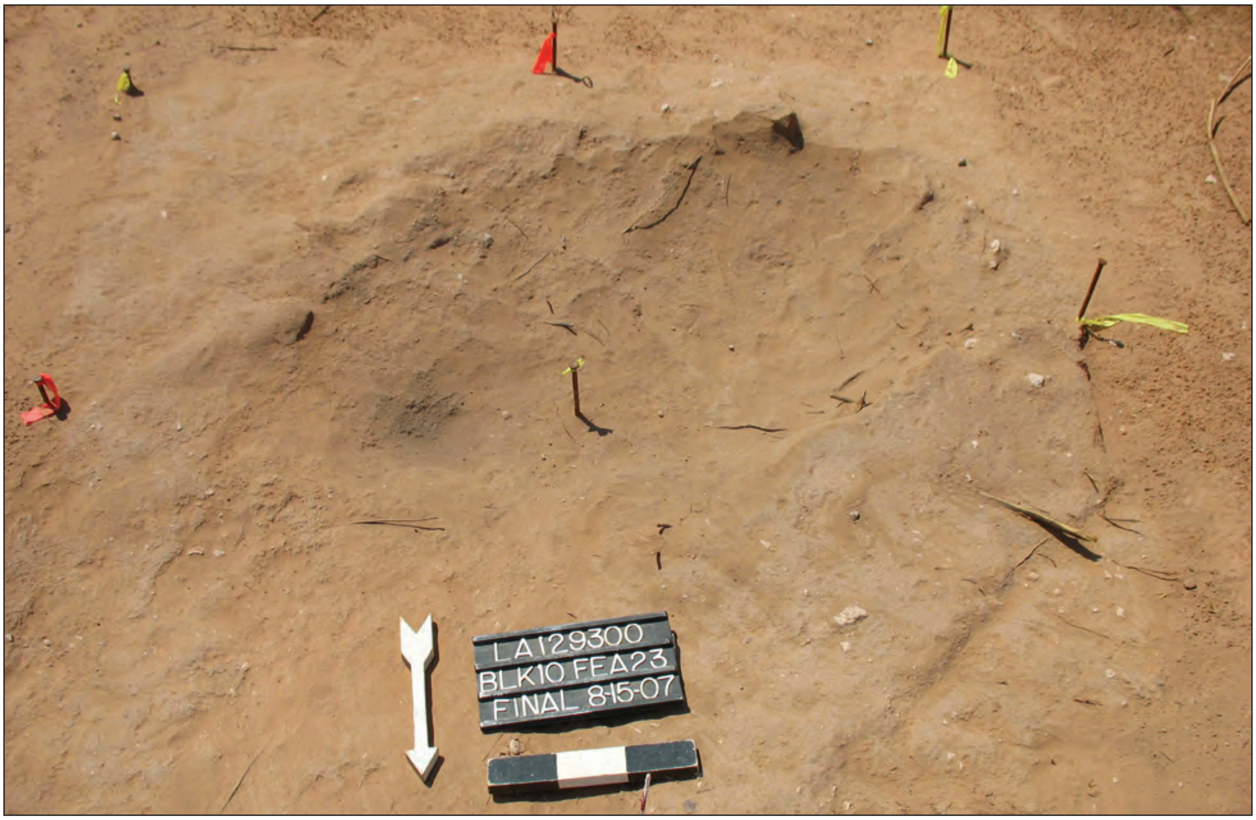

Figure 13.15. LA 129300, Feature 23, a deep, rock thermal pit that produced a calibrated intercept date of 4250 BC (Beta 258932).

Figure 13.16. LA 129300, Feature 23, profile.

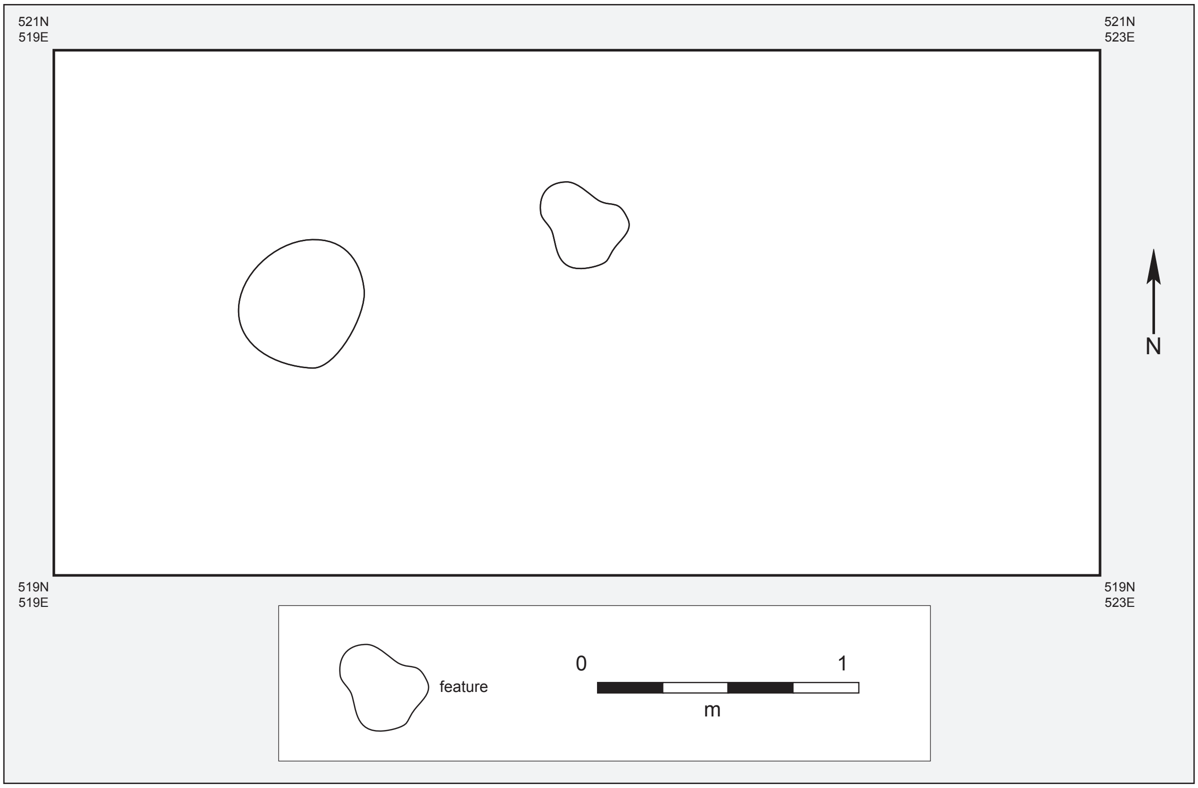

Figure 13.17. LA 129300, Block 12, plan.

artifacts including a projectile point, a mano, and a hammerstone (Table 13.13) represent a density of 2.0 artifacts per square meter of the excavated area.

Block 14 (2 sq m)

Block 14 was established to excavate two features that had been exposed on the north side of Backhoe Trench 11.

Both squares were excavated as single levels or “cuts” down to the tops of the exposed features. Excavation proceeded through Stratum 1 and into Stratum 2 sediments. Because the ground surface in this area undulates, depth of excavation varied from 15 to 41 cm.

One of the features was discovered to be rodent-burrow backfill and not a cultural feature. As for the second feature, its actual location was found north of the exposure in the trench face, again the result of rodent displacement of stained fill.

Thermal Feature 32 was excavated in Block 14.

Chipped lithic debitage and pottery sherds (Table 13.14) represent a density of 5.0 artifacts per square meter of the excavated area.

Block Summary

A summary of findings for all blocks can be found in Table 13.15.

Feature Descriptions

Feature 1: Thermal feature, rock, shallow, large
Provenience: Block 3, 556N/493E
Elevation and Stratum: 99.00, modern surface
Size and Shape: Oval, core area, 90 by 60 by 10? cm
Definition: Fair (many of burned rocks scattered)
Fill: Missing due to weathering (wind, rain, etc.)
Bioturbation: None noted
Artifacts: Several surface artifacts scattered among the rocks, could not be conclusively associated with hearth
Samples: None
Dates: None

Feature 15: Thermal feature, rock, shallow, large (may be part of Feature 20)
Provenience: Block 4, 517N/491E
Elevation and Stratum: 99.80, modern surface

Figure 13.18. LA 129300, profile of Feature 40, a large, shallow, rock thermal pit.

Size and Shape: Roughly circular, 100 by 100 by 12 cm
Definition: Fairly good, but with some scattering of burned rocks
Fill: Missing due to weathering
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, burned rock
Dates: None

Feature 16: Thermal pit, non-rock, deep, medium
Provenience: Block 1, 504N/524E
Elevation and Stratum: 98.71–98.51, Strata 2 and 3
Size and Shape: Oval, 59 by 54 by 20 cm
Definition: Good
Fill: Dark yellow-brown, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 17: Thermal pit, non-rock, shallow, medium
Provenience: Block 1, 506N/528E
Elevation and Stratum: 98.39–98.22, Stratum 3
Size and Shape: Nearly circular, 50 by 48 by 18 cm
Definition: Good boundaries, with some oxidation in bottom
Fill: Reddish brown, with charcoal flecking
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 18: Thermal pit, non-rock, shallow, medium
Provenience: Block 8, 550N/540E
Elevation and Stratum: 98.74–98.62
Size and Shape: Nearly circular, 59 by 56 by 7 cm
Definition: Good
Fill: Mottled gray, with charcoal
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 19: Thermal pit, non-rock, shallow, medium
Provenience: Block 1, 506N/526E
Elevation and Stratum: 98.53–98.46, Stratum 3

Size and Shape: Oval, 50 by 48+ by 17 cm (not fully exposed)
Definition: Good
Fill: Strong brown, with a few charcoal bits
Bioturbation: None
Artifacts: None
Samples: Flotation, pollen
Dates: None

Feature 20: Thermal pit, rock, shallow, medium (may be pit for Feature 15 rocks)
Provenience: Block 4, 517N/492E
Elevation and Stratum: 99.34–99.18
Size and Shape: Irregular oval, 56 by 52 by 16 cm
Definition: Good, with boundaries defined by burned rocks
Fill: Brown to strong brown, with charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation, radiocarbon, burned rock
Dates: Intercept cal 4540 BC (Beta 258931)

Feature 21: Thermal pit, non-rock, deep, uncertain
Provenience: Block 1, 503N/521E
Elevation and Stratum: 98.82–98.68, Strata 2 and 3
Size and Shape: Oval, 49+ by 48 by 24 cm (not fully exposed)
Definition: Good, with clear boundaries and some oxidation
Fill: Dark brown, with charcoal
Bioturbation: Insect
Artifacts: Two lithic debitage, one projectile point
Samples: Flotation, pollen, radiocarbon, burned rock ("gravels")
Dates: Intercept cal AD 260/280/330 (Beta 258930)

Feature 22: Posthole
Provenience: Block 6, 519N/510E
Elevation and Stratum: 99.35–99.29, Stratum 2
Size and Shape: Oval, 20 by 15 by 6 cm
Definition: Fair
Fill: Brown, no charcoal
Bioturbation: Rootlet
Artifacts: None
Samples: Flotation
Dates: None

Feature 23: Burned-rock cluster and deep thermal pit; rock-lined pit underlay western end of rock cluster and appeared to be a functional part of it; deep; medium
Provenience: Block 10, 513N/519E
Elevation and Stratum: 99.21–98.93
Size and Shape: Rock cluster: oval, 159 by 120 by 24 cm deep; Pit: oval, 65 by 57 by 20 cm
Definition: Good, except where damaged during discovery; areas of oxidation
Fill: Dark reddish gray, with some charcoal
Bioturbation: Rootlet, insect
Artifacts: None
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: Intercept cal 4250 BC (Beta 258932)

Feature 24: Pit
Provenience: Block 6, 520N/512E
Elevation and Stratum: 99.35–99.25
Size and Shape: Oval, 22 by 18 by 10 cm
Definition: Good
Fill: Brown, no charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 25: Thermal pit, non-rock, shallow, medium
Provenience: Block 12, 520N/520–521E
Elevation and Stratum: 99.12–99.05, Stratum 2
Size and Shape: Irregular elongate oval, 42 by 34 by 8 cm
Definition: Fair
Fill: Dark reddish gray, with some charcoal flecks
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 650 (Beta 258933)

Feature 26: Thermal pit, non-rock, deep, medium
Provenience: Block 12, 519N/519E
Elevation and Stratum: 99.15–98.93, Stratum 2 to top of Stratum 3
Size and Shape: Triangular with rounded corners, 57 by 50 by 22 cm
Definition: Fair
Fill: Dark reddish gray, with some charcoal
Bioturbation: Root, rootlet
Artifacts: One lithic debitage
Samples: Flotation, radiocarbon, burned rock

Dates: Intercept cal AD 670 (Beta 258934)

Feature 27: Voided

Feature 28: Posthole?, thermal pit?
Provenience: Block 11 (BHT 4), 528N/540E
Elevation and Stratum: 97.93–97.62
Size and Shape: Oval, 22 by 10+ by 31 cm (not fully exposed)
Definition: Diffuse boundaries
Fill: Dark brown, with some charcoal
Bioturbation: None noted
Artifacts: None
Samples: Flotation
Dates: None

Feature 29: Thermal pit, non-rock, shallow, medium
Provenience: Block 11 (BHT 4), 532N/540E
Elevation and Stratum: 97.93–97.62
Size and Shape: Uncertain, 40 by 19+ by 11 cm (not fully exposed)
Definition: Reddened, diffuse boundaries
Fill: Dark brown, with sparse charcoal flecks
Bioturbation: Rootlet, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 30: Thermal pit (bell-shaped), non-rock, deep, uncertain
Provenience: Block 11 (BHT 4), 532N/540E
Elevation and Stratum: 97.86–97.56
Size and Shape: Uncertain, 17+ by 40+ by 30 cm (not fully exposed)
Definition: Reddened lower boundaries
Fill: Dark brown, with flecks and small pieces of charcoal
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 31: Voided

Feature 32: Thermal pit, non-rock, shallow, medium
Provenience: Block 14, 498N/513E
Elevation and Stratum: 99.38–99.29, Stratum 2 into Stratum 3
Size and Shape: Football-shaped, 45 by 32 by 9 cm
Definition: Slightly darker than surrounding matrix
Fill: Light gray, with some charcoal
Bioturbation: None noted
Artifacts: One lithic debitage, two pottery sherds
Samples: Flotation, radiocarbon
Dates: Intercept cal AD 780 (Beta 258935)

Feature 33: Voided

Feature 34: Thermal pit, rock, very deep, uncertain
Provenience: Block 10, 513N/518E
Elevation and Stratum: 99.21–98.77, Stratum 2, into calcrete
Size and Shape: Oval, 46+ by 70 by 34 cm (not fully exposed)
Definition: Good, with bottom and lower sides defined by calcrete
Fill: Dark reddish gray, with some charcoal
Bioturbation: Root, rootlet
Artifacts: Two lithic debitage
Samples: Flotation, pollen, burned rock
Dates: None

Feature 35: Thermal pit, non-rock, shallow, medium
Provenience: Block 11, 532N/540E
Elevation and Stratum: 98.24–98.15
Size and Shape: Oval, 39 by 20 by 9 cm
Definition: Clear and abrupt boundaries, patchy oxidation of base
Fill: Very dark gray
Bioturbation: Root, insect
Artifacts: None
Samples: Flotation
Dates: None

Feature 36: Thermal pit, non-rock, shallow, uncertain
Provenience: Block 7, 521N/535E
Elevation and Stratum: 98.00–97.84
Size and Shape: Oval, 18+ by 22+ by 10 cm (not fully exposed)
Definition: Good, with some oxidation of bottom
Fill: Dark brown, charcoal not noted
Bioturbation: Rodent, root
Artifacts: None
Samples: Flotation, pollen, burned rock
Dates: None

Table 13.15. LA 129300, summary of blocks, features, and artifact frequencies.

			FEATURE TYPE				
BLOCK	AREA (SQ M)	NO. OF FEATURES	THERMAL	STRUCTURAL/ WINDBREAK	PIT	POSTHOLE	ARTIFACTS/ SQ M
1	80	5	5	–	–	–	1.6
2	none excavated due to proximity of calcrete	–	–	–	–	–	–
3	6	1	1	–	–	–	0.8
4	32	1	1	–	–	–	2.2
5	16	1	–	–	1	–	1.4
6	36	2	–	–	1	1	1.8
7	32	7	7	–	–	–	1.7
8	4	1	1	–	–	–	0
9	32	0	–	–	–	–	1.6
10	16	2	2	–	–	–	0.1
11	4	4	3	–	–	1	1.8
12	8	2	2	–	–	–	0.4
13	6	1	1	–	–	–	2
14	2	1	1	–	–	–	5
Total	**274**	**28**	**24**	**0**	**2**	**2**	–

Feature 37: Thermal pit, non-rock, shallow, medium
Provenience: Block 7, 522N/536E
Elevation and Stratum: 98.01–97.90
Size and Shape: Oval, 47 by 39 by 14 cm
Definition: Good, with some oxidation of southeast edge
Fill: Dark grayish color, with charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen
Dates: Intercept cal AD 660 (Beta 258937)

Feature 38: Thermal pit (bell-shaped), non-rock, deep, medium
Provenience: Block 7, 522N/535E
Elevation and Stratum: 98.00–97.75, Strata 2 and 3
Size and Shape: Oval, 52 by 48 by 25 cm
Definition: Good
Fill: Dark brown, with some charcoal
Bioturbation: Root
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 540 (Beta 258936)

Feature 39: Large pit
Provenience: Block 5, 514N/547E
Elevation and Stratum: 97.00–96.76, Stratum 3
Size and Shape: Elongate oval, 93 by 38 by 24 cm
Definition: Good
Fill: Strong brown, with sparse charcoal
Bioturbation: None noted
Artifacts: Four lithic debitage, one animal bone fragment
Samples: Flotation, burned rock
Dates: None

Feature 40: Thermal pit, rock, shallow, large
Provenience: Block 13, 503N/548E
Elevation and Stratum: 97.57–97.45
Size and Shape: Oval, 97 by 80 by 12 cm
Definition: Abrupt and clear in places, diffuse in others; patchy oxidation around perimeter
Fill: Slightly darker than surrounding matrix; some charcoal
Bioturbation: None noted
Artifacts: Hammerstone, mano, dart projectile point
Samples: Flotation, pollen, radiocarbon, burned rock
Dates: Intercept cal AD 890 (Beta 258939)

Feature 41: Thermal pit, non-rock, deep, medium
Provenience: Block 7, 517N/537E
Elevation and Stratum: 97.93–97.64, Strata 2 and 3
Size and Shape: Nearly circular, 51 by 48 by 21 cm
Definition: Generally good; small spot of oxidation on north rim

Fill: Two strata, one black, the other light gray; profile suggests the light gray strat is mixed by rodent burrowing
Bioturbation: Rodent
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 550 (Beta 258938)

Feature 42: Thermal pit, non-rock, shallow, medium; associated ash dump to southeast
Provenience: Block 7, 523N/537E
Elevation and Stratum: 97.70–97.62
Size and Shape: Circular, 41 by 40 by 8 cm
Definition: Good
Fill: Dark brown, with sparse charcoal flecking
Bioturbation: None noted
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: None

Feature 43: Thermal pit, non-rock, shallow, small
Provenience: Block 7, 517N/537E
Elevation and Stratum: 97.86–97.69
Size and Shape: Circular, 32 by 32 by 17 cm
Definition: Good
Fill: Two strata, one black, the other light gray; profile suggests the light gray was mixed by rodent burrowing
Bioturbation: Rodent
Artifacts: Two lithic debitage, but could be from rodent backdirt
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 550 (Beta 258940)

Feature 44: Thermal pit, non-rock, deep, uncertain
Provenience: Block 7, 517N/537E
Elevation and Stratum: 97.82–97.62, Stratum 3
Size and Shape: Uncertain, 46+ by 21+ by 20 cm (not fully exposed)
Definition: Good
Fill: Dark brown, with some charcoal
Bioturbation: None noted within feature
Artifacts: None
Samples: Flotation, pollen, radiocarbon
Dates: Intercept cal AD 430 (Beta 258941)

14 ⩡ LA 129220, Twentieth-Century Ranching Facility

Dorothy A. Zamora

Site Description

LA 129220 was first recorded by TRC Associates (2000) during the initial survey of the area for the New Mexico Department of Transportation (Figs. 14.0 through 14.2). In all, nine features were recorded. Most of the site is outside the scope of proposed work; therefore, archival research was conducted instead of excavation because only Feature 8, a corral, is within the proposed right-of-way.

LA 129220 is located along both sides of NM 128 at an elevation of 990 m (3,250 ft). It is on a ridgetop overlooking Los Medanos to the east. Vegetation in the area consists of creosote bush, mesquite, broom snakeweed, and several grasses supported by a sandy loam soil with caliche nodules. The site measures 170 m (557 ft) north–south by 170 m (557 ft) east–west, covering a total of 7.14 acres (2.89 ha).

History

LA 129220, a historic site, contains a well and windmill, two large water-storage tanks, two small drinkers or water troughs for livestock, a feed trough, one small pen, and two corrals. Over the years, the land has been leased from the State of New Mexico by several people for cattle grazing. According to records at the New Mexico State Land Office, the first people to lease the land in Section 2 were Charles H. and William O. James.

Feature 6, a small drinker or water tank has a cement footing around it with the inscription "Bill James, 5 9 48." The James brothers dug the well and set up the windmill here in approximately 1947. The water-storage tanks (Features 3 and 5) and a small drinker were also installed by the brothers. The lease was relinquished in 1974, and T. T. Sanders leased the property for a short time. Marilie Tully Walker acquired the lease in 1974, also for a short period. Arnold Crabb obtained the lease from Walker in 1974 and retained it until 1978. W. L. Mobley Jr, the current holder, said that a 280 ft well, a windmill, and 2 miles of wire fencing also are listed on the lease.

Surface Features

Of the nine features comprising the site, five are clustered within an area of 841 sq m (9,052 sq ft) and constitute the central part of the site (Fig. 14.3). Four other features range from 50 m (164 ft) to 120 m (394 ft) away from the area.

Feature 1: Feature 1 is a small pen that measures 7 by 7 m. It is constructed of four main posts, with two to three smaller posts in between, and four strands of barbed wire enclosing the pen. The fence is down on the east side of the pen. Few artifacts were present near or in the pen (Table 14.1).

Feature 2: Feature 2 is a small water drinker for livestock that measures 2 m in diameter and 52 cm deep (Fig. 14.4). It was constructed on an oversized, irregularly shaped concrete pad, the top surface of which was so deteriorated at the time of the project that it looked more like a conglomerate outcrop.

The tank is concrete with remnants of sheet metal around the outside. Several sections of formed concrete, similar to segments of modern parking barriers, were placed around the outside base of the tank. They average 27 cm in height and are variable in length. Four upright wooden posts have been spaced between the concrete segments. Water was pumped to the drinker through a 60 cm metal pipe. The northeast wall of the tank has collapsed, and a 1.2 m post is present. It seems as though the post was placed there when the tank was built. Some twisted wire with a loop is also present, and it is possible that it was strung around the wooden posts for additional support. Very few artifacts were associated with this feature (Table 14.2).

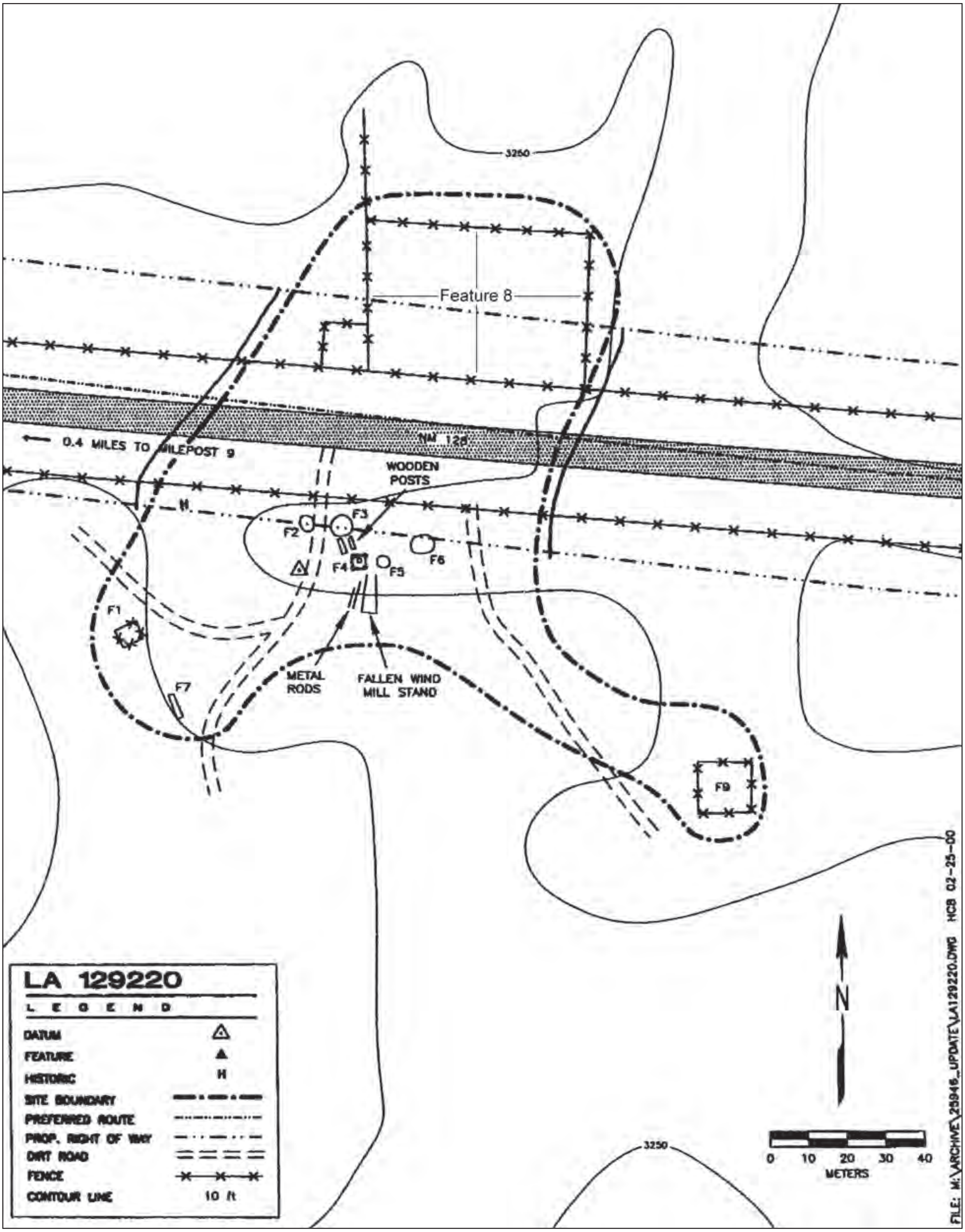

Figure 14.0. LA 129220, site map, from TRC Survey, 2000.

Figure 14.1. LA 129220, central part of site.

Table 14.1. LA 129220, Feature 1, artifacts.

ARTIFACT	MAKER'S MARK	COUNT	BEGIN DATE	END DATE
Coke bottle base	Hot Springs, NM	1	1940s	–
Modern brown beer bottle	bottle trademark	1	1970	present
Brown bottle glass	–	1	1880	present
Sardine can	–	1	1895	present
Sanitary can	–	1	1920	present

The method of construction appears to have been "homemade" (not industrial or commercial), as deduced from photographs of Features 2 and 6. First, the oversize concrete pad was laid and allowed to dry. Prior to drying, four wooden posts were set vertically in place. Once the pad was dry, sheets of metal were bent into arcuate shapes and set inside the four wooden posts; wire was strung between the posts to support both the posts and the metal sheets. Probably also at this time, low, concrete curb-like segments—having been made previously or, possibly, having been broken out of a dismantled trough of the same design—were set in place to support the metal sheets and prevent their expanding outward when the concrete lining of the trough was poured.

Once the form was ready, a lower course of stiff concrete was laid around the inside of the metal sheets. From the photos, this first course appears to have been approximately 5 to 10 cm thick and 25 cm high.

When the first course had firmed up, a second course of concrete was added in the same way. The last step appears to have been the pouring of a 10 cm thick layer of concrete to form the bottom of the trough. Once the entire structure had been allowed to dry, and a pipe had been brought in from the well, the trough was ready for use.

Figure 14.2. LA 129220, Feature 8, large corral north of NM 128.

Table 14.2. LA 129220, Feature 2, artifacts.

ARTIFACT	MAKER'S MARK	COUNT	BEGIN DATE	END DATE
Wire nail	–	2	1890	present
Clear glass	–	3	1930	present
Unknown metal fragment	probably from the tank	1	–	–

Feature 3: Feature 3 appears to be the remains of a large storage tank that consists of a large, circular, concrete pad 9 m in diameter (Fig. 14.5). Included in the measurement is a 37 cm apron around the base of the tank. Large sheets of corrugated metal—about 13.5 by 1.6 m in size—next to the pad appear to be remnants of tank siding. Tar was used to join the metal sheets together and seal them in order to prevent water leakage. The artifacts associated with this feature are in Table 14.3.

Feature 4: Feature 4 is a disassembled windmill, consisting of a well bore in a concrete pad, a windmill stand, six lengths of windmill pipe, and eight wooden armature components. The well bore is 16 cm in diameter. The concrete pad is nearly square, with each side averaging just over 2 m.

The windmill tower was removed from the stand and laid down east of the well. It is 9.2 m long and 1.5 m wide at the bottom. Each leg is constructed of five sections of metal post that are horizontally connected at each section. A metal ladder on the east side of the downed tower is 23 cm wide with rungs spaced 43 cm apart. The length of the ladder is the same as the windmill tower. Grouped sections of well pipes and wooden armature rods are laid out neatly to the north and south of the well pad. The near ends of the pipes and rods are propped up on the pad, presumably to slow the accumulation of moisture by partly lifting them off the ground and thereby forestalling rusting and rotting.

Artifacts around the windmill area are black plastic hosing, clear modern glass, one glass Coke

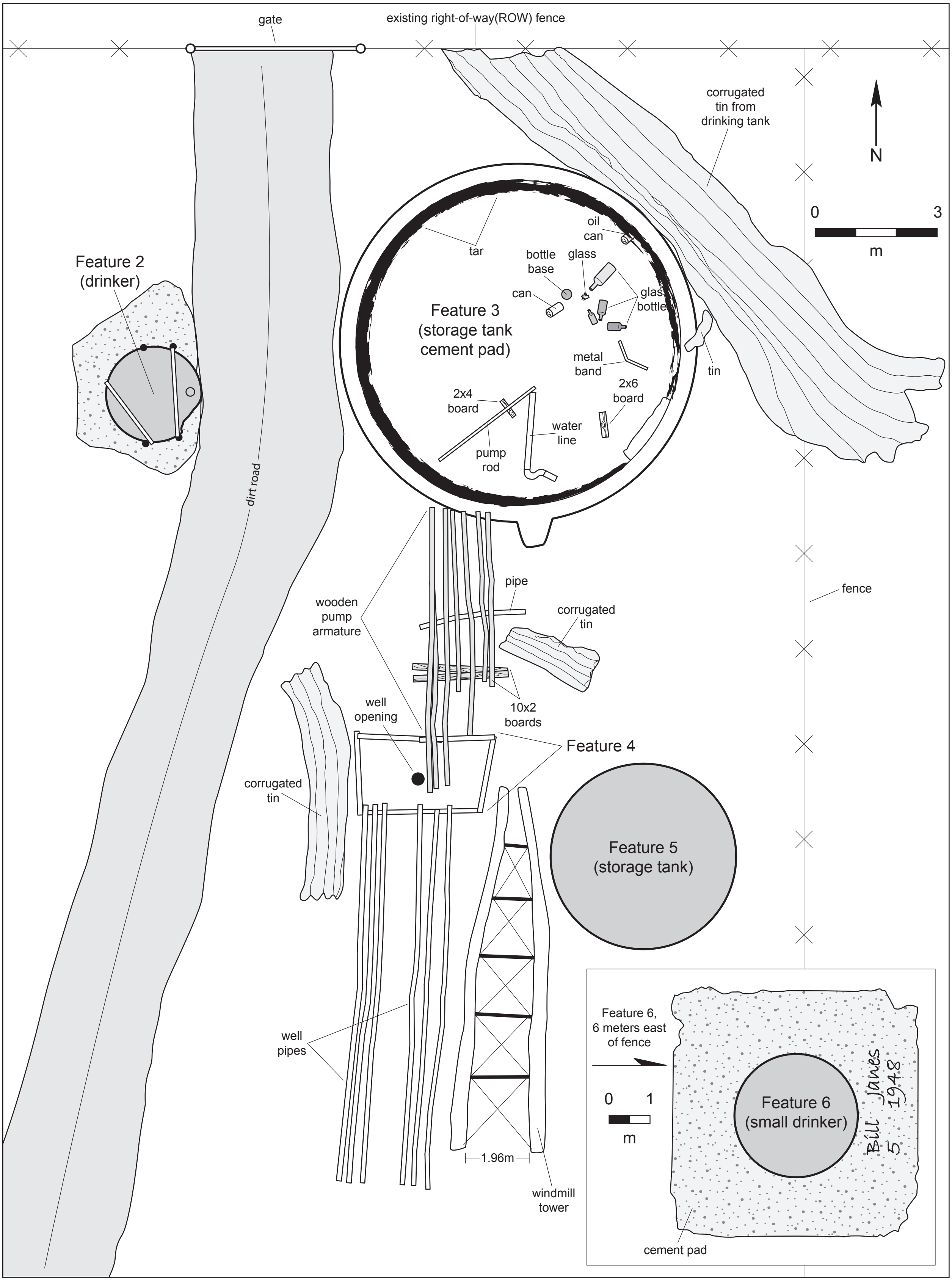

Figure 14.3. LA 129220, detailed map of central features.

Figure 14.4. LA 129220, Feature 2, small, circular, livestock drinker.

Figure 14.5. LA 129220, Feature 3, concrete pad of a large water tank.

Figure 14.6. LA 129220, Feature 5, a standing, solid metal tank—note the welded patches.

bottle fragment, one 1x6 piece of milled lumber, and a sheet of corrugated tin (Table 14.3). The tin was probably part of Feature 3, the storage tank.

Feature 5: Feature 5 is a solid metal storage tank that is still standing (Fig. 14.6). It is 1.46 m in diameter and about 2.6 m high. The tank sits on a concrete pad that is 1.87 m in diameter. Several areas on the tank have been welded or patched.

Feature 6: Feature 6 is another small water tank or drinker (Fig. 14.7 constructed in the same manner as Feature 2. It is likely an earlier version, because it had completely collapsed at the time of the NM 128 project, and many of its components had been carried off. Feature 6 is 1.40 m in diameter and is 32 cm high. This feature's concrete pad measures 1.42 m in diameter and has three wooden post set into it.

The tank was probably constructed of metal with a cement bottom, as suggested by the remains of sheet metal against the raised circular concrete. Concrete supports were placed around the tank between the wooden posts. On the west side of the tank, in the cement, is an inscription that reads "B H JAMES 5 9 48" (Fig. 14.8). The few artifacts located around the feature consisted of baling wire; a small, clear, glass fragment; a wire nail; and fragments of sheet metal.

Feature 7: Feature 7 is a feeding bin constructed of eight 20 gallon barrel halves. Because of the closeness of this feature to the surrounding vegetation, it was not possible to get a clear. And, since it is not in the construction right-of-way, it is still "alive and well" for those who wish to see it for themselves.

The barrels have been placed against each other to form a line. The entire bin is 6.4 m long by

Figure 14.7. LA 129220, Feature 6, a second, small, circular, livestock drinker.

Figure 14.8. LA 129220, inscription on apron of Feature 6 ("B H James 5 9 48").

Table 14.3. LA 129220, Feature 3, artifacts.

ARTIFACT	COLOR	MAKER'S MARK	COUNT	BEGIN DATE	END DATE
Beer bottle	brown	–	11	1880	present
Glass jar with twist-off lid	clear	–	2	1930	present
Soda bottle	green	–	1	1930	present
Sanitary can	–	–	3	1920	present
Metal bar	–	–	1	–	–
Metal band with holes	–	–	1	–	–
Corrugated tin	–	–	10	–	–
Wooden board	–	2 X 6	2	–	–
	–	2 x 4	2	–	–
Metal pipes for water line	–	–	1	–	–
Sucker rod fragment	–	–	1	–	–
Rubber hose	black	–	5	–	–

59 cm wide and is 29 cm deep. It was set between two upright railroad ties with two smaller wooden posts in the middle for support. Artifacts located near Feature 7 include two wire nails; a clear, glass fragment; baling wire; and indeterminate metal fragments.

Feature 8: Feature 8 is a large corral (Fig. 14.2) situated north of NM 128, next to the existing highway right-of-way fence and a metal gate. It is built with upright railroad ties, and measures 8.68 m north–south by 4.4 m east–west. The structure is enclosed with horse wire.

To the west is a chute measuring 5.8 m long with a gate measuring 3 m wide. The existing right-of-way fence forms one side of the chute. Artifacts near the corral mainly represent road trash and include clear glass fragments and modern, miscellaneous trash. Baling wire and some barbed wire probably were associated with use of the corral.

Feature 9: Feature 9 is another corral approximately 100 m (328 ft) southeast of the well bore. This corral is constructed of six main posts 25 cm in diameter and 1.8 m high. Smaller wood posts had been placed every meter and were strung with barbed wire. Artifacts in this area are few and include one clear, glass fragment and a small strand of barbed wire.

Conclusion

The historic well, windmill, and other nearby features were constructed for the James Ranch. We have no way of knowing when the various features were constructed other than the one livestock drinker (Feature 6) that is inscribed May 9, 1948. We could also not determine when use of the well and other features ceased and the windmill tower was disassembled. The wheel that operated the windmill is not present at the site and was presumably taken for use elsewhere.

15 ⇓ Description and Analysis of Site Features

Regge N. Wiseman

Seven types of cultural features and facilities were identified during excavations at the NM 128 sites (Table 15.1). An eighth type of feature, Number 44 in Block 2 at LA 129214, is natural and apparently represents either a water catchment or a dried-up spring in the calcrete. Feature types are described and discussed in the following paragraphs.

Thermal Features

As the name implies, thermal features are heat facilities generally referred to as hearths, fire pits, small baking pits, and the like.

It is important to bear in mind that, in the discussions that follow, the inferred functions (cooking versus baking, for instance) are strictly that—inferences—and are based on assumptions about the variety of sizes, depths, details of construction, and associated ancillary details (especially whether or not rocks, including calcrete bedrock exposures, were present in the fills and/or incorporated in the sides and bottoms).

The size and shape categories, to be described shortly, are generally applied to all of the NM 128 thermal features. Plans and profiles of all features for which drawings were made can be found in Appendix 1.

It is also important to remember that only relatively small thermal features, those less than 2 m, were encountered at NM 128 sites. These have been grouped according to whether they are simple or complex. Of the latter, we have double features, or thermal pits having two chambers arranged vertically. Paired features have two pits arranged side by side in a manner suggesting shared function.

No truly large thermal features such as annular rock middens, ring middens, midden circles, agave pits, mescal pits, or communal baking facilities were present at any of the sites.

Size: Since the thermal features at the NM 128 sites appear in a wide range of sizes, length, width, and depth dimensions were graphed in a variety of ways to ascertain if any natural groupings were present. Such groups were indeed present, and led to the establishment of the following horizontal (plan) and vertical (profile) categories: large, 67 or more cm long; medium, 39 to 66 cm long; small, up to 38 cm long; and unk/unc, unknown/uncertain, usually because full measurements could not be obtained or because only a portion of the feature was exposed in the side of a backhoe trench.

Depth: Graphs of the depths suggested that fairly discrete categories of thermal feature depth can be discerned, as follows: shallow, 4 to 18 cm; deep, 19 to 30 cm; very deep, 31 to 49 cm; unk, unknown, usually because full measurements could not be obtained or could not be verified.

Area: Although a variety of horizontal (plan) shapes are inherent in these features, most are more or less oval-shaped. Accordingly, the area of the opening or orifice of each feature was calculated by multiplying the length times the width times 0.758 to obtain the area of an oval.

Volume: Feature volume was very roughly calculated by multiplying the area figure by the depth. Volume of a feature can provide clues to function, and the amount and nature of function-related fill can provide additional clues to length and/or intensity of use.

Type: Type refers to whether rock was or was not significantly associated with the fill and/or incorporated in the sides or bottom of the feature. The bottoms of a number of thermal features at LA 129214 are composed of naturally occurring calcrete bedrock, but whether or not this was intentional is uncertain.

Rocks and bedrock in the fill and/or sides and bottom of a thermal pit would assist with heat retention and efficiency of these thermal features (Black et al. 1997). However, we have no way of ascertaining at this time whether the incorporation of

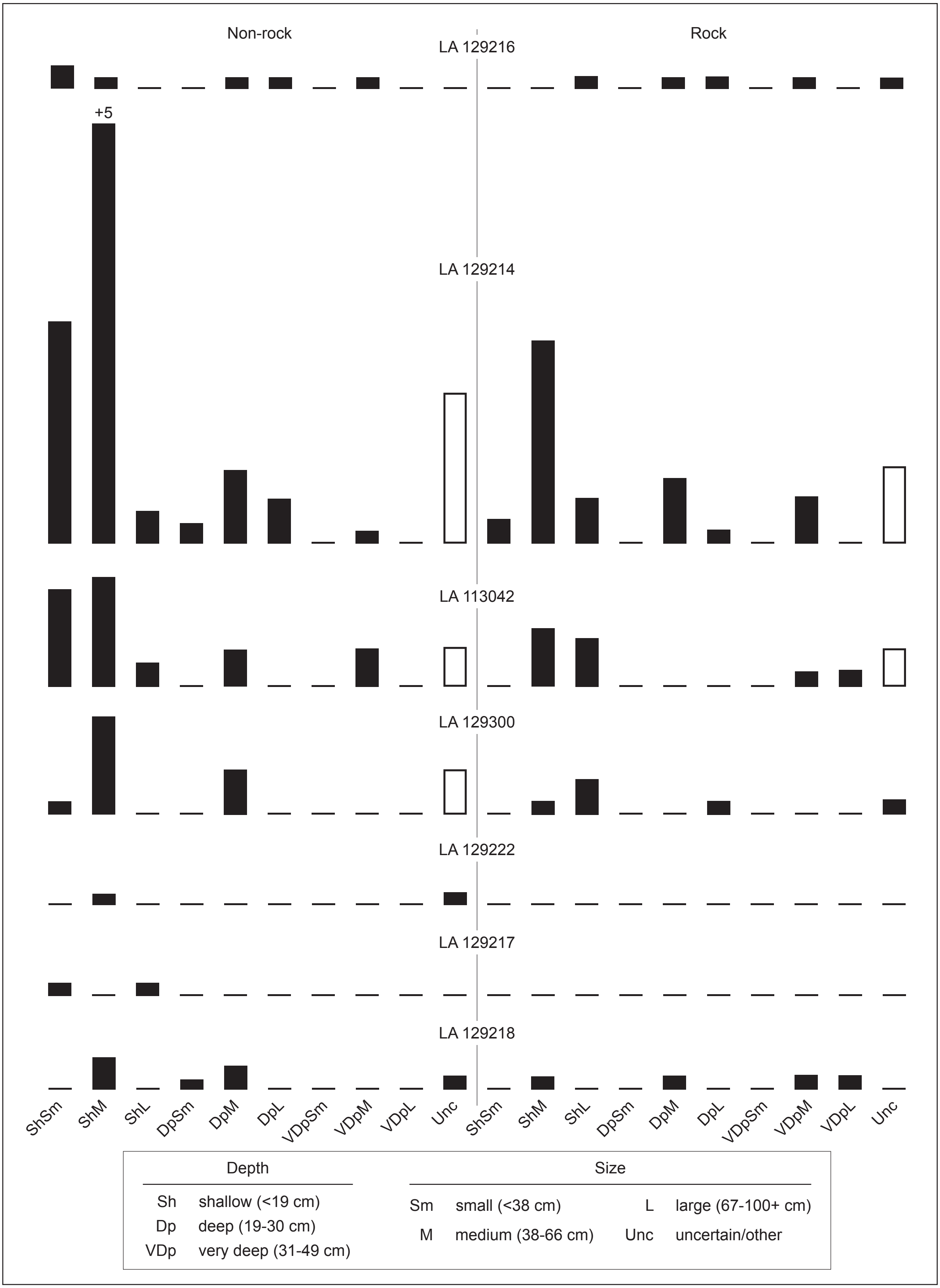

Figure 15.1. Frequency of NM 128 thermal features, by type (non-rock vs. rock), depth, and size.

Table 15.1. NM 128 feature types, by site.

SITE	THERMAL FEATURE	POSTHOLE	PIT	BURNED ROCK CONCENTRATION	ROCK CACHE	WINDBREAK	STRUCTURE
LA 113042	42	3	4	–	1	–	–
LA 129214	146	9	1	–	–	1 or 2	1
LA 129216	11	–	–	1	–	–	–
LA 129217	2	–	–	–	–	–	–
LA 129218	11	–	–	–	–	–	–
LA 129222	2	1	1	–	–	–	–
LA 129300	25	1	2	–	–	–	–
Total	**239**	**14**	**8**	**1**	**1**	**1 or 2**	**1**

bedrock was intentional or a circumstance resulting from a thin sand mantle at the time each feature was built.

"Non-rock" thermal features generally lacked rock in the fills, sides and/or bottoms, but not always.

A number of these features had from one to perhaps eight, small, pebble-sized rocks in their fill, but the numbers and sizes of the rocks are generally believed to have been insufficient to have seriously affected the heating properties of the features.

Also, a problem encountered in the NM 128 sites is the presence of many thermal features with very-fine (gravel- to marble-sized) calcrete fragments in their fills. Were these originally larger chunks that served the same function as rocks, and later disintegrated into very small pieces through use?

Shape: Shape in all but one instance refers to the shape of the orifice or horizontal plan of the thermal feature. Seventeen categories are recognized, several of them variations on a theme (Table 15.2). Some, especially irregular and amorphous shapes, may well be the result of cleanings that distorted the shape of the orifice, or of excavation error.

The point is, not all thermal features are simple circles or ovals, meaning some of the variation might be connected to aspects of function or even of social or ethnic identity. The vertical profiles of all but a few thermal features are basin-shaped, with the shallower ones having gently sloping sides and the deeper ones having steeper and, in some cases, nearly vertical sides.

The one exception in the shape category is designated according to its vertical profile, rather than its orifice. The bell-shaped pit (Table 15.2), with its oval orifice, is unusual and might well identify a small baking pit.

Simple Thermal Features

Simple thermal features consist of individual pits or concentrations of burned rocks that constitute a heating, lighting, and/or cooking locus. These, the most common feature at all of the NM 128 sites, are mostly unmodified pits dug into the ground. Using the variables described above, we have 20 potential groups as shown in Figure 15.1 and Appendix 1. The left half of the figure presents the non-rock thermal features, and the right half those made of rock. Within each half, groups are arranged first by depth category—shallow, deep, very deep— and then, by size, into small, medium, and large. Features lacking complete size data are grouped under the far right column of each half and are titled "unc" for uncertain or unknown.

As is readily apparent in the figure, non-rock simple thermal features are far and away the most common feature type, with shallow, medium-sized examples being the most common of those. Features in this group may be up to 18 cm deep and have the longest dimension measuring from 19 to 30 cm. This is also true for the rock simple thermal features.

Within the non-rock category, the shallow small group is the next most common. However, the rock category has no clear second-most common group.

Regarding depth categories, shallower features are the most common, with deep features (19 to 30 cm) being far less common, and very deep features (31 cm and deeper) being the least numerous.

Large thermal features, meaning those with the longest dimension exceeding 66 cm, are the least common in every category and group.

Normally, we assume that the deep (19 to 30 cm) and very deep (31 to 49 cm) features functioned differently than the shallower ones. Because of their depths, they are good candidates for below-

Table 15.2. NM 128, data and dates on all thermal features, listed by site and block.

BLOCK	FEATURE	TYPE	SHAPE	SIZE	AREA (CM^2)	DEPTH	VOLUME	I DATE	OX CAL PERIOD	BETA NO.
LA 113042										
1	28	n	i - o	m	1943.0	d	42.7	AD 1000	7	258894
1	34	n	i - o	l	2512.0	s	12.6	–	–	–
1	35/38	n	s	s	791.0	s	12.6	–	–	–
1	40	n	c	m	2002.0	d	48.0	920 BC	3	258898
1	41	n	e - o	s	487.0	s	4.4	AD 1040	9	258899
1	49	n	c	s	544.0	s	3.3	AD 660	7	258902
2	33.1	r	e - i - o	l	2349.0	s	23.5	AD 1020	8	258895
2	33.2	r	o	m	1382.0	s	13.8	?	–	–
2	36	r	o	m	–	s	–	AD 1020	8	258896
2	37	r	o	s	–	s	–	AD 1030	8	258897
2	64	n	o	m	–	s	–	AD 540	–	258905
3	50	n	c	s	314.0	s	1.6	–	–	–
5	43	r	o	m	1166.0	s	15.2	–	–	–
5	51	n	c	s	2417.0	s	36.3	–	–	–
6	45	n	c	m	1286.0	s	12.9	AD 1160	9	258900
6	46	n	o	m	816.0	s	12.2	AD 690	7	258901
11	54	n	i - o	m	1036.0	s	11.4	–	–	–
11	55	n	o	m	2002.0	s	24.0	AD 1030	8	258903
11	56	n	c	s	471.0	s	3.8	AD 1030	8	258904
12	57	n	o	unk	–	s	–	–	–	–
12	58	n	o	s	451.0	s	4.1	AD 570	7	275121
12	59	n	amor	m	1845.0	s	31.4	–	–	–
12	60	n	o	l	17477.0	d	524.3	–	–	–
12	61	n	amor	m	1661.0	vd	23.3	–	–	–
12	65	n	c2c	m	–	s	–	–	–	–
12	67	n	c	s	637.0	s	10.8	AD 640	7	2589907
13	62	r	o	m	–	vd	–	–	–	–
14	63	r	b - s	vl	–	vd	–	AD 140	5	258906
15	69	n	e - o	m	3834.0	s	46.0	–	–	–
15	70	n	o	m	2638.0	s	31.7	–	–	–
15	82	n	o	m	1055.0	s	10.6	AD 660	7	258911
15	83	n	o	m	–	d	–	–	–	–
16	68	n	b - s	m	–	vd	–	AD 130	5	258908
16	71	r	o	m	1507.0	s	21.1	–	–	–
17	73	r	o	m	2374.0	s	26.1	AD 650	7	258909
18	74	r	e - o	l	2912.0	s	46.6	–	–	–
18	75	r	o	l	4773.0	s	66.8	AD 690	7	258912
18	76	n	irr	l	3297.0	s	46.2	–	–	–
18	77	r	i - o	l	4974.0	s	69.6	AD 610	7	275122
19	78	r	c	m	2204.0	s	37.5	AD 210	5	258910
20	79	n	c	m	2041.0	s	28.6	–	–	–
21	80	r	oct	l	2449.0	s	41.6	AD 140	5	258913
22	81	r	o	m	2951.0	vd	121.8	AD 670	7	258914
LA 129214										
1	39	n	o	m	1046.0	s	11.5	AD 1020	8	258469
1	43	n	o	m	–	s	–	–	–	–
1	58	n	o	m	1963.0	d	37.3	AD 90	4	258474
1	59	n	o	m	1865.0	s	24.2	AD 250	6	258475
1	83	n	i - o	m	2120.0	s	31.8	–	–	–
1	85	n	s - r	unk	–	unk	–	AD 1030	8	258489

(Table 15.2, continued)

BLOCK	FEATURE	TYPE	SHAPE	SIZE	AREA (CM^2)	DEPTH	VOLUME	I DATE	OX CAL PERIOD	BETA NO.
1	88	n	unk	unk	–	d	–	AD 140	5	258491
1	89	n	unk	unk	–	d	–	AD 120	5	258492
5	61	n	o	m	2602.0	s	23.4	AD 650	–	258476
5	74	r	c	m	1163.0	s	19.8	AD 680	7	232975
5	81	n	c	s	345.0	s	4.5	–	–	–
6	46	n	i - o	m	1554.0	s	23.3	AD 1020	8	232969
6	48	n	o	s	728.0	s	7.3	–	–	–
6	49	n	o	m	1094.0	s	19.7	–	–	–
6	50	n	o	m	1099.0	s	13.2	AD 1160	9	232971
6	52	n	c	s	989.0	d	18.8	AD 890	7	258471
6	54	n	c	s	615.0	s	4.3	AD 710/750/760	7	258472
6	55	n	o	m	–	s	–	AD 620	7	232972
6	56	n	c	m	–	s	–	–	–	–
6	57	r	o	s	774.0	s	7.0	AD 680	7	258473
6	62	r	e - s	m	1696.0	s	27.1	AD 1160	9?	258477
6	63	n	e - s	s	267.0	s	2.4	AD 570	7	258478
6	65	r	i - o	m	1382.0	s	9.7	–	–	–
6	66	n	i - o	unk	–	d	–	–	–	–
6	68	r	e - o	l	3179.0	s	38.2	AD 550	7	232974
7	47	n	a - o	m	1492.0	s	22.4	AD 230	5	232968
7	51	n	i - c	m	1963.0	s	17.7	AD 1210	10	258470
7	53	n	o	m	1140.0	s	14.8	AD 1030	8	232970
7	79	n	c	m	2002.0	s	30.0	AD 1040/1100/1120	9	232976
7	84	n	o	m	1154.0	d	26.5	AD 1020	8	258488
7	87	r	c	m	1590.0	s	25.4	AD 770	7	232978
8	64	n	unk	unk	–	d	–	AD 400	6	258479
8	69	n	t	m	2041.0	s	14.3	–	–	–
8	70	n	t - o	m	1590.0	s	28.6	–	–	–
8	71	n	o	m	1452.0	s	16.0	AD 410	6	258480
8	73	r	i - o	m	1444.0	s	23.1	AD 380	6	258482
8	75	r	e - s	m	2028.0	s	16.2	AD 140	5	258483
8	80	r	o	m	3014.0	s	45.2	AD 420	7	258486
8	82	n	c	s	933.0	s	10.3	AD 450/450/460/480/530	7	258487
9	72	r	c	m	2825.0	s	28.3	AD 710/750/760	7	258481
9	78	r	t	m	1661.0	s	16.6	–	–	–
9	86n	n	o	m	1121.0	s	14.6	AD 1000	7	258490
9	86s	n	o	s	986.0	s	5.9	?	–	–
9	93	n	o	m	1068.0	s	14.9	AD 770	7	258493
9	94	n	t	m	1218.0	s	15.8	AD 670	7	232977
9	95	n	o	m	2205.0	s	26.5	AD 810	7	258494
9	96	n	o	s	603.0	d	10.9	AD 1040	9	258495
9	98	n	i - c	m	1418.0	s	18.4	AD 1210	10	258496
9	99	n	o	m	1696.0	s	18.7	AD 890	7	258497
9	106	n	t	s	1046.0	s	8.4	AD 870	7	258502
9/B11	152	n	unk	m	–	vd	–	AD 650	7	232987
9/B11	156	n	o	s	469.0	s	4.7	AD 670	7	258527
9/B11	158	n	o	l	–	s	–	AD 770	7	232990
9/B11	165	n	o	m	2049.0	s	28.7	–	–	–
9/B11	191	n	o	s	–	s	–	–	–	–
9/B11	193	r	o	m	–	s	–	–	–	–
9/B11	194	r	o	m	–	vd	–	–	–	–
9/B11	195	n	o	l	–	s	–	–	–	–
9/B11	196	r	unk	unk	–	s	–	–	–	–
9/B11	203	n	c	s	314.0	s	2.5	–	–	–
9/B11	204	n	c	unk	–	unk	–	–	–	–
9/B11	205	n	c	s	314.0	s	2.8	–	–	–

(Table 15.2, continued)

BLOCK	FEATURE	TYPE	SHAPE	SIZE	AREA (CM^2)	DEPTH	VOLUME	I DATE	OX CAL PERIOD	BETA NO.
9/B11	207	n	c	s	380.0	s	4.9	–	–	–
10	76	n	c	m	1885.0	s	24.5	AD 410	6	258484
10	77	n	unk	unk	–	s	–	AD 870	7	258485
11	91	n	o?	m	–	unk	–	–	–	–
11	92	r	c	m	1163.0	s	18.6	–	–	–
12	97	n	i - o	m	1623.0	s	6.5	–	–	–
12	101	n	i - r	s	754.0	s	5.3	AD 980	7	258498
12	102	n	c	m	2330.0	d	79.2	AD 890	7	258499
12	103	r	c	m	1733.0	s	22.5	AD 690	7	232979
12	104	n	k - b	s	1044.0	s	7.3	AD 890	7	258500
12	105	r	o	m	1731.0	d	48.5	AD 640	7	258501
12	107	n	i - o	s	–	s	–	–	–	–
12	108	r	o	m	2261.0	s	9.0	–	–	–
12	109	r	c	m	1451.0	vd	49.3	AD 420	7	232980
12	110	n	o	m	1806.0	vd	57.8	AD 430	7	258503
12	119	n	c	m	1452.0	d	33.4	AD 660	7	258509
12	120	r	c	m	3420.0	d	95.7	AD 680	7	232984
12	121	n	o	m	1570.0	s	11.0	–	–	–
12	123	n	c	m	3215.0	d	80.4	AD 260/290/320	6	232983
12	124	n	o	m	888.0	s	5.3	–	–	–
12	128	r	e - o	m	1115.0	s	5.6	–	–	–
12	129	r	o	m	1962.0	s	21.6	AD 540	7	258510
12	130	r	c	m	2332.0	d	62.9	–	–	–
12	131	r	i - o	m	2362.0	d	49.6	AD 810	7	258511
12	136	r	o	m	3212.0	d	93.2	AD 690	7	258515
12	176	n	o	s	502.0	s	2.0	–	–	–
12	183	n	i - o	m	2072.0	s	31.1	–	–	–
12	184	n	o	s	200.0	s	1.2	–	–	–
12	185	n	c	s	593.0	s	3.6	–	–	–
12/B13	190	r	unk	l	–	d	–	–	–	–
13	122	r	k - s	m	1055.0	s	9.5	AD 250	6	232982
13	132	r	o	l	3120.0	s	15.6	AD 260/280/330	6	258512
13	133	n	i - o	m	1856.0	s	9.3	AD 1400	12	258513
13	135	n	o	m	–	s	–	AD 1060/1080/1150	9	232985
13	139	r	o	unk	–	unk	–	–	–	–
13	141	r	e - s	m	2002.0	s	18.0	AD 670	7	232986
14	111	–	(not a feature)			–	–	AD 710/750/760	7	232981
14	112	r	c	m	1385.0	s	20.8	AD 120	5	258504
14	113	n	o	m	942.0	s	4.7	–	–	–
14	114	r	c	m	2779.0	s	50.0	AD 1010	7	258505
14	115	n	o	m	1055.0	s	5.3	AD 900/920/960	7	258506
14	116	n	o	m	1451.0	s	26.1	AD 1200	10	258507
14	117	n	c	s	531.0	s	4.8	–	–	–
14	118	n	c	m	1385.0	s	18.0	AD 1030	8	258508
15	134	n	o	m	1583.0	s	19.0	AD 1030	8	258514
15	137	n	e - o	m	848.0	s	5.9	AD 980	7	258516
15	142	n	o	l	5395.0	d	118.7	AD 890	7	258518
15	151	n	o	m	2713.0	s	35.3	AD 650	7	258524
15	153	n	o	m	1950.0	s	9.7	AD 890	7	232991
15	154	n	o	s	377.0	s	3.4	AD 900/920/950	7	258525
15	155	n	irr	m	2959.0	d	88.8	AD 900/920/950	7	258526
15	160	n	e - o	s	507.0	s	4.1	–	–	–
15	161	n	o	unk	–	s	–	AD 880	7	258529
15	201	(possible protohistoric thermal feature, unexcavated)						–	–	–
15	202	r	unk	m	–	vd	–	–	–	–
16	138	n	s	l	3827.0	d	84.2	AD 1060/1080/1150	9	258517

(Table 15.2, continued)

BLOCK	FEATURE	TYPE	SHAPE	SIZE	AREA (CM^2)	DEPTH	VOLUME	I DATE	OX CAL PERIOD	BETA NO.
16	143	r	o	m	2237.0	s	26.8	AD 900/920/960	7	258519
16	144	n	c	m	2920.0	s	52.6	AD 1020	8	258520
16	145	n	o	s	449.0	s	3.6	AD 1020	8	258521
16	146	r	o	l	4522.0	s	63.3	AD 900/920/950	7	232988
16	148	n	o	l	5299.0	s	68.9	AD 890	7	258522
16	149	n	o	m	–	s	–	AD 1270	7	258523
16	150	n	i - o	m	1727.0	s	15.5	–	–	–
16	162	r	e - o	l	4950.0	s	42.7	AD 1020	8	258530
16	163	n	o	s	–	s	–	AD 970	7	258531
16	164	n	o	m	–	s	–	–	–	–
16	180	r	o	s	424.0	s	3.8	AD 550	7	258534
16	181	n	o	s	531.0	s	7.4	AD 770	7	258535
16	182	n	o	m	1130.0	s	9.0	AD 670	7	258536
18	157	r	i - o	m	1661.0	s	24.9	AD 1170	10	232989
18	159	r	o	unk	–	vd	–	AD 560	7	258528
19	166	n	o	m	2080.0	s	31.2	–	–	–
19	167	n	e - o	m	1166.0	s	12.8	AD 1010	7	232993
19	173	r	o	m	1256.0	d	32.7	–	–	–
19	174	n	c	s	707.0	s	6.4	–	–	–
19	175	n	o	m	–	s	–	–	–	–
19	187	n	o	m	–	d	–	–	–	–
19	188	n	unk	l	–	d	–	–	–	–
19	189	n	unk	s	–	d	–	–	–	–
20	177	n	o	unk	–	s	–	AD 890	7	258532
BHT-7	199	n	unk	l	–	d	–	–	–	–
BHT-7	200	r	unk	unk	–	d	–	–	–	–
BHT-14	197	r	unk	unk	–	s	–	–	–	–
BHT-14	198	r	unk	unk	–	d	–	–	–	–
LA 129216										
6	13	n	e - s	m	1592.0	s	15.9	AD 420	7	258916
7	10	r	unk	l	–	d	–	AD 340	6	258915
7	17	n	t	m	1755.0	d	35.1	AD 390	6	258921
7	18	n	o	l	4591.0	d	91.8	AD 380	6	258920
8	19	r	o	m	2355.0	vd	82.4	AD 540	7	232994
8	20	n	o	m	2813.0	vd	104.1	AD 440/490/520	7	232995
9	11	r	o	l	–	s	–	–	–	
9	12	r	o	l	–	s	–	–	–	
9	14	n	c	s	491.0	s	3.4	AD 1030	8	258918
10	15	n	o	s	1074.0	s	7.5	AD 900/920/950	7	258919
10	16	r	e - s	m	1356.0	d	38	AD 600	7	258917
LA 129217										
2	10	n	o	l	1934.0	s	30.9	–	–	–
6	11	n	t	s	933.0	s	7.5	–	–	–
LA 129218										
1	8	r	c	m	2374.0	s	16.6	AD 1030	8	258922
6	10	n	o	m	2591.0	d	67.8	–	–	–
6	11	n	i - o	m	1319.0	s	19.8	AD 1030	8	258923
8	14	r	i - o	l	3077.0	vd	116.9	4540 BC	1	258926
8	17	r	i - o	m	2918.0	d	64.2	–	–	–
8	22	n	d	s	933.0	d	24.2	–	–	–
9	13	n	o	m	3115.0	d	81.0	AD 1050/1130/1140	9	258925
9	15	n	fb	m	772.0	s	3.9	–	–	–
9	16	r	o	m	2490.0	vd	107.1	4340 BC	1	258927
10	12	n	c	m	1418.0	s	25.5	AD 1010	7	258924

(Table 15.2, continued)

BLOCK	FEATURE	TYPE	SHAPE	SIZE	AREA (CM^2)	DEPTH	VOLUME	I DATE	OX CAL PERIOD	BETA NO.
11	23L	n	o	s	725.0	d	21.8	4350 BC	1	258928
LA 129222										
2	4	n	o	m	1072.0	s	9.6	–	–	–
4	2	n	i - o	unk	–	unk	–	AD 980	7	258929
LA 129300										
1	16	n	o	m	2501.0	d	50.0	–	–	–
1	17	n	c	m	1884.0	s	33.9	–	–	–
1	19	n	o	m	–	s	–	–	–	–
1	21	n	o	unk	1846.0	d	44.3	AD 260/280/330	6	258930
3	1	r	o	l	4592.0	s	45.9	–	–	–
4	15	r	c	l	7850.0	s	94.2	–	–	–
4	20	r	i - o	m	2327.0	s	37.2	4540 BC	1	258931
7	36	n	o	unk	–	s	–	–	–	–
7	37	n	o	m	1439.0	s	20.1	AD 660	7	258937
7	38	n	o	m	1959.0	d	49.0	AD 540	7	258936
7	41	n	c	m	1922.0	d	55.7	AD 550	7	258938
7	42	n	c	m	1287.0	s	10.3	–	–	–
7	43	n	c	s	804.0	s	13.7	AD 550	7	258940
7	44	n	unk	unk	–	d	–	AD 430	7	258941
8	18	n	c	m	2593.0	s	18.2	–	–	–
10	23	r	o	m	2041.0	d	14.3	4250 BC	1	258932
10	34	r	unk	unk	–	vd	–	–	–	–
11	28	n	unk	unk	–	vd	–	–	–	–
11	29	n	unk	m	–	s	–	–	–	–
11	30	n	unk	unk	–	d	–	–	–	–
11	35	n	o	m	612.0	s	5.5	–	–	–
12	25	n	i - e - o	m	1121.0	s	9.0	AD 650	7	258933
12	26	n	t	m	2237.0	d	49.2	AD 670	7	258934
13	40	r	o	l	6091.0	s	73.1	AD 890	7	258939
14	32	n	fb	m	1130.0	s	10.1	AD 780	7	258935

Key to Symbols:
Type: n = nonrock, r = rock
Shape (orifice): a = angular, amor = amorphous; b - s = bell-shaped with oval orifice; c = circular; c2c = complex 2-chambered; d = irregular diamond; e = elongate; e - s = egg; fb = football; i/irr = irregular; k - b = kidney bean; k - s = corn kernel; o = oval; diamond; e = elongate; oct = octagonal; r = rectangular; s = nearly square; s - r = subrectangular; t = triangular with rounded corners; t - o = truncated oval; unk = unknown or uncertain
Size: l = large (67+ cm long); m = medium (39–66 cm long); s = small (17–38 cm long)
Area of orifice: length x width x .785 (area of an oval)
Depth (orifice to bottom): d = deep (19–30 cm); s = shallow (4–18 cm); vd = very deep (31–49 cm)
Volume = area of orifice x depth
Idate = calibrated intercept radiocarbon date

ground baking ovens, whether using the dry or the wet method (Black et al. 1997:Chapter 3). Unfortunately, biological data, which should assist in determining which materials were cooked in these features (Table 15.3), are not helpful in this regard. As always, the remains of species recovered from contexts such as these present problems. Which are actual food items? Which items are trash disposed into the features? And which items were introduced into the features through taphonomic agencies and were in no way connected with feature function?

Interestingly, the most common plant remains recovered from all types of thermal pits at the NM 128 sites, whether shallow, deep, or very deep, are generally the same—seeds of annuals, especially chenpodium (goosefoot), amaranthus (amaranth), and portulaca (purslane).

One of the more interesting simple thermal pit-forms is the bell-shaped pit. These are interesting because the orifices in these forms are smaller than the greatest diameters, suggesting the possibility that their function is more specialized than that of thermal pits lacking this characteristic. A baking function seems very likely since the addition of enclosed space (the bulge) would be antithetical to both open-air cooking and to accessing the contents once the cooking was completed. However, the bulge would presumably improve the efficacy of the baking process.

Seven bell-shaped pits were excavated at four of the NM 128 sites: three at LA 113042; two at LA 129300; and one each at LA 129214 and LA 129216 (Appendix 1; Table 15.4). Some are rock, others non-rock, and all are either deep or very deep and medium or large in size. They were used in most time periods, with calibrated intercept dates ranging from AD 140 to 920. All but one had been radiocarbon-dated.

Temporal Trends of Thermal Features: Rock Versus Non-Rock

The next question concerns the temporal dimension of simple thermal features. Earlier studies of the dichotomy, non-rock versus rock, at sites west of the Pecos River have shown that there is a temporal trend, with non-rock thermal features generally dating from the time of Christ to well into the historic period (Wiseman 2001). Rock thermal features, on the other hand, were used from fairly early in the Archaic period to about AD 1200 (Wiseman 2010).

The question here is, does this temporal dichotomy hold for sites lying east of the Pecos River? Unfortunately, few of the NM 128 radiocarbon dates fall within the Archaic period. Of the five that belong to the Archaic 1/Archaic 2 transition (ca. 4500 BC), the Archaic 2 (ca. 4500 to 2500 BC), and the Archaic 3 (ca. 2500 to 500 BC) periods, four are rock and two are non-rock in type. The four thermal features that belong to the Archaic 4 period (ca. 500 BC to AD 200) are evenly split between rock and non-rock. Thus, the temporal range of non-rock thermal features east of the Pecos River starts as early as 4350 BC, or over 4000 years earlier than seems to be the case for this type of thermal feature found west of the Pecos.

Regarding the late end of the thermal-feature type ranges, none of the rock thermal features date later than AD 1170. Thus, the end date of about AD 1200 for rock thermal features appears to hold for these features east of the Pecos.

Temporal Dimensions of Thermal Features by Size and Depth

Inspection of Table 15.5 shows that there is no obvious correlation between time and size or time and depth. This seems to be true for those groups having small sample sizes as well.

Complex Thermal Features

Two features—Number 65 in Block 12 at LA 113042 and Number 23 exposed in Backhoe Trench 12 near Block 11 at LA 129214— might be characterized as double thermal pits (see individual feature descriptions for these sites). That is, they appear to be features with two compartments, one upper and one lower. The question becomes: Are these designed features or are they separate features with a later pit inadvertently superimposed upon an earlier one? The best way to unravel the situation would have been to date carefully selected materials from each and compare the results. Unfortunately, this option is no longer possible in either of the present examples.

Two other possible examples of double thermal pits are Features 58/89 and Features 59/88 in Block 1 at LA 129214 (Appendix 1). In both cases, excavators assigned separate feature numbers to upper and lower pits, the lower pits having been

Table 15.3. NM 128, potential food remains, by site and thermal feature type.

		POTENTIAL FOOD REMAINS IN FILL	
FEATURE	TYPE	PLANT	ANIMAL
		LA 113042	
35	shallow, small	*Cheno-Am*	–
58	shallow, small	–	small rodent, small mammal
67	shallow, small	*chenopodium*	–
46	shallow, medium	hedgehog, horse crippler cactus	–
49	shallow, medium	prickly pear, mesquite seed/pod, unknown	–
54	shallow, medium	unknown plant	–
65	shallow, medium	*chenopodium*	unknown small animal, small mammal, medium–large rodent, medium–large mammal, cottontail
69	shallow, medium	unidentified seed	–
76	shallow, large	–	woodrat
80	shallow, large	–	unknown small animal
28	deep, medium	mesquite seed/pod	–
61	very deep, medium	*chenopodium*	small mammal, small–medium mammal, cottontail, lizard/amphibian
63	very deep, large	–	small mammal
		LA 129214	
104	shallow, small	–	small mammal
156	shallow, small	*chenopodium, portulaca,* echinocereus, unknown	unknown small animal
39	shallow, medium	–	medium–large mammal, large mammal
46	shallow, medium	*portulaca*	–
47	shallow, medium	*chenopodium, Cheno-Am*	–
50	shallow, medium	*chenopodium*	–
55	shallow, medium	–	unknown small animal
56	shallow, medium	*portulaca*	small mammal
69	shallow, medium	–	snake
70	shallow, medium	*portulaca* , unidentified seed	mussel
72	shallow, medium	*Cheno-Am* , unidentified seed	–
73	shallow, medium	*chenopodium*	–
74	shallow, medium	*chenopodium, portulaca*	–
76	shallow, medium	*portulaca*	–
80	shallow, medium	*chenopodium*	–
92	shallow, medium	*chenopodium*	–
97	shallow, medium	–	mussel
114	shallow, medium	*chenopodium, portulaca,* unidentified seed	small mammal
116	shallow, medium	*chenopodium*	–
118	shallow, medium	*portulaca*	–
121	shallow, medium	–	medium–large bird
135	shallow, medium	–	small mammal
143	shallow, medium	–	small mammal, small–medium mammal
144	shallow, medium	–	unknown small animal, small mammal, medium–large mammal
150	shallow, medium	–	small mammal, cottontail

(Table 15.3, continued)

		POTENTIAL FOOD REMAINS IN FILL	
FEATURE	TYPE	PLANT	ANIMAL
165	shallow, medium	*chenopodium*	–
68	shallow, large	*chenopodium*	–
132	shallow, large	*chenopodium*	mussel
146	shallow, large	–	small mammal, small–medium mammal
148	shallow, large	–	small mammal, small–medium mammal
43	shallow, unknown	*chenopodium*	–
96	deep, small	unidentified seed	small mammal
102	deep, medium	–	jackrabbit
120	deep, medium	*chenopodium* , monocot, *portulaca* , unknown plant, unidentified seed	–
155	deep, medium	–	medium–large rodent
173	deep, medium	*portulaca*	small mammal/medium–large bird, medium artiodactyl, large mammal
138	deep, large	–	small mammal, unknown small animal
142	deep, large	–	unknown small animal, small mammal, lizard/amphibian, mussel
64	deep, unknown		lizard
66	deep, unknown	*chenopodium*	–
110	very deep, medium	unknown plant	–
159	very deep, unknown	*chenopodium-portulaca*	–
LA 129216			
14	shallow, small	*portulaca*	–
16	deep, medium	*chenopodium*	–
17	deep, medium	*portulaca*	–
10	deep, large	*chenopodium*	–
19	very deep, medium	amaranth, *Cheno-Am* , *mollugo, portulaca,* asteraceae, unknown plant	–
20	very deep, medium	*chenopodium, portulaca*	–
LA 129217			
10	shallow, large	*chenopodium*	–
LA 129218			
8	shallow, medium	unknown plant	–
11	shallow, medium	unknown plant	–
LA 129300			
18	shallow, medium	*chenopodium* , unknown plant	–
25	shallow, medium	*chenopodium*	–
35	shallow, medium	fabacaceae, unidentified seed	–
1	shallow, large	unidentified seed	–
23	deep, medium	–	small mammal, mussel
26	deep, medium	*portulaca*	–
38	deep, medium	unknown plant	–

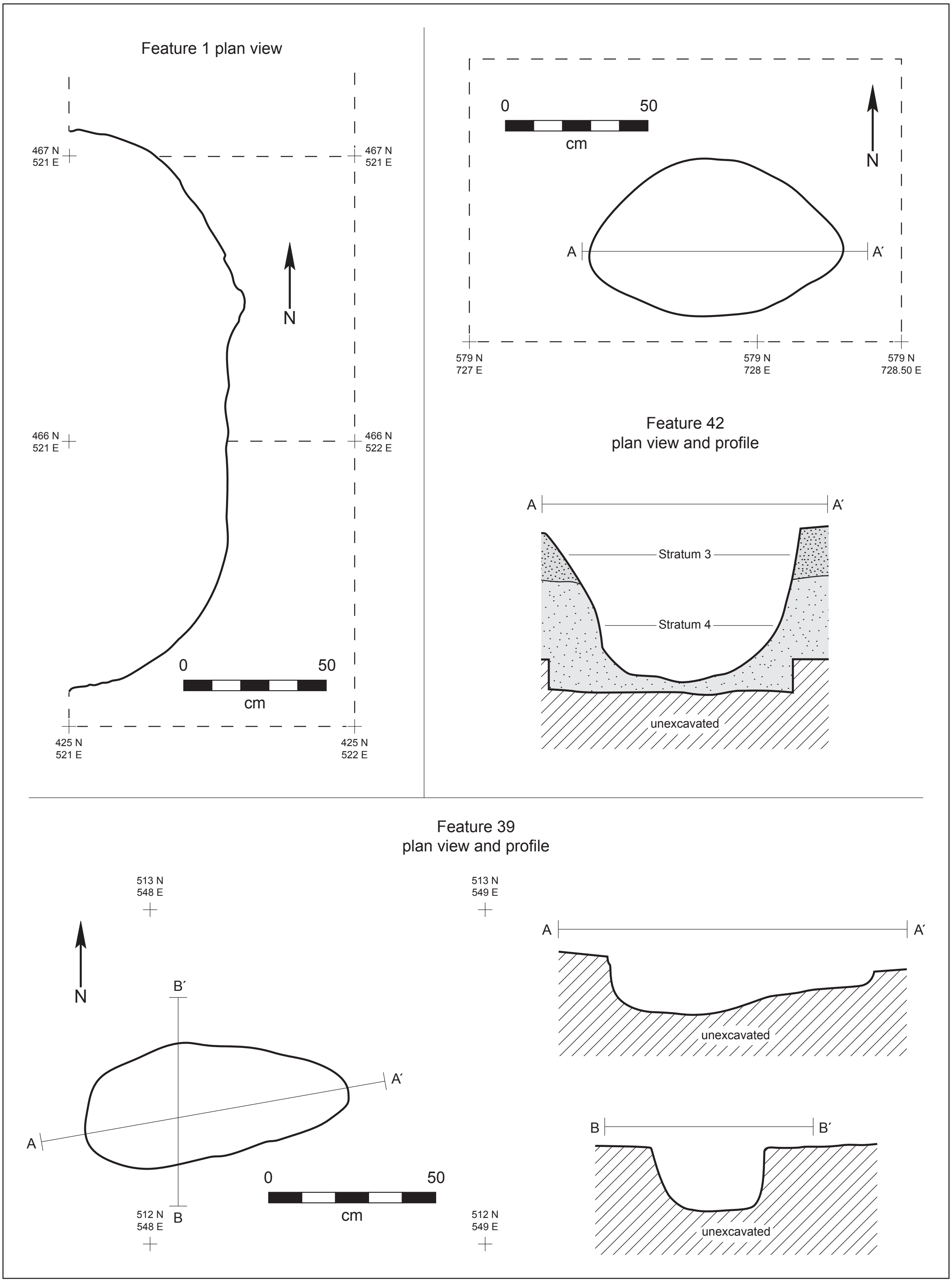

Figure 15.2a. Plans and profiles of NM 128 pits from Features 1 and 39.

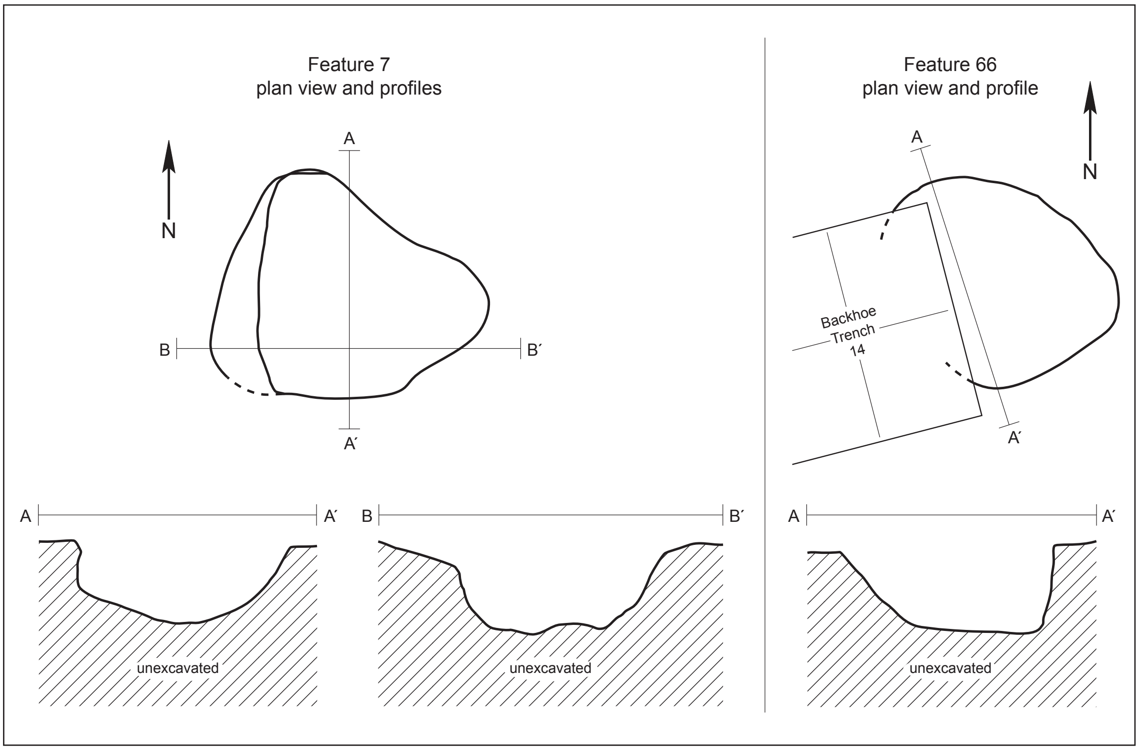

Figure 15.2b. Plans and profiles of NM 128 pits from Features 7 and 66.

Table 15.4. NM 128 bell-shaped thermal features.

SITE	BLOCK	FEATURE	TYPE	DEPTH	SIZE	I DATE*
LA 113042	1	40	nonrock	deep	medium	920
	14	63	rock	very deep	large	140
	16	68	nonrock	very deep	medium	130
LA 129214	9, BHT 11	152	nonrock	very deep	uncertain	650
LA 129216	10	16	rock	deep	medium	600
LA 129300	7	38	nonrock	deep	medium	540
	11, BHT 4	30	nonrock	deep	uncertain	–

*calibrated intercept date AD

discovered at later dates, after excavations were deepened. Uncertainty remains as to whether these examples represent individual features with upper and lower compartments or whether the secondary pits were later features superimposed over earlier ones. Given the slightly off-center locations of the lower features (i.e., slightly west of the centers of the upper features) and their arcs, the lower features appear to have been separate, earlier features rather than lower compartments of the upper features. Neither lower feature was completely exposed by excavation. Interestingly, all four features were dated, with the following results in Table 15.5a.

As will be shown in a later section of this report, these dates probably represent three different episodes of use in spite of what might be assumed from similar single-standard deviations. According to the analysis by Steven Lakatos (this report) using the OxCal routine, the dates for Features 89 and 58 center at about AD 100 and could be contemporary, perhaps even as a true double-thermal pit. However, it is also possible that these numbers represent closely sequential but separate, partly superimposed features built and used a few years apart.

The dates for Features 88 and 59 are both later than for Features 89 and 58. The date for Feature 59 is later than that for Feature 88. That is, the date for Feature 88 appears to be about AD 130 to 140, while the date for Feature 59 probably occurred from AD

Table 15.5. NM 128, intercept dates of thermal features, by depth, size and type. All dates are AD unless specified as BC.

SITE	FEATURE	TYPE	DATE*
Shallow, Small Size			
LA 113042	37	rock	1030
LA 129214	180		550
	57		680
LA 113042	58	nonrock	570
	67		640
	49		660
	56		1030
	41		1040
LA 129214	82		450/450/460/480/530
	63		570
	156		670
	54		710/750/760
	181		770
	106		870
	104		890
	154		900/920/950
	163		970
	101		980
	145		1020
LA 129216	15		900/920/950
	14		1030
LA 129300	43		550
Shallow, Medium Size			
LA 113042	78	rock	210
	73		650
	36		1020
	75		140
	122		250
	73		380
	80		420
	129		540
	141		670
	74		680
	103		690
	72		710/750/760
	87		770
	143		900/920/960
	114		1010
	144		1020
	62		1160
	157		1170
LA 129218	8		1030
LA 113042	64	nonrock	540
	46		690
LA 129214	47		230
	59		250
	71		410
	76		410
	55		620
	151		650

250 to 300. The example for Features 88 and 59 is more clearly an instance of feature superimposition.

As an aside, it is pertinent to note that Features 89, 58, 88, and 59 are situated west of possible windbreak Features 40 and 41 in an area where one might expect to find thermal features associated with the use of the windbreak. Assuming there was more than one period of use of this windbreak, this would partly explain how superpositioning could occur.

Horizontally paired thermal pits are a different phenomenon. These consist of two features located near one another in a manner that suggests that the two functioned as a pair. Our examples are Feature 33—Block 2 at LA 113042—and Feature 86—Block 9 at LA 129214.

Feature 33 at LA 113042 is a confusing array of pits and cultural debris. Thermal Features 33.1 and 33.2 are situated at either end of a large, shallow, irregularly shaped depression that may or may not have been intentionally created (Appendix 1). Furthermore, these features may or may not have been functionally related to the depression or to each other. The fill of the depression contained burned rocks and calcrete fragments of various sizes and shapes that were situated in seemingly haphazard positions relative to one another. Chipped lithic artifacts, organically stained sediments, charcoal, and "ash" were scattered throughout the fill. However, no potential botanical or faunal foods were recovered from any part of this feature. Because spots of oxidation appeared here and there on the bottom of the depression, the depression and the trashy fill may well be the result of some sort of large cooking or baking event. It is not clear whether Thermal Features 33.1 and 33.2 were part of this event. The question would be whether they were created prior to, or subsequent to, the use of the depression. Only one radiocarbon date—cal intercept AD 1020 (Beta 258895)—was obtained from a palimpsest sample taken from this feature (though in Table 15.2 the date is listed, for convenience, as 33.1).

Feature 86 at LA 129214 is an elongate feature with a shallow basin at the south end and a deeper one at the northern end. The overall configuration of the shape and profile suggest these basins functioned as a unit. However, no botanical or faunal materials were recovered from either pit to assist in determining what its function might have been. An intercept date of cal AD 1000 came from the deeper, northern pit, 86n.

(Table 15.5, continued)

SITE	FEATURE	TYPE	DATE*
	94		670
	182		670
	93		770
	95		810
	99		890
	153		890
	115		900/920/960
	137		980
	86n		1000
	167		1010
	39		1020
	46		1020
	118		1030
	134		1030
	79		1040/1100/1120
	135		1060/1080/1150
	53		1140
	50		1160
	116		1200
	51		1210
	98		1210
	149		1270
	133		1400
LA 129216	13		420
LA 129218	12		1010
	11		1030
LA 129300	25		650
	37		660
	32		780
Shallow, Large Size			
LA 113042	80	rock	140
	77		610
	75		690
	33.1		1020
LA 129214	132		260/280/330
	68		550
	146		900/920/950
	162		1020
LA 129300	40		890
LA 129214	158	nonrock	770
	148		890
Deep, Small Size			
LA 129214	52	nonrock	890
	96		1040
LA 129218	23L		4350 BC
Deep, Medium Size			
LA 129214	105	rock	640
	120		680
	136		690
	131		810
LA 129216	16		600
LA 129300	23		4250 BC
LA 113042	40	nonrock	920 BC
	28		1000
LA 129214	58		90

Feature 86 is very similar to Features 16, 22, 35, and U—found during the WIPP project excavations at nearby ENM 10418 (Lord and Reynolds 1985 Figs. 4.18, 4.23, 4.25, and 4.28). Charred floral remains, which might indicate materials processed in some of these features, include euphorbia (16, 35) and mesquite (35) (Lord and Reynolds 1985: Table 7.2). No faunal materials were recovered from any of these features. Uncalibrated radiocarbon dates are AD 340 (Feature U) and AD 520 (Feature 35) (Lord and Reynolds 1985:95,105).

Postholes/Supports

Twelve small-diameter pits and one concentration of stacked rocks at sites LA 113042, LA 129214, LA 129222, and LA 129300 were assigned feature numbers and documented as postholes (Table 15.6). As such, they are believed to have been postholes for vertically placed wooden members that held up some sort of shades or racks. Two postholes in the floor of the wickiup floor (Feature 300) at LA 129214 are not included in this total.

Additionally, five holes of similar size in the calcrete exposures in Blocks 7 and 14 at LA 129214 were noted but not assigned feature numbers and also were not documented in detail. Nevertheless, these possible postholes are included in the analysis of activity areas (site structure) presented in another chapter of this report.

All postholes are simple holes in the ground. Most have remained unmodified, though some had small rocks, in the side walls or at the bottom of the holes that may or may not have been intentionally added for post support. Designation as a posthole was, in most cases, based on small diameter size. However, three holes are 20 to 22 cm in diameter, suggesting that they might have instead been small thermal pits, but the colors and contents of their fills—no charcoal staining and few or no charcoal flecks and pieces—indicate otherwise. The features varied in size from 8 to 22 cm in diameter and from 4 to 31 cm in depth.

Nine of the postholes occurred singly, two were paired, and four were found near to one another. Since the paired postholes in Block 20 of LA 129214 were situated only 10 cm apart, they may have functioned together in some way. The four postholes in Block 9 of LA 129214 all occurred within a few

(Table 15.5, continued)

SITE	FEATURE	TYPE	DATE*
	123		260/290/320
	119		660
	102		890
	155		900/920/950
	84		1020
LA 129216	17		390
LA 129218	13		1050/1090/1130/1140
LA 129300	38		540
	41		550
	26		670
Deep, Large Size			
LA 129214	142	nonrock	890
	138		1060/1080/1150
LA 129216	18		380
Very Deep, Small Size			
–	–	–	no examples dated
Very Deep, Medium Size			
LA 113042	81	rock	670
LA 129214	109		420
LA 129216	19		540
LA 129218	16		4340 BC
LA 113042	68	nonrock	130
LA 129214	110		430
LA 129216	20		440/490/520
Very Deep, Large Size			
LA 129218	14	rock	4540 BC

meters of one another; however, these were exposed in the sides of a backhoe trench and cannot be adequately evaluated for interfunctionality.

Feature 140 in Block 13 of LA 129214 consists of a 55 cm diameter, 10 cm high, partially collapsed or dismantled stack of unburned and burned rocks surrounding an open area devoid of rocks. No evidence of a hole, extending below the void, was noted in the underlying soft fill. The only logical explanation for this configuration is that it once supported a vertical timber for a shade or other device, but this is strictly conjectural.

Pits

Only eight pits were found at the project sites. All are simple, unmodified pits dug into the ground. None are standardized as to size or shape (Fig. 15.2a to 15.2c; Table 15.7). Features 48 and 53 at LA 113042 and Feature 39 at LA 129300 were sufficiently large and of a shape to be appropriate for sleeping pits, or alternatively, as human graves. No bones or other evidence was recovered to substantiate such use. The rest of the pits are assumed to have been used for the storage of items or foodstuffs.

Burned Rock Concentrations

Feature 11 in Block 9 of LA 129216 was discovered in the face of Backhoe Trench 1. It consists of 277 pieces of burned caliche/rock situated in a shallow, irregularly shaped pit that measures 125+ by 114 by 10 cm (Fig. 9.5a to Fig. 9.5b). While a feature such as this would normally be interpreted as a baking facility, the notes are clear than no charcoal was associated with the rocks, even though they were burned and fire fractured. Therefore, a functional interpretation is currently lacking. Hall (this report) suggests that this feature and Feature 12 (Fig. 9.6), which does have some charcoal associated with it, are cultural because of their nature and sediment-unit association and, on the basis of interpolated OSL dates, date to the Paleoindian period.

Cache

Feature 44 in Block 1 at LA 113042 is one of the more curious features encountered during the project and appears to be a cache of unburned calcrete/caliche rocks (Figs. 7.11 and 7.12). The 68, closely packed, carbonate rocks (mostly tabular, 10 to 25 cm long, and 5 to 7 cm thick) evidently had been placed in an oval pit with a concave bottom, though the sides and bottom of the pit could not be discerned, except by reference to the configuration of the rocks. Many of the rocks had been placed on edge or at an angle, perhaps to facilitate ground-moisture drainage. The sediment in the interstices among the rocks contained neither charcoal (stain or fragments) nor artifacts. The overall size of the cache is 72 by 53 by 28 cm.

Windbreak

At LA 129214, three natural calcrete outcrops—Features 40, 41, and 42—were exposed in Block 1 (Figs. 8.4 and 8.5). This would not be considered unusual except for the fact that, when first encountered, they all had piles of loose cobbles of varying sizes sitting directly on top of them. Other cobbles were

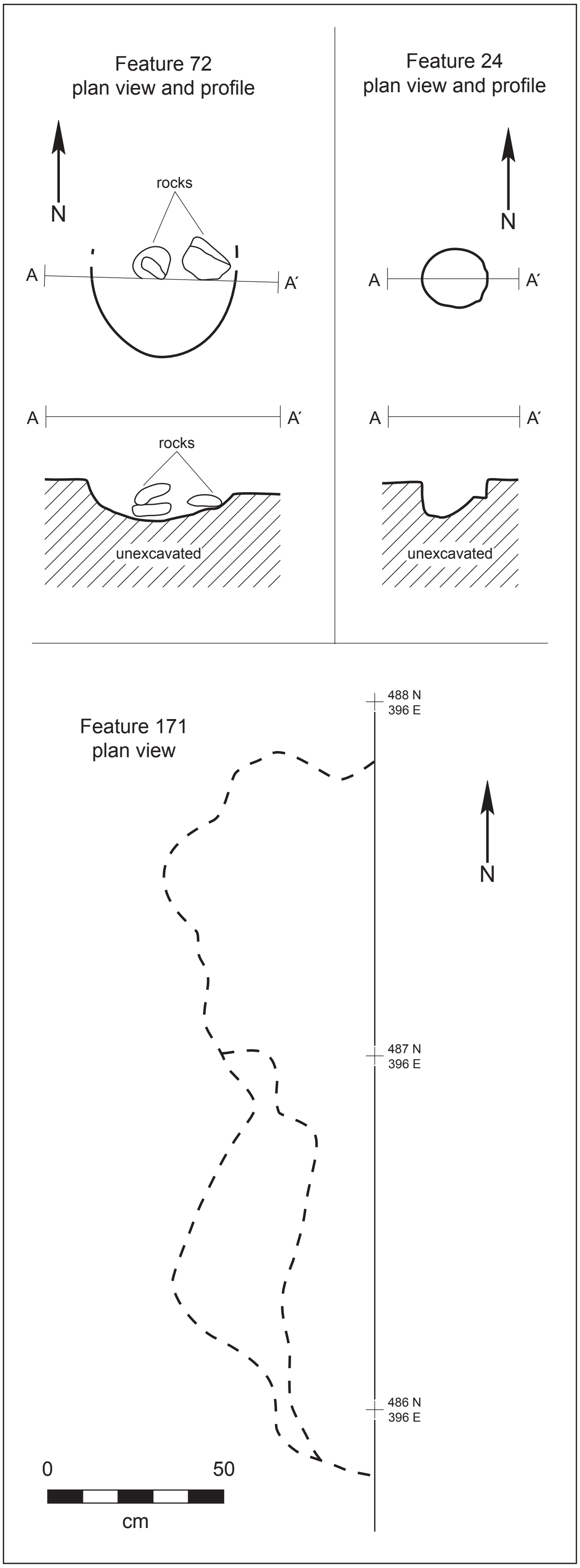

Figure 15.2c. Plans and profiles of NM 128 pits from Features 72, 24, and 171.

scattered around the sides as if they, too, had at one time been up on top.

Since it seems fairly clear that the cobbles were not placed in these positions through natural means (i.e., weathering), it was concluded that they had been piled on top by humans. If true, the primary purpose for such an activity might have been to weight down hides, mats, brush, or similar materials for use as roofing materials for makeshift shades or structures. From their relative positions and their orientations, Features 40 and 41 probably functioned together. Feature 42, positioned a short distance to the northwest of 40 and 41 may have functioned independently or could have been used in concert with them.

When we combine this notion with the placement of nearby thermal features and a study of associated artifact patterns, the whole scene is very reminiscent of a camp area not too different from that illustrated by O'Connell (1987:Fig. 1) for the Alyawara settlement of Bendaijerum in central Australia. This point is discussed further in the following chapter of this report.

Wickiup Structure

Feature 300, in Block 5 at LA 129214, is the remains of a wickiup, or brush, structure (Figs. 8.7 and 15.3a—15.e). It consists of a large, roughly oval, horizontal open space within the calcrete bedrock. A narrow horizontal break in the southeast side might be an entry point. Within the open space, several profiles define a slightly depressed use-surface bearing two thermal features (Features 61 and 81) and two irregularly placed postholes (Features 67 and 90). It is assumed that the superstructure was a dome-shaped affair made of perishable elements, but no evidence, such as peripheral pole holes or burned materials, was found. Various details about Feature 300, including measurements, can be found in the individual feature descriptions for LA 129214.

Radiocarbon samples from Features 61 and 67 indicate use of this structure in the mid AD 600s or later (Beta 232973 and 258476).

A third thermal feature (74) superimposed on top of the calcrete along the west edge post-dates Feature 300 as determined from its higher stratigraphic position and slightly later radiocarbon date (Beta 232975).

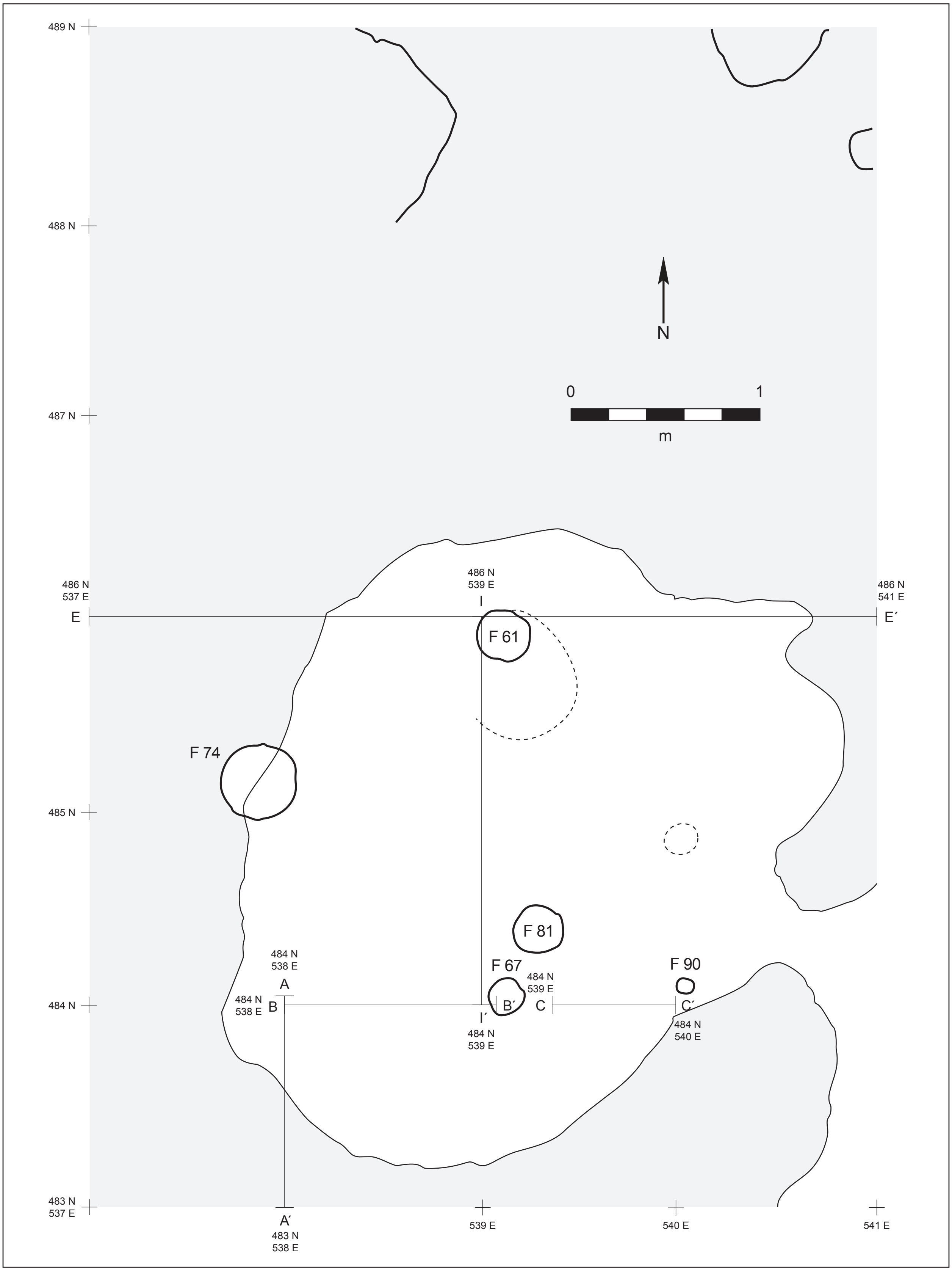

Figure 15.3a. Plan of Feature 300.

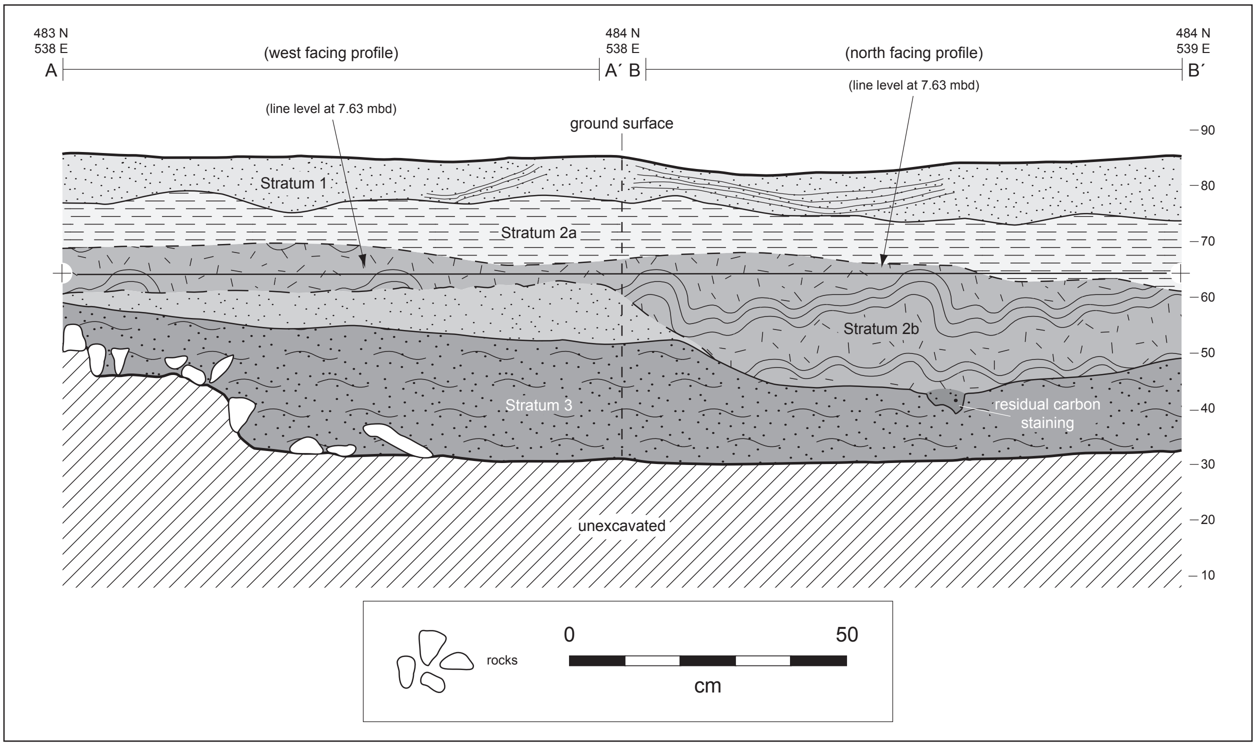

Figure 15.3b. Feature 300, profile.

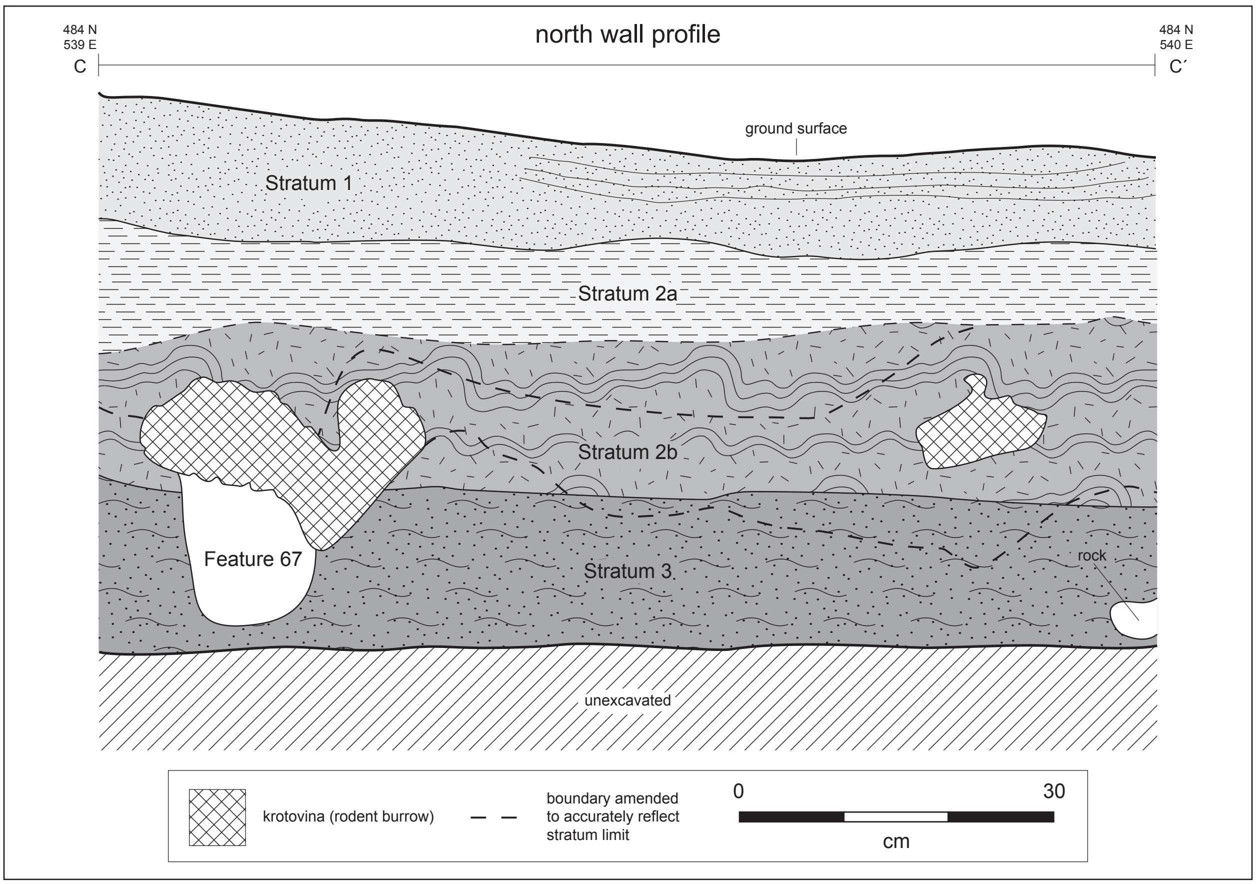

Figure 15.3c. Feature 300, north wall, profile.

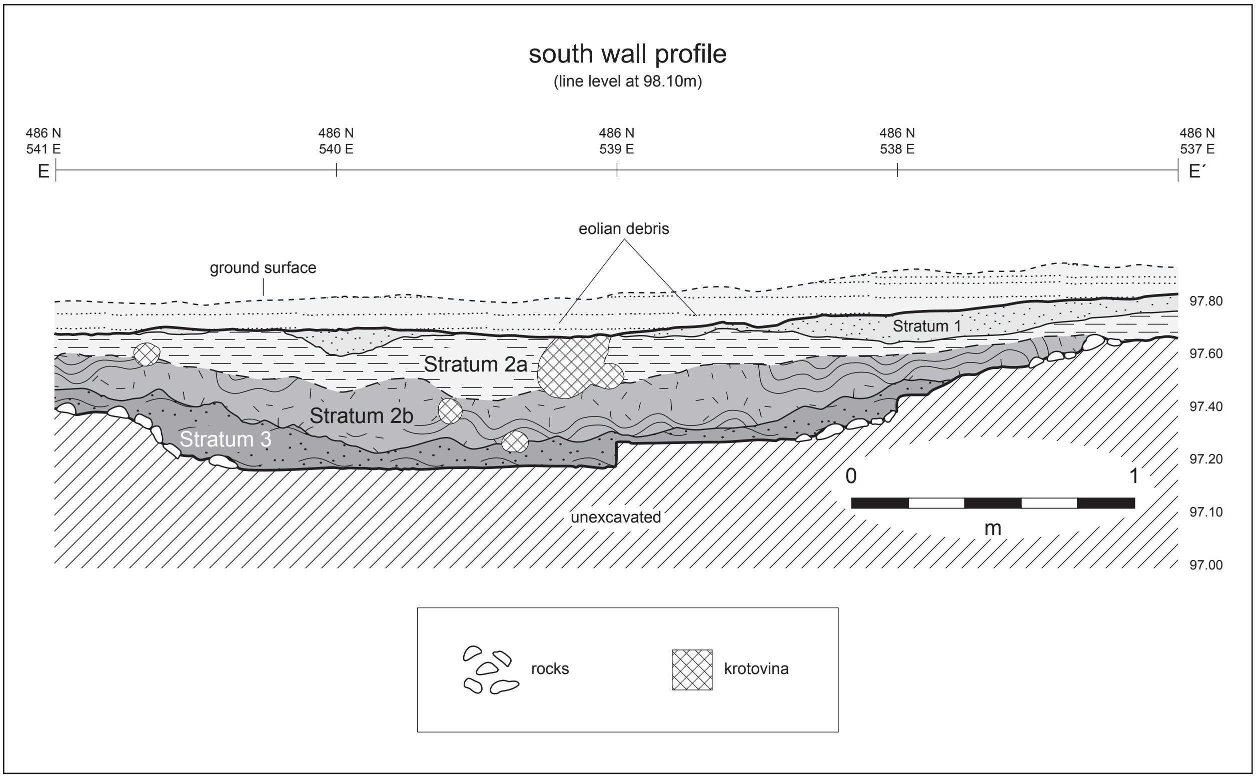

Figure 15.3d. Feature 300, plans and south wall profile.

Table 15.5a. LA 129214, Block 1, dating of double thermal pits, Features 58/89 and 59/88.

Site	Block 1				
	Double Thermal Pit Divisions	Feature	Date	Intercept	
				1 SD	2 SD
	Thermal Pit 58/89				
LA 129214	Upper part	58	AD 90	60–130	20–220
	Lower part	89	AD 120	80–140	50–230
	Thermal Pit 59/88				
	Upper part	59	AD 250	230–260/140–380	280–330
	Lower part	88	AD 140	120–230	70–250

SD - Standard Deviation

Use-Surface/Shelter Floor

Feature 301, in Block 7 at LA 129214, appears to be the remains of a surface that most likely signifies the presence of some sort of temporary shelter (Fig. 8.7). It is manifest as a 1 cm thick, compacted layer of sediment which might have been a prepared surface or a surface compacted through continuous and frequent human use. Probably due to the wear and tear it received through the centuries, it has an irregular, semi-rectangular shape and covers an area of approximately 2 sq m in Units 485N/524E and 486N/524E. Its very nature strongly suggests that it may have been the floor of a shade structure or that was next to a vertical windbreak that was not, or could not, be further defined archaeologically. The important point is—whether it was actually prepared by laying down a layer of mud or having it form through repeated trampling—the layer is restricted to a tightly delimited space and is clearly unusual for the project sites. No radiocarbon dates have been directly associated with this surface. However, Thermal Pit 47 located one or so to the east, produced a calibrated intercept date of AD 230 (Beta 232968) and might have been related to this feature.

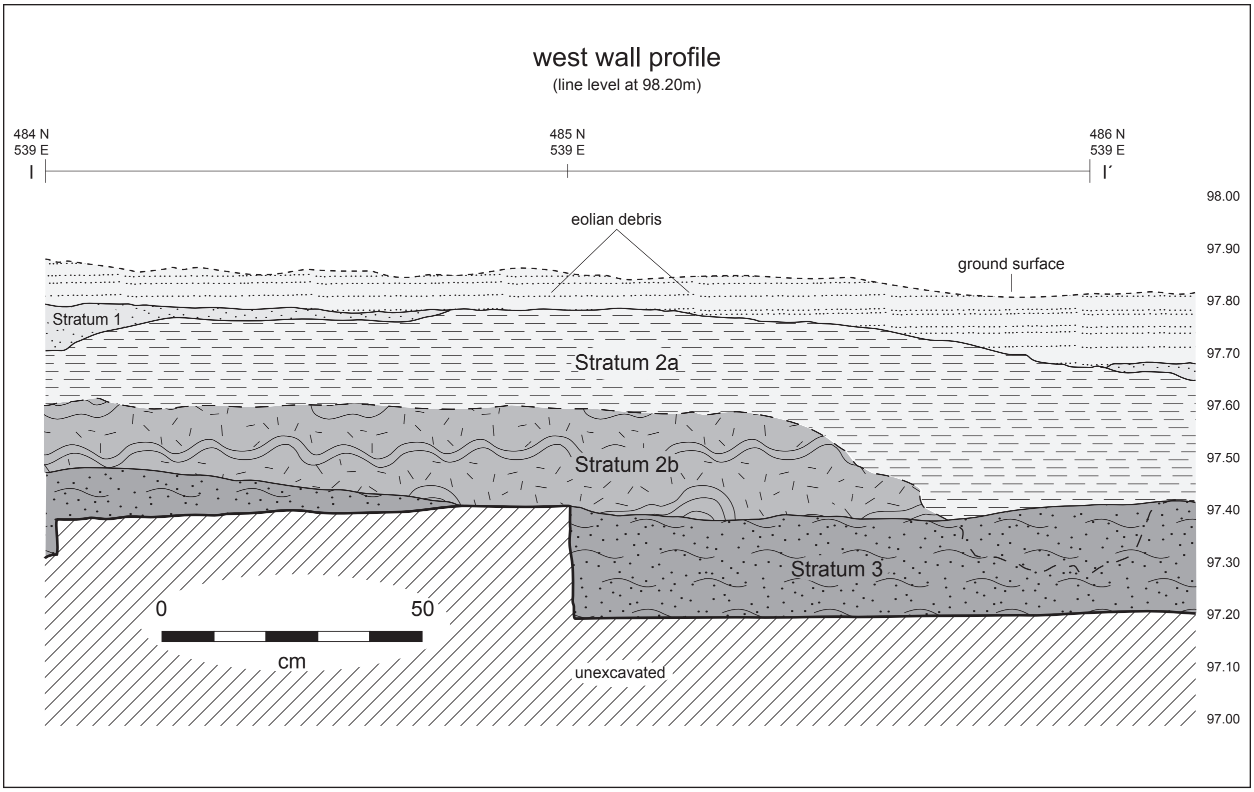

Figure 15.3e. Feature 300, west wall profile.

Table 15.6. NM 128, postholes at project sites.

SITE	BLOCK	FEATURE	DIMENSIONS (CM)	COMMENTS
LA 113042	1	32	15 x 11 x 16	LA 113042 in sides.
	3	52	10 x 10 x 20	–
	5	47	9 x 9 x 10	6 x 3 x 2 cm rock in bottom.
LA 129214	9	168	11 x 10 x 17	A few small rocks in sides.
		169	12 x 10 x 19	–
		170	11 x 11 x 26	–
		192	12 x 4+ x 14	–
	12	172	10 x 8 x 5	Possibly associated with thermal pits186 and/or 176.
	13	140	55 x 55 x 22	Stacked rock feature.
	20	178	20 x 12 x 8	Possibly associated with Feature 186.
	–	186	8 x 8 x 4	Possibly associated with Feature 178.
LA 129222	1	3	19 x 19 x 9	–
LA 129300	6	22	20 x 15 x 6	–

Table 15.7. NM 128, pits at project sites.

SITE	BLOCK	FEATURE	DIMENSIONS (CM)	COMMENTS
LA 113042	1	53	196 x 64+ x 46	Half excavated; possible use as thermal pit infill at one end.
	3	48	88 x 55 x 52	Well defined.
	12	72	35+ x 43 x 24	Faint boundaries; ground stone fragments in fill; half excavated.
	15	66	86 x 46+ x 3	Partly filled with trash.
LA 129214	19	171	190+ x 55+ x ?*	Very large pit with diffuse, irregular outline; trash fill.
LA 129222	2	7	53 x 45 x 19	Opening triangular with round corners; steep sides and bumpy bottom.
LA 129300	5	39	93 x 38 x 25	Well defined by soil color and texture.
	6	24	22 x 18 x 10	Appropriate size for a thermal pit but no evidence of such use.

*depth not recorded

Natural Water Catchment, Spring, or Prehistoric Hand-Dug Well

Feature 44, in Block 2 at LA 129214, was located near the base of the east slope of the back ridge, just above the west margin of the drainage which separates the back ridge from the front ridge. It lies within a 3 by 3 m area between grid units 507–510N/534–537E. The feature consists of an irregularly oval-shaped opening in the calcrete, the western half of which was excavated.

The horizontal outline of the opening—partly defined at a depth of approximately 1.5 m below the modern surface—is at least 2 m in diameter (Fig. 8.6). Excavation within the opening terminated at a depth of 2.5 m where a basin-shaped bottom defined by calcrete was exposed.

Three units of sediment—described as semi-consolidated, very fine-grained, yellowish-brown (Munsell 10YR 4/4 to 5/4) silty, sandy loam bearing less than 1 percent caliche and roots—were recorded from top to bottom.

Excavators believed that this feature was a natural water catchment or possibly a dried-up spring. To this might be added the possibility that it was (presumably) a failed hand-dug well similar to those documented in Archaic contexts such as Mustang Springs near Midland, Texas (Meltzer 1991).

If a failed well, the presumption of failure is based on the fact that the digging had not penetrated the calcrete to an underlying water-permeable unit. However, no evidence of digging marks was noted by the excavators, nor was any coarse, well-polished, rounded sediment grains, typical of springs, noted in the lower sediments of the feature.

16 ⚶ Description and Analysis of Site and Inter-Site Structure

Regge N. Wiseman

To a greater or lesser extent, each excavation block in each site constitutes at least part of an activity area. Prior to analysis, some sites, especially those with thermal features, have the potential for being residential camps of greater or lesser duration. At least two, Blocks 1 and 5 at LA 129214, contained the remains of shelters (or structures). Block 1 has the initial appearance of a more or less complete camp composed of one structure, its associated clearing, extramural thermal features, and at least part of a refuse zone. The model that assists in the definition of this camp is described and illustrated by O'Connell (1987) and is summarized below.

Most blocks, however, exposed only portions of camps, especially the parts containing thermal features. In the smaller blocks, excavations were too limited to uncover all of the evidence of the camp or camps represented by thermal features. For some of the larger blocks in which full household-camp footprints were not located, the positioning of the excavation units may have been incorrect. There is also the possibility, even the probability, that not every occupation within the site was of a nature conducive to producing a household-camp footprint.

This section of the report examines only the larger blocks at each site that have the prospect of defining camp footprints in part or in total. One small block, Number 16 at LA 129214, is included in this discussion because of its unusually high density of artifacts. LA 129216 lacked large block excavations and is omitted here.

Modeling the Organization of a Household Camp: The Alyawara Model

The model of the household camp described here is that presented by James O'Connell in his study of two modern Alyawara settlements in central Australia (O'Connell 1987). At the time of the study, one settlement, Bendaijerum, was inhabited, and the other, Gurlanda B, was abandoned. The author summarizes his documentation of the individual household camps comprising Bendaijerum in a study that covered an 11 month period. At Gurlanda B, O'Connell and his students mapped and inventoried the abandoned settlement that had been occupied for about two years. Of the many important and informative details that O'Connell relates, several are particularly pertinent to our study of the prehistoric hunter-gatherers of southeastern New Mexico. These include:

1. Fluctuations from 20 to 200 people resident in Bendaijerum during the study period of 11 months;

2. Some people were resident for the full study period, others for only part of that time; the people came and went for a variety of reasons;

3. Bendaijerum covered a large area measuring 600 by 400 m; the settlement was composed of 23 individual household camps, but also contained the remains of 105 previously occupied camps;

4. Those households present for six months or longer during the study period moved their main shelter an average of five times, sometimes only a meter or two from its previous location and, at other times, up to several hundred meters; this resulted in the creation of individual camps that might be detectable archaeologically; later camps sometimes were partially imprinted over earlier ones, obfuscating the integrity of the patterning for both;

5. The activities at each household camp at Gurlanda generated enormous amounts of refuse of all sorts that are estimated to have numbered upwards of 1 million items (O'Connell 1987:91). While many of these remains are of modern materials that are more durable (metal, plastic), during pre-modern times, similar numbers of items would have been generated using only natural materials (stone, plant materials) during the manufacture and repair of shelters, equipment and tools. The primary difference between the modern and aboriginal camps,

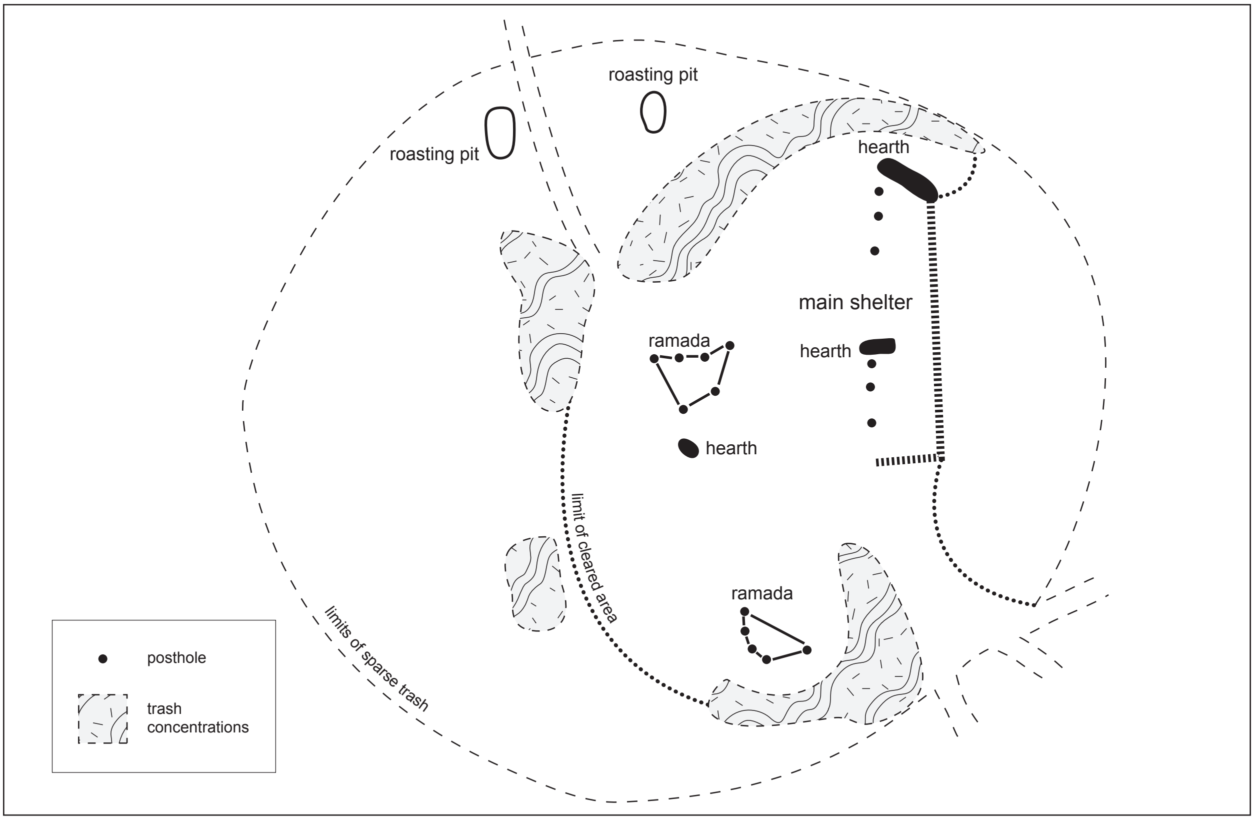

Figure 16.1. Model of an Alyawara Household Area (adapted from O'Connell 1987:Fig. 1).

of course, is the limited survival of perishables as part of the archaeological record;

6. The internal layout of household camps was sufficiently regular that a model camp can be illustrated.

The ideal model of an Alyawara household camp as illustrated by O'Connell is presented here as Fig. 16.1 (O'Connell 1987:Fig. 1). This camp varies in diameter according to the number of people living in it but usually runs on the order of 30 to 50 m across. The several features or activity areas of this model are a shelter of some sort (usually a windbreak or sunshade) on the windward side, with several zones sequenced outward from it. These zones are: a cleared area in and next to the shelter where the people carry on various activities of daily living, this area may contain smaller shades and fire pits; a partial ring of small-item debris and fire-pit ashes surrounding the clearing; and an outer zone containing scattered large items of refuse and larger thermal features for roasting large quantities of foodstuffs.

By including this model of a household camp in this report I am not suggesting that this is the only possible camp layout, nor am I suggesting that the pattern of this camp will necessarily be found among the remains uncovered at the NM 128 project sites. It does, however, provide some perspective that might be useful in examining and evaluating project excavation blocks. As it turns out, there seem to be strong similarities between the model and the overall features of at least one block, Number 1 at LA 129214. The following sections assess each block from the perspective of the O'Connell model.

LA 113042

Because Blocks 1 and 2 adjoined to one another, they are discussed together here as Blocks 1/2. They contain the widest array of features types of any block at this site and for the project as a whole. Eleven thermal pits, one posthole, one large pit, and a cache pit are all present (Fig. 16.2).

Interestingly, the block contains two large, "empty" spaces, one of them surrounded by features. Given the size of the combined blocks, we might expect to be able to discern elements of an

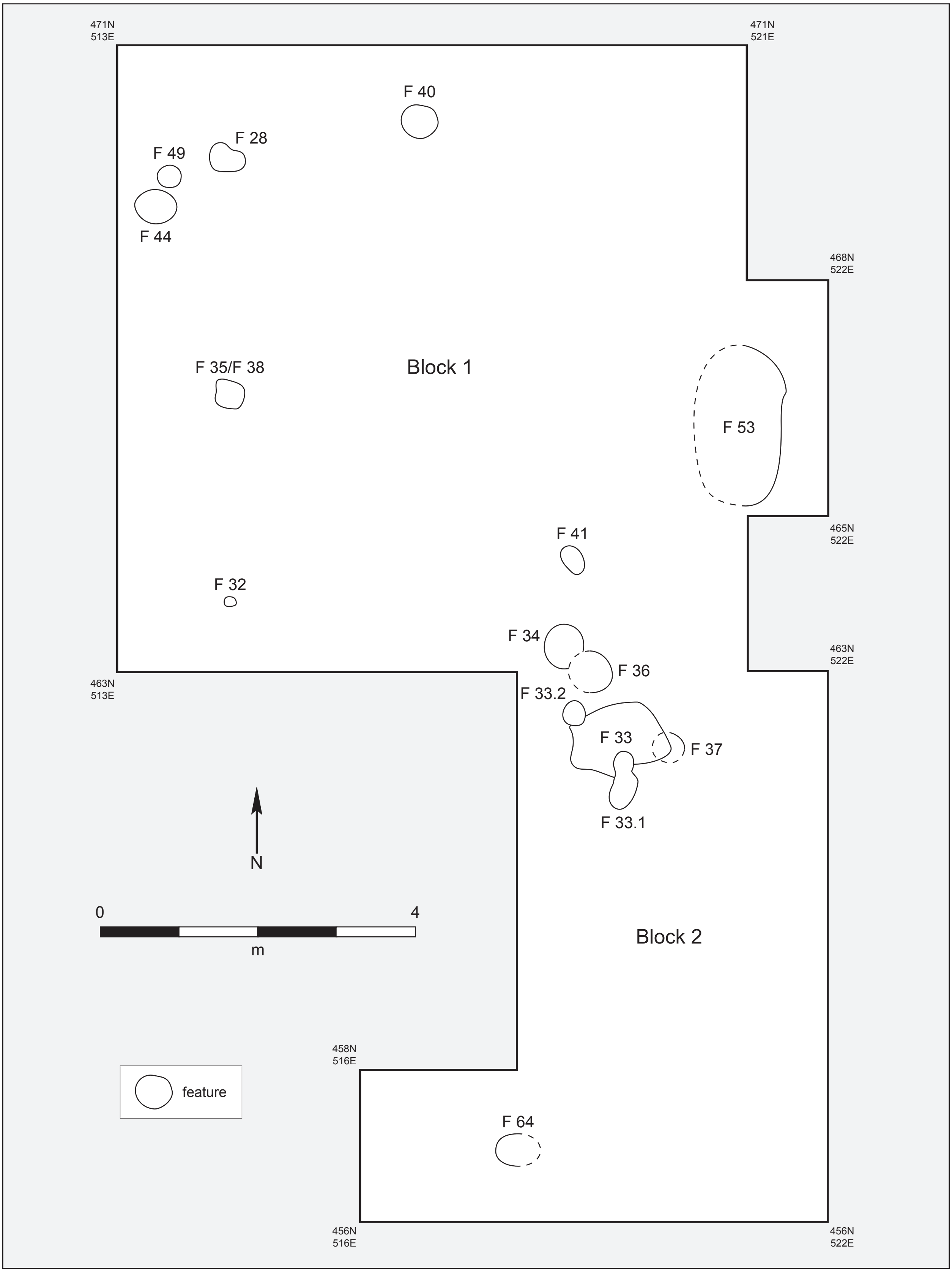

Figure 16.2. LA 113042, Blocks 1 and 2, feature distribution.

Table 16.1. LA 113042, Blocks 1 and 2, summary of features and radiocarbon dates.

FEATURE	CHARACTERISTICS	RADIOCARBON CALIBRATION I DATE (AD EXCEPT AS NOTED)	BETA ANALYTIC SAMPLE NO.
Nonrock Thermal Features			
28	thermal n/d/m*	1000	258894
34	thermal n/s/l	–	–
35/38	thermal n/s/s	–	–
40	thermal n/d/m	920 BC	258898
41	thermal n/s/s	1040	258899
49	thermal n/s/s	660	258902
64	thermal n/s/m	540	258905
Rock Thermal Features			
33.1	thermal r/s/l	1020	258895
33.2	thermal r/s/m	?	?
36	thermal r/s/m	1020	258896
37	thermal r/s/s	1030	258897
Posthole			
32	posthole	–	–
Pit			
53	sleeping pit or burial pit?	–	–
Cache			
44	rocks (for use as heating elements?)	–	–

*Characteristics: type/depth/size, where type n = nonrock; r = rock;
depth s = shallow; d = deep; vd = very deep; u = unknown or uncertain;
size s = small; m = medium; l = large; u = unknown or uncertain.
IDates are the calibrated radiocarbon intercepts.

Alyawara-like camp layout. The distribution of refuse, as expressed by lithic debitage, the most numerous of cultural categories should be key to discernment of just such a layout.

Also, a tight cluster of thermal features bearing very similar radiocarbon dates will be discussed as a group.

Thermal Pit Cluster: The cluster of six thermal features includes 33.1, 33.2, 34, 36, 37, and 41 (Table 16.1). Rock type thermals (33.1, 33.2, 36, and 37) and non-rock features (34, 41) are represented. All of the rock thermals are shallow but range from small to large in size. Both non-rock thermals are also shallow, but one is small and the other is large.

The status of Features 33.1, 33.2, and probably 37 is problematic to a degree, for they are peripheral to Feature 33. Thus, they may represent clean-out debris from Feature 33, or one or more of them might be smaller thermal features not directly related to the functioning of Feature 33.

Four radiocarbon dates obtained for four of the features (33.1, 36, 37, 41) are all so similar that these facilities could have been created, and used, by the same group of people over a short period of time (calibrated intercepts from AD 1020 to 1040), perhaps on a seasonal basis or even during the same camping event.

Other Thermal Features: The remaining Thermal Features 28, 35/38, 40, 49, 64 are scattered throughout the block. All are non-rock in type. Features 35/38, 49, and 64 are shallow, with 35/38 and 49 being small and 64 medium in size. Both 28 and 40 are deep and medium in size and may represent pit-baking of foods, rather than the warming and roasting functions suggested by Features 35/38, 49, and 64.

Miscellaneous Feature Types: A single, small pit (32) that may be a posthole, is situated in the southwest corner of the block. Its function, though strictly conjectural, might have been as a single-post, lean-to shelter or shade. If part of a larger construction, its companion postholes may well lie outside the excavated block.

A large pit (53), at the eastern edge of the block, is 2 m long and about 1 m wide. As stated in the Feature Analysis section of this report, it is possible that this structure could have been either a sleeping pit or a grave.

One of the more interesting features is Number 44, a cache pit filled with usable rocks/caliche fragments. It is possible that these fragments were cached here for use as thermal pit elements. The caching of these presumably mundane items could have been advantageous; these items were close to the location of their intended use, but were well hidden from others when the owners were not present.

Thermal elements certainly stand in stark contrast to better known, often-cached items such as high-quality knapping materials, grinding equipment, and other artifacts, yet, if good thermal elements were not readily available at frequently used camps, securing a guaranteed supply for use during the next visit makes perfect sense. This is not so surprising if my impressions—that much of the project area was desert grassland during the Prehistoric period—are correct. That is, with a healthy grass cover to hamper visibility of the surface, searches for suitable rocks would have been more time consuming than is the case today.

Radiocarbon Dating and Diagnostic Artifacts: Eight radiocarbon dates obtained from features in Blocks 1 and 2 demonstrate an intermittent, 2000 year use of the locus. Thermal Pit 40 produced a calibrated intercept of 920 BC (Beta 258898). Subsequent uses are represented by calibrated intercept dates of AD 540 for Thermal Pit 64 (Beta 258905) and AD 660 for Thermal Pit 49 (Beta 258902).

The majority of dates are also the latest; Thermal Pits 28, 33.1, 36, 37, and 41 produced calibrated intercepts of AD 1000, 1020, 1020, 1030, and 1040 (Beta 258894, 258895, 258896, 258897, and 258899), respectively.

OxCal analysis indicates at least four separate periods of occupation of Blocks 1 and 2, as represented by the order of the following features, from earliest to most recent: 40, 64, 49, 28, 33.1, 36, 37, and 41. As mentioned in the discussion of the thermal pit cluster, the dates and proximity of features 33.1, 36, 37, 41—and perhaps 33.2 and 34 as well—could indicate use by the same group of people over a relatively short period of time. Features 32, 35/38, 44, and 53 were not radiocarbon dated.

Projectile point FS-655, an Ellis-like dart point, was recovered from Stratum 2, Level 3 in Square 462N/520E. Although this same square contained Thermal Feature 37 (intercept date of AD 1030), the point was recovered from the level below the bottom of the feature. Turner and Hester (1993) date the Ellis in Texas to the period ca. 2000 BC to AD 700.

El Paso Brown and South Pecos Brown potsherds were recovered from Blocks 1 and 2. Current evidence suggests that the manufacture of El Paso Brown started at some point between AD 200 and 600 in the El Paso region of Texas and south-central New Mexico (Miller 1995:Table 4) and ended about AD 1000 or 1100 (Miller 1995:Table 4). However, since the bottoms of El Paso Polychrome jars are not slipped or painted, the bottom sherds appear to be from plain vessels, and thus, El Paso "Brown" continues to show up in late pottery assemblages. On the basis of seriation of surface sherds, Jelinek (1967) suggests manufacture dates for South Pecos Brown to have been approximately AD 900 to 1200. However, in his seriation diagram, sites producing both earlier and later examples are noted (Jelinek 1967:Fig. 9).

Evaluation of Dates and Depths of Features: Blocks 1 and 2 at LA 129042 are situated on essentially level ground. The depths of the orifices of the features, and therefore the assumed upper edges of the following features, were found in their respective strats: Strat 1-1, Features 28, 36, 37, 44, 64; Strat 2-2, Features 33 (33.1 and 33.2), 53; and Strat 2-3, Features 34, 35/38, 41.

The actual orifice depths below datum are: Feature 28, 99.00 cm; Feature 33, 98.88 cm; Feature 34, 98.86 cm; Feature 35/38, 98.89 cm; Feature 36, 98.90 cm; Feature 37, 98.85 cm; Feature 41, 98.79 cm; Feature 44, 99.09 cm; Feature 53, 98.75 cm; and Feature 64, 98.90 cm.

Since the excavation levels, as standardized by survey instrument, are also relative to the modern ground surface (in this case essentially level and even across the two blocks), a comparison of feature dates with cultural strata and excavation levels provides temporal perspective on feature depth. For instance, OxCal analysis suggests that Features 28, 33.1, 36, 37, and 41 may have been in use at approximately the same time. In effect, they could have been used by the same group during the same visit to the site. However, Features 28, 36, and 37 were in Strat 1-1; Feature 33 was in Strat 2-2; and Feature 41 was in Strat 2-3. Since each level was 5—10 cm deep, feature depth below modern surface and association with cultural stratum and excavation level are not necessarily a guide to contemporaneity or non-contemporaneity of features.

This incongruence of information is particularly important to note with regard to Features 33.1, 36, and 37, which are tightly clustered. Actual orifice depth data among these three features, however, vary by a maximum of 5 cm, indicating that the shift from Stratum 1 (light-colored matrix) to Stratum 2 (dark-colored matrix) varied on the micro-level for any number of reasons.

Several factors, together or separately, may be responsible for incongruencies in dating, stratigraphy, and archaeological mapping. First and foremost, radiocarbon dating is not precise in that, for short-term occupations such as those examined here, the technique does not yet have strong resolution. Second, various types of bioturbation, including the scuffling of ancient humans, often obliterate or otherwise obscure the original openings of features; comments as to the difficulties in defining feature orifices are noted throughout excavation journals and forms. Precise archaeological definition of the original feature orifice is not always possible.

Accordingly, relative elevations of archaeologically defined feature orifices and estimations of aboriginal ground surfaces with which they are associated are only approximations. Thus, comparisons with other features, whether nearby or further away, cannot be considered accurate or directly comparable.

Another factor that can come into play is the difference in natural sediment accumulation rates. Anyone familiar with Southwestern wind storms knows that several vertical centimeters of wind-borne sediment can accumulate in an hour or two, thus raising the ground surface.

Likewise, the minute lowering of the ground surface can happen quickly when sediment is removed by wind. Torrential rains instigate the same processes. In summary, vertical differences on the order of 5, 10, or even 15 cm in most open contexts involving soft, silty/sandy sediments, are often not straightforward or necessarily meaningful in a temporal sense.

Distribution of Artifacts Across Blocks 1/2: Excavations in Blocks 1 and 2, ranging from 50 to 100 cm, were deep for this site and for the project as a whole. Although most of the artifacts were recovered from the first three levels (surface to 30 cm), occasional items were found as deep as 80 to 90 cm. It had been hoped that the upper-level distribution/density plots of lithic debitage, along with the features found, would assist in delineating the footprint of one or more camps. Instead, the plots display two aspects pertaining to the relationship of the aboriginal ground surfaces to the modern level (Fig. 16.3).

In the discussion that follows, one salient feature of the topographic situation of Blocks 1 and 2 should be kept in mind: these blocks were situated on top of the ridge. At this location, the modern ground surface was essentially level or ever so slightly sloped downward from west to east. In spite of this fact, Strata 1-1, 2-2, 2-3 within Block 1—the square northern half of the combined blocks—illustrate a dip in deposits from northeast to southwest. This dip in the aboriginal surface can be seen in the fact that, in Stratum 1-1, more artifacts were recovered from the northeastern squares. In Stratum 2-2, artifacts are more evenly spread across the block, though the northeastern-most squares are devoid of them. In Stratum 2-3, artifacts were recovered mainly from the western- and southern-most squares, leaving the northeastern squares virtually devoid of cultural items.

By way of contrast, Block 2, appended to the southeast corner of Block 1, displays a concentration of artifacts in all three strata and levels at the point of contact between the two blocks. From that point southward, however, the distribution of artifacts in each stratum and level is about even across the block, indicating that aboriginal ground surfaces were essentially level.

Keeping the changes in ground surface configuration in mind, overall distribution of artifacts is generally even across the blocks. Here and there, the density of items is punctuated by 1 m square or slightly larger "hotspots" denoted by higher numbers of items. These spots have the appearance of individual knapping places or perhaps places where debris from individual knapping episodes was dumped. One or more toss zones adjacent to one

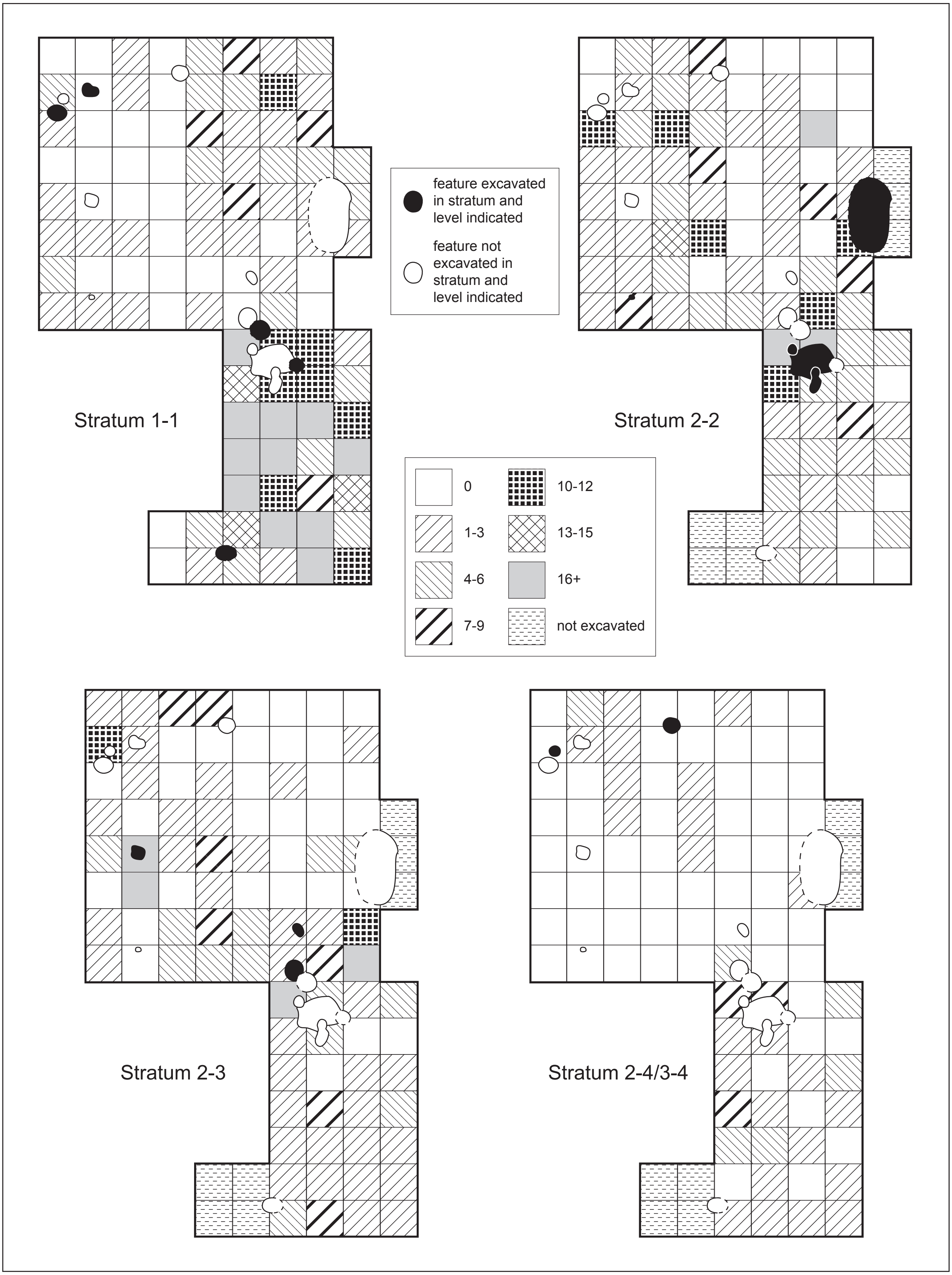

Figure 16.3. LA 113042, Blocks 1 and 2, lithic debitage distribution.

Table 16.2. LA 129214, Block 1, summary of features and radiocarbon dates.

FEATURE	CHARACTERISTICS	RADIOCARBON CALIBRATION I DATE (AD)	BETA ANALYTIC SAMPLE NO.
Shade/Shelter Component			
40	rock outcrop	–	–
41	rock outcrop	–	–
42	rock outcrop	–	–
Nonrock Thermal Features			
39	thermal n/s/m*	1020	258469
43	thermal n/s/m	–	–
58	thermal n/d/m	90	258474
59	thermal n/s/m	250	258475
83	thermal n/s/m	–	–
85	thermal n/u/u	1030	258489
88	thermal n/d/u	140	258491
89	thermal n/d/u	120	258492

*Characteristics: type/depth/size, where type n = nonrock; r = rock; depth s = shallow; d = deep; vd = very deep; u = unknown or uncertain; size s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

or more clear areas are not evident, indicating that either camp footprints are lacking, or that, if present, they are overprinted and therefore obscured.

The pottery sherds, being far less numerous than the knapping debris, nevertheless follow the same general depositional trends as the lithics (Fig. 16.4).

LA 129214

Block 1 permitted examination of 11 features. Of these, three were natural calcrete outcrops modified to serve as windbreaks. Eight are thermal features (Table 16.2).

Block 1

The calcrete outcrops, designated Features 40, 41, and 42 (Fig. 16.5), naturally project upward from the bedrock of the same material. These kinds of upward projections are to be seen here and there on the surfaces on both this site and LA 129042. Although these three were the only ones exposed by our excavations, they appear to differ from the others noted elsewhere and lead us to believe that they were augmented to serve as windbreaks and/or shade anchors. This was done by piling loose calcrete cobbles of varying sizes on top of each outcrop where they presumably weighed down the edges of shelter-covering materials (poles, brush, mats, hides, etc.).

These covers presumably extended outward to form shades or shelters. Features 40 and 41 would have served admirably for this purpose, especially since together they form an angle that would have provided additional wind protection from two directions. Although no postholes were found to the west to hold up the other ends of the covering material(s), sediments in that part of the site were soft enough that postholes could easily have slumped or filled back in once the posts were removed, thereby obscuring all evidence of their former shapes.

Seven of the Block 1 thermal features were west of the calcrete outcrops/windbreaks, and one is to the east. All of them are known, or appear, to be medium in size, with 39, 43, 59, and 83 being shallow; 58, 88, and 89 being deep; and 85 being of uncertain original depth. Thus, at least two general functions relating to depth may be represented by these features.

Radiocarbon and Diagnostic Artifact Dating: Radiocarbon dates were obtained for six of the thermal features. The calibrated intercepts are AD 90 (Feature 58, Beta 258474), AD 120 (Feature 89, Beta 258492), AD 140 (Feature 88, Beta 258491), AD

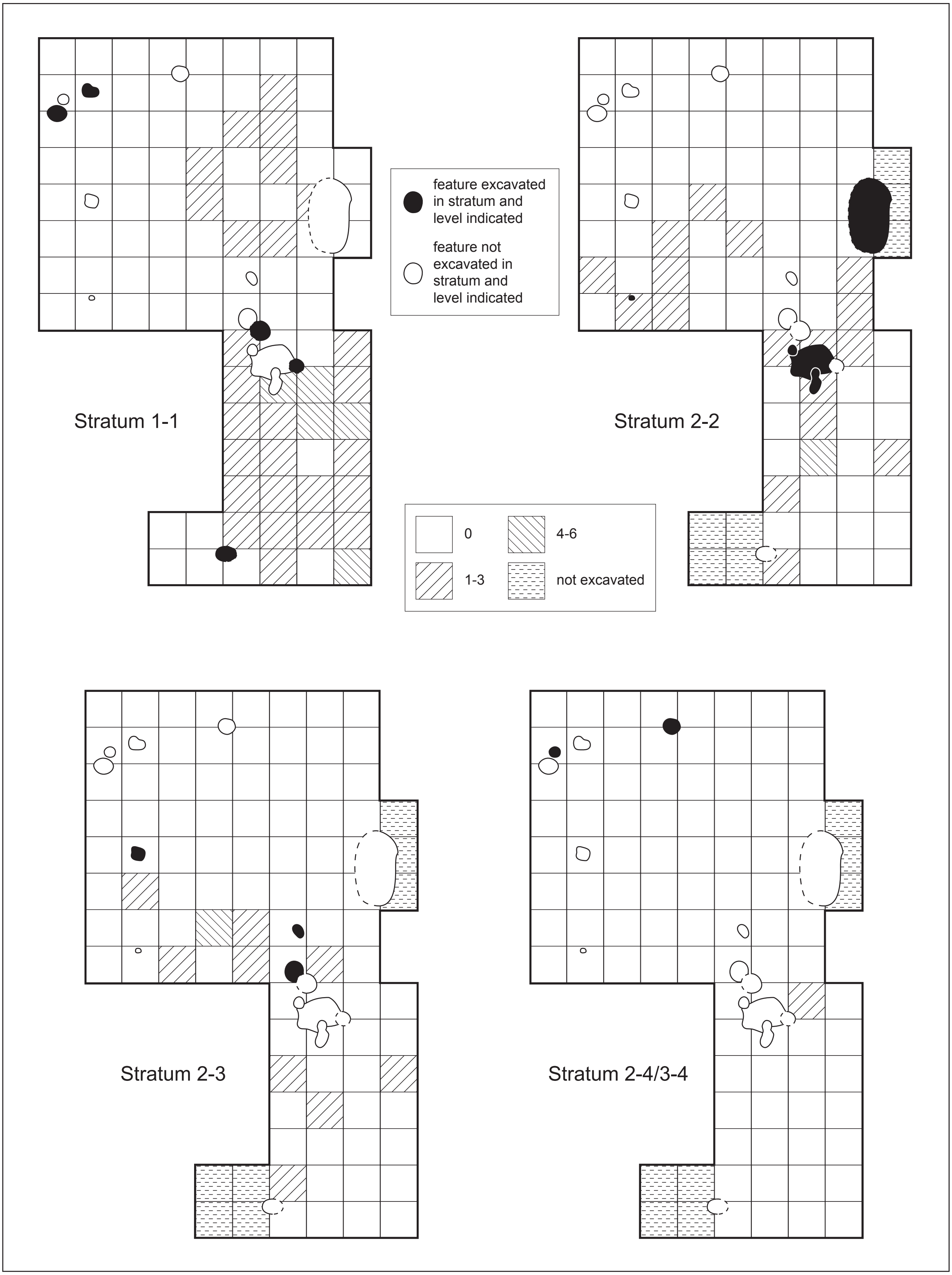

Figure 16.4. LA 113042, Blocks 1 and 2, pottery distribution.

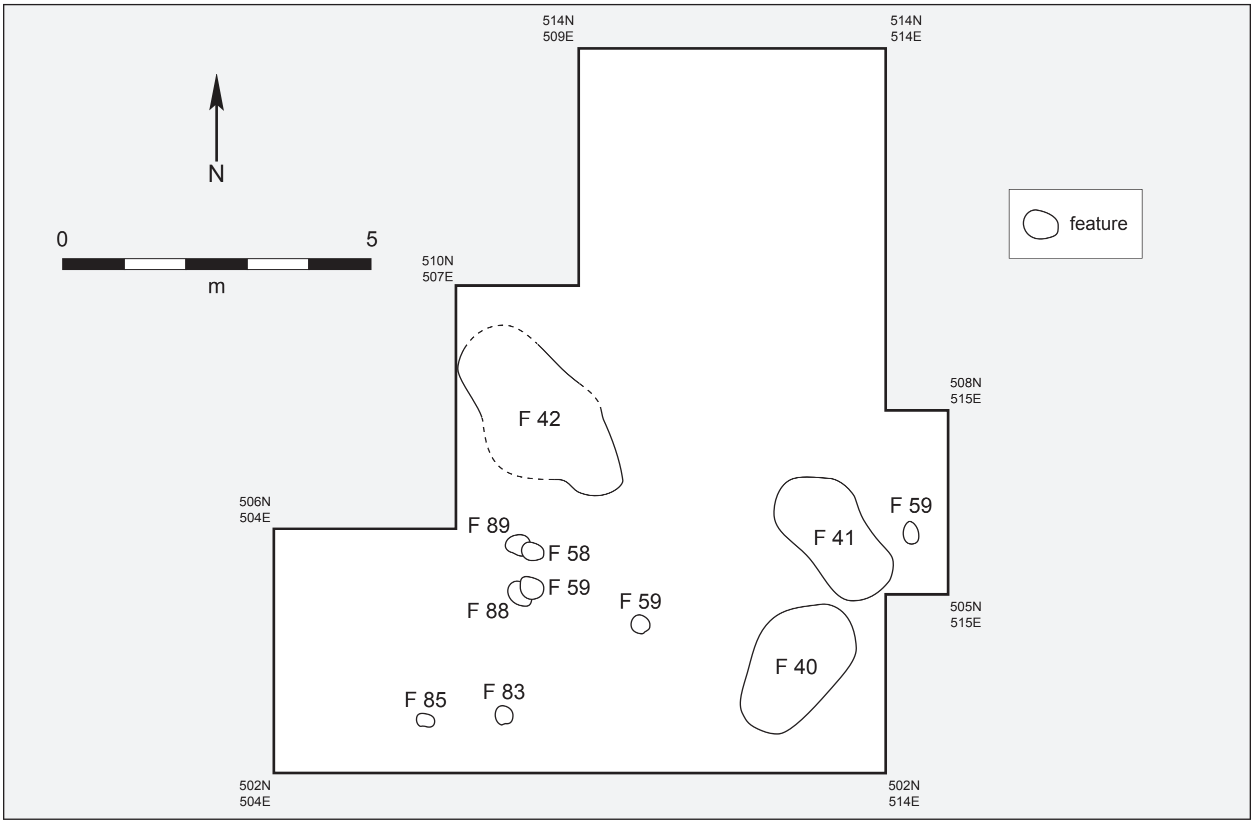

Figure 16.5. LA 129214, Block 1, feature distribution.

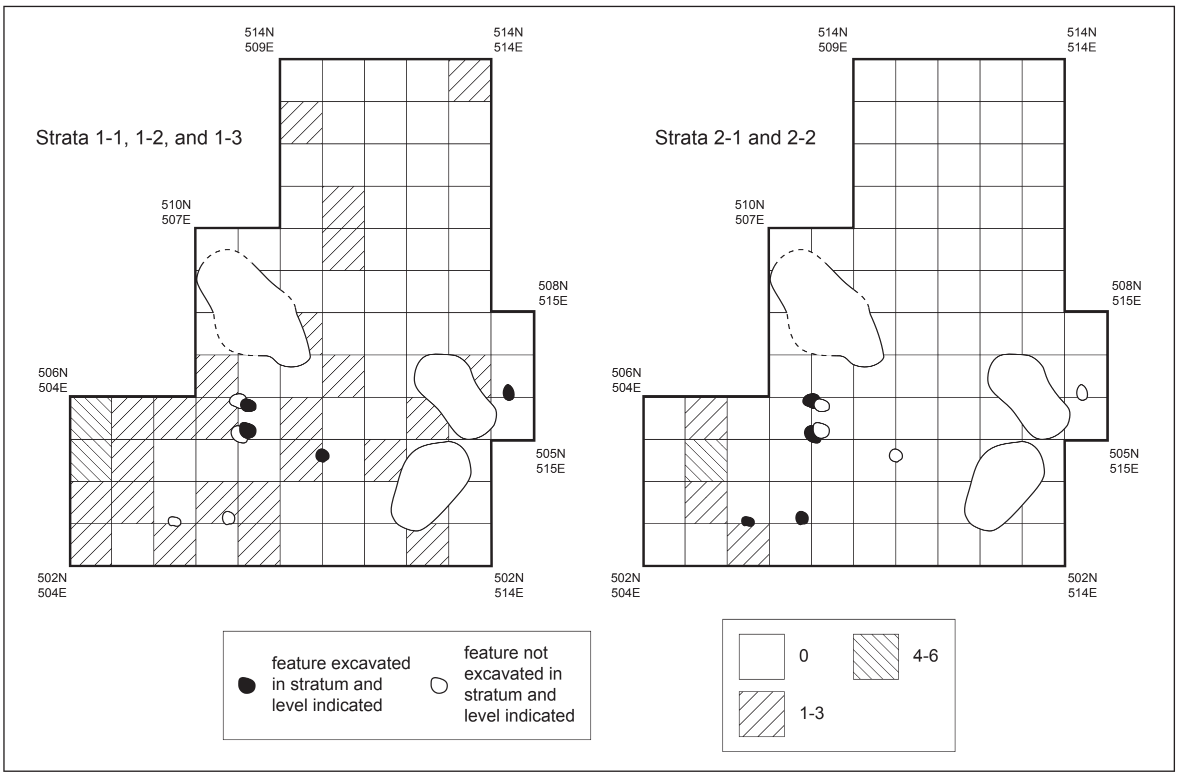

Figure 16.6. LA 129214, Block 1, lithic debitage distribution.

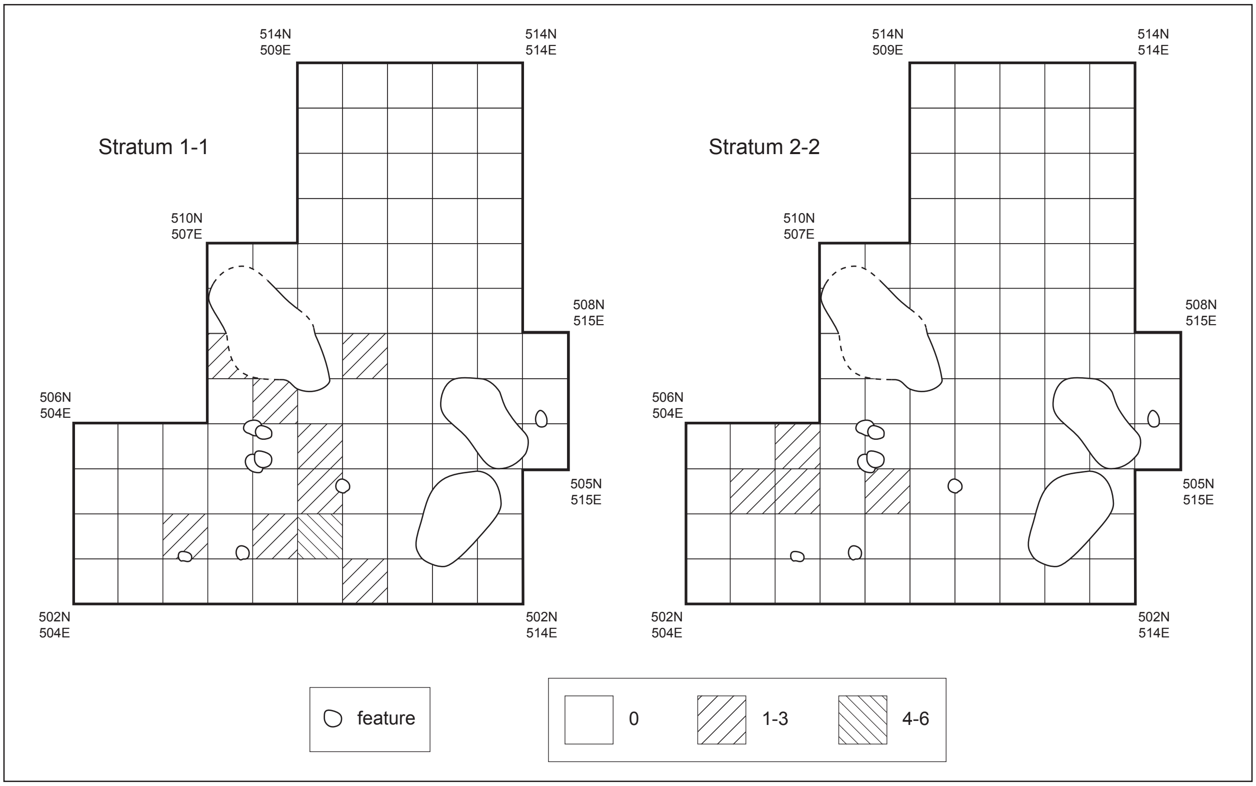

Figure 16.7. LA 129214, Block 1, pottery distribution.

250 (Feature 59, Beta 258475), AD 1020 (Feature 39, Beta 258469), and AD 1030 (Feature 85, Beta 258489). OxCal analysis indicates that these dates probably represent at least five periods of occupation, from earliest to most recent: Feature 58/89, Feature 88, Feature 59, Feature 39, and Feature 85. Features 58 and 89 could be the lower and upper parts of the same thermal pit as discussed elsewhere, but the dates suggest otherwise.

Projectile point FS-9, a wide-blade, Neff-style Livermore arrow point, was recovered from the modern surface in Square 501N/512E. In the Lower Pecos and Trans-Pecos regions of west Texas (Prewitt 1995), Livermore points date to the period AD 900 to 1400 (Turner and Hester 1993) that suggests an association with either Features 39 or 85.

El Paso Brown and Jornada Brown potsherds were recovered from positions scattered across the southern part of the block but can only be assumed to have been associated with certain features based on dating. Current evidence suggests that El Paso Brown was manufactured from AD 200 to 600 and 1000 to 1100 (see comments regarding unpainted bottom portions of El Paso Polychrome jars above). The inception of Jornada Brown is estimated to have occurred about AD 450 or 500 in the Sierra Blanca (Ruidoso) Region of south-central New Mexico (Wiseman 2003c:164; Campbell and Railey 2008). Manufacture of Jornada Brown ceased about AD 1350 or 1400 (Wiseman 2003c:164).

Distributions of Artifacts Across Block 1: Relatively few pieces of lithic debitage and pottery fragments were recovered from Block 1 as a whole (Figs. 16.6 and 16.7). Most of these items were concentrated in the southwest corner of the block. Since all came from shallow deposits (Levels 1–3), they are presented as two groups of levels in the figures.

The Presence of a Camp Footprint? As described, Features 40 and 41 possess characteristics that could represent backside anchors for perishable windbreaks or shelters. When considered with other characteristics of the block, this site is highly reminiscent of the Alyawara model camp (Fig. 16.1).

The habitation area characterized by four sequential zones stretching from east to west as follows: the shelters or shades; a space within and in front of the shelters that could have been used for sleeping, shade, getting out of the wind, craftwork, and visiting; a space with thermal features for cooking and other activities; and a zone beyond the thermal features containing most of the cultural debris presumably thrown out of the rest of the camp area.

This alignment of zones places the outcrops in the upwind position relative to the dominant winds of the region. A windrose developed for the nearby WIPP project shows that the dominant winds come from the southeast for nearly one-fifth of the year, with most occurring during the summer monsoons (Lord and Reynolds 1985:Fig. 3.5; Tuan et al. 1973:17).

The one aspect that does not meet our expectations with regard to the O'Connell model is that the artifacts are not as neatly concentrated as we would expect (Figs. 16.5 and 16.6). But, we must keep in mind that the model deals with the concentration of the majority of cultural debris items and does not necessarily mean that absolutely no such items are to be found in other zones. The items in our Block 1 case are all quite small and could easily be overlooked or lost in the sand and thus not have made their way to the disposal zone.

The overall length of camp occupation cannot be determined since the far side of the refuse zone was not fully defined through excavation. The exposed length, stretching from 1 to 2 m east of Thermal Feature 39 to the west edge of the excavation is 13 m; the width, not including the single calcrete outcrop/windbreak is at least 6 m. In hindsight, continued excavation to the west and to the south probably would have uncovered more of the total area of the camp.

Blocks 5, 7, and 14 (or 5/7/14)

These three blocks adjoin one another on the nearly level, lower east slope of the ridge. Blocks 5 and 7 were in blowouts on either side of a large dune. When a number of features were found in each block, and several thermal features were noted near the east margin of Block 7, the dune was mechanically removed in order to discover what lay in between the two blocks. The result was the exposure of several more thermal features and two possible postholes. Only about half of the squares within Block 14 were excavated by hand once the dune was removed.

Together, Blocks 5, 7, and 14 constitute the single largest exposure of space on the site (Fig. 16.8). The total number of features and possible features exposed among the three blocks include 13 thermal features, three seemingly unassociated possible postholes, a structure (Feature 300), and a possible camp footprint (Feature 301). Features 300 and 301 are described at the end of this section for Blocks 5/7/14.

Unassociated Thermal Features: The 13 thermal features not directly associated with Features 300 and 301 embody surprisingly little variation (Table 16.3). All but four (74, 87, 112, 114) are shallow, medium-sized rock pits. The rest are non-rock pits, with seven being shallow, medium size (51, 53, 79, 113, 115, 116, 118), and one each that are shallow, small (117) and deep, medium (84). The clustering of 10 of the thermal features in the western part of the combined blocks is notable.

However, given the variety of dates encompassed by these features (see below), all we can do is surmise that the locus was a central place for about 350 years for reasons that are currently unclear. But, if nearby Feature 44 (in Block 2) was a water source, then a focal point such as this makes sense.

Two possible postholes are present near the thermal feature cluster just mentioned, and a third is situated at least 2 m to the north. Since all three are seemingly non-natural, slightly cylindrical depressions/holes in the calcrete, they are thought to be man-made holes for supporting vertical or nearly vertical wooden elements. No phenomena other than the thermal pits were noted near these possible postholes, making a functional evaluation difficult. One possibility is that they were supports for a drying rack or racks. The relationship of the third possible posthole to the first two is uncertain.

Radiocarbon and Diagnostic Artifact Dates for "Unassociated" Thermal Features: Eleven dates were obtained for the 13 thermal features that were not associated with either Feature 300 or Feature 301 (Table 16.3). To summarize, intercept dates are, in order from earliest to most recent: AD 120 (Feature 112); 680 (Feature 74); 770 (Feature 87); 900/920/960 (Feature 115); 1010 (Feature 114); 1020 (Feature 84); 1030 (Feature 118); 1030 (Feature 53); 1040/1100/1120 (Feature 79); 1200 (Feature 116); and 1210 (Feature 51).

El Paso Brown and South Pecos Brown potsherds were recovered from this block group. Given the wide range of manufacture dates for both types, as discussed previously, the sherds could represent

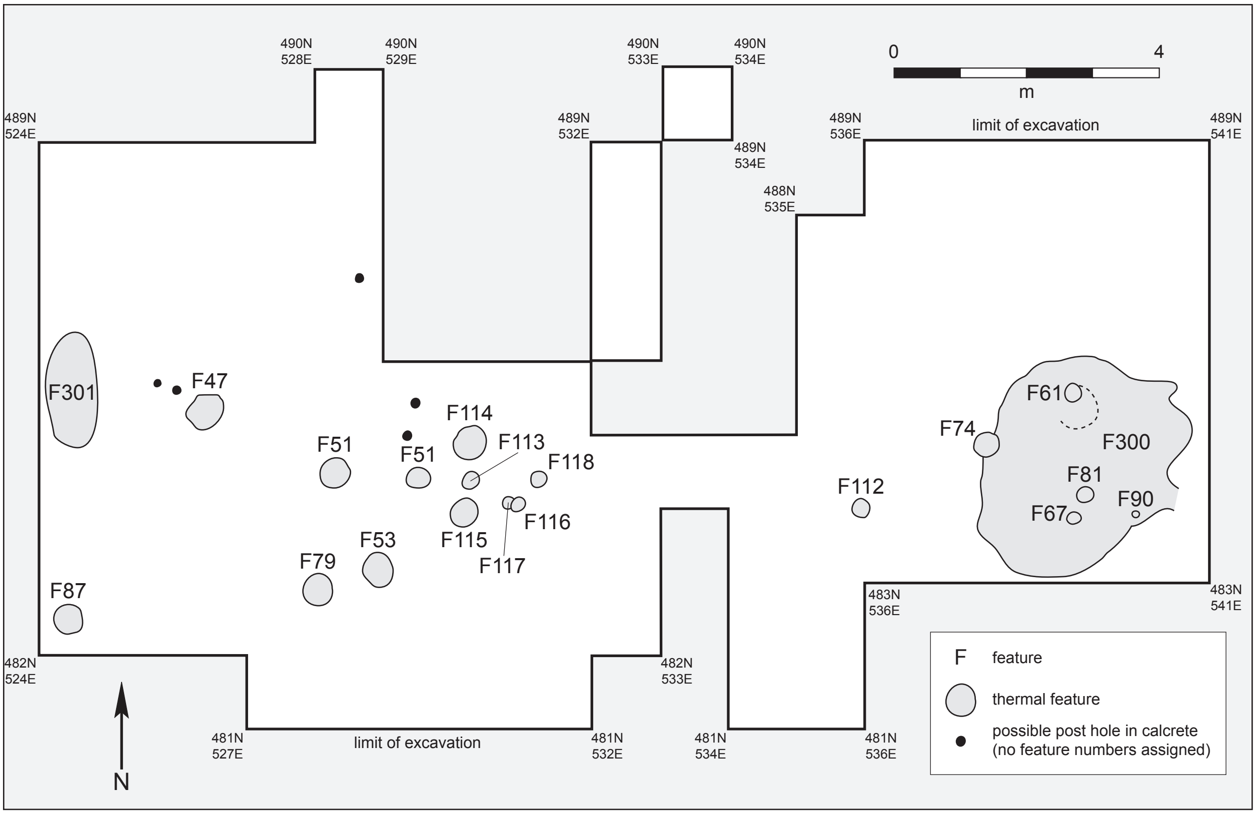

Figure 16.8. LA 129214, Blocks 5, 7, and 14, feature distribution.

the use of any or all of these features except the first, Feature 112.

Feature 300, Wickiup Structure: As described and discussed in the chapter on site features, Feature 300 appears to be the remains of a wickiup or brush shelter. Radiocarbon samples from one of the thermal pits and one of the postholes in the floor indicate use of the shelter in the mid AD 600s (both calibrated intercept dates of AD 650, Beta 232973 and 258476).

Since Feature 300 lies in the southeast corner of the block, any other features lying to the east or south that might have been associated with it were not uncovered. Regarding Feature 300, The use of Thermal Pit 74 post-dates 300 because it was stratigraphically a little higher, it overlapped the west periphery of the structure, and it produced a slightly later radiocarbon date (calibrated intercept of AD 680, Beta 232975).

One of the more interesting aspects of Feature 300 is the fact that its fill and the sediments in the immediately adjacent squares produced rather large numbers of artifacts, especially pieces of lithic debitage and potsherds. While most of these items were clearly deposited subsequent to the occupation of the feature, four pieces of lithic debitage and six brown ware potsherds were recovered from contexts suggesting association with the wickiup occupation (Table 16.4).

Feature 301, Use-Surface: As described and discussed in the chapter on site features, Feature 301 appears to be the remains of a compacted use-surface, or possibly a prepared surface that probably signifies the former presence of a temporary shelter. A shallow, medium-sized thermal pit (Number 47) and two probable postholes located a meter or so to the east are in a position appropriate to have been associated with Feature 301. As would be expected from the Alyawara model, very few cultural items were recovered from the shelter floor and the area between it and the thermal pit. Beyond the thermal pit, the number of items increases dramatically, forming an arcuate shape that suggests that at least some of these items belong to the occupation of the shelter. A calibrated intercept radiocarbon date of AD 230 (Beta 232968) was obtained from Thermal Feature 47.

Distribution of Artifacts Across Block 5/7/14:

Table 16.3. LA 129214, Blocks 5, 7, and 14, summary of features and radiocarbon dates.

FEATURE NO.	FEATURE TYPE	RADIOCARBON CALIBRATION I DATE (AD)	BETA ANALYTIC SAMPLE NO.
Nonrock Thermal Features			
51	thermal n/s/m*	1210	258470
53	thermal n/s/m	1030	232970
79	thermal n/s/m	1040/1100/1120	232976
84	thermal n/d/m	1020	258488
113	thermal n/s/m	–	–
115	thermal n/s/m	900/920/960	258506
116	thermal n/s/m	1200	258507
117	thermal n/s/s	–	–
118	thermal n/s/m	1030	258508
Rock Thermal Features			
74	thermal r/s/m	680	232975
87	thermal r/s/m	770	232978
112	thermal r/s/m	120	258504
114	thermal r/s/m	1010	258505
Possible Postholes			
No number	possible posthole	–	–
No number	possible posthole	–	–
No number	possible posthole	–	–
Feature 300 - Structure with Associated Features			
61	thermal n/s/m	650	258476
67	posthole	650	232973
81	thermal n/s/s	–	–
90	posthole	–	–
300	wickiup outline and packed floor	–	–
Feature 301 - Camp Footprint with Associated Features			
47	thermal n/s/m	230	232968
No number	possible posthole	–	–
No number	possible posthole	–	–
301	packed floor	–	–

*Characteristics: type/depth/size, where type n = nonrock; r = rock;
depth s = shallow; d = deep; vd = very deep; u = unknown or uncertain;
size s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

Most squares excavated in Blocks 5 and 7 produced at least one artifact (Figs. 16.9, 16.10, and 16.11). In the western area (Block 7) the density was fairly light with a tendency towards concentration that might reflect association with the use of Feature 301. For those squares containing thermal features, just how the artifacts relate temporally to the features cannot be determined with certainty.

After all, limited evidence, such as the Alyawara model and patterns observed at what appear to have been single-use thermal features elsewhere (i.e., Feature 1 at the River Crossing Site, LA 112349, Wiseman 2010), suggests that people usually make some effort to keep a 1 to 2 m diameter area around their thermal pits clear of debris, especially sharp-edged debris.

This suggests that any items found immediately adjacent to a thermal pit did not derive from the use of that pit, but rather, were tossed there by someone who might have camped at a nearby thermal feature.

The Block 5 area shows a strong contrast to

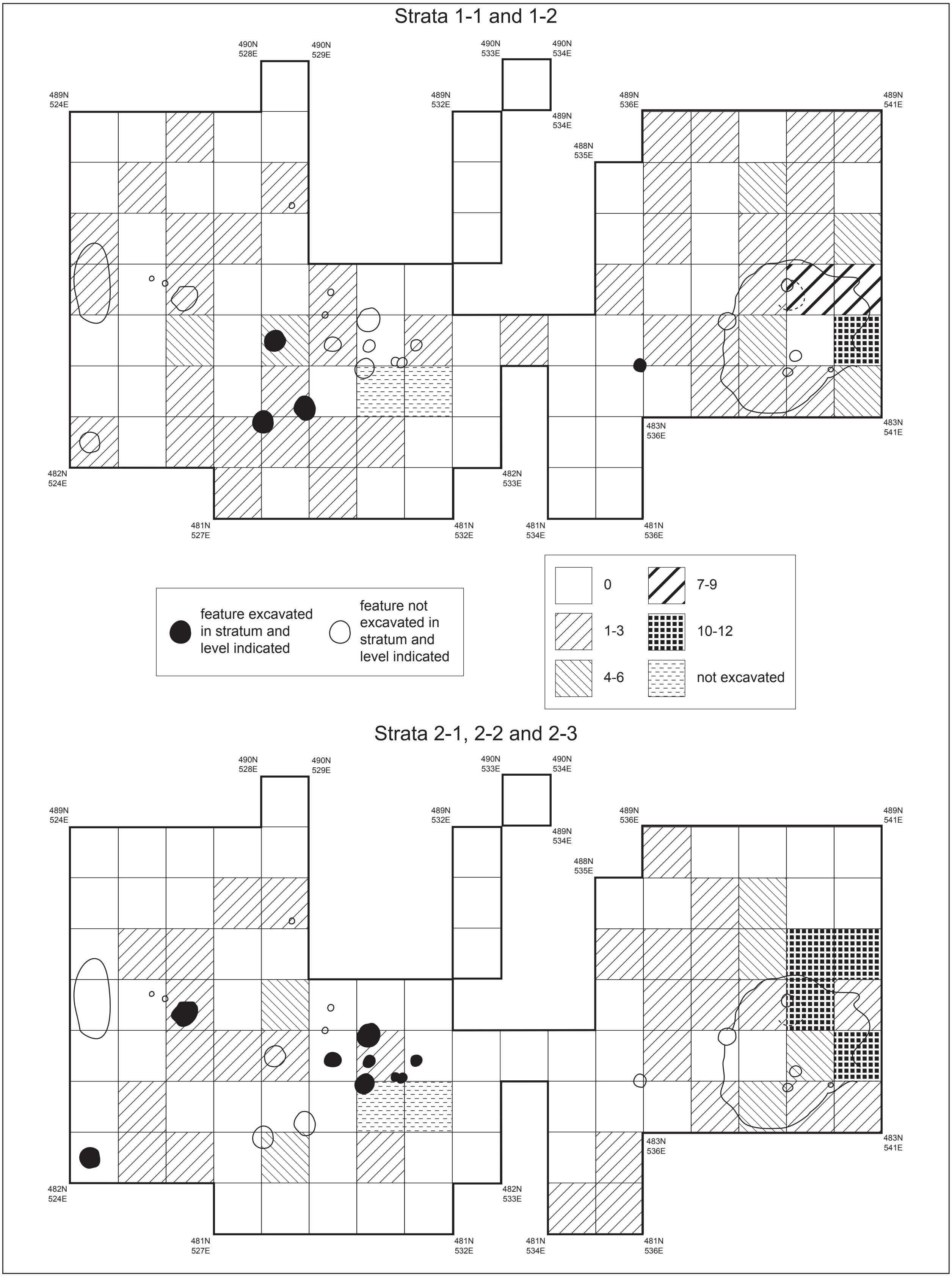

Figure 16.9. LA 129214, Blocks 5, 7, and 14, lithic debitage distribution.

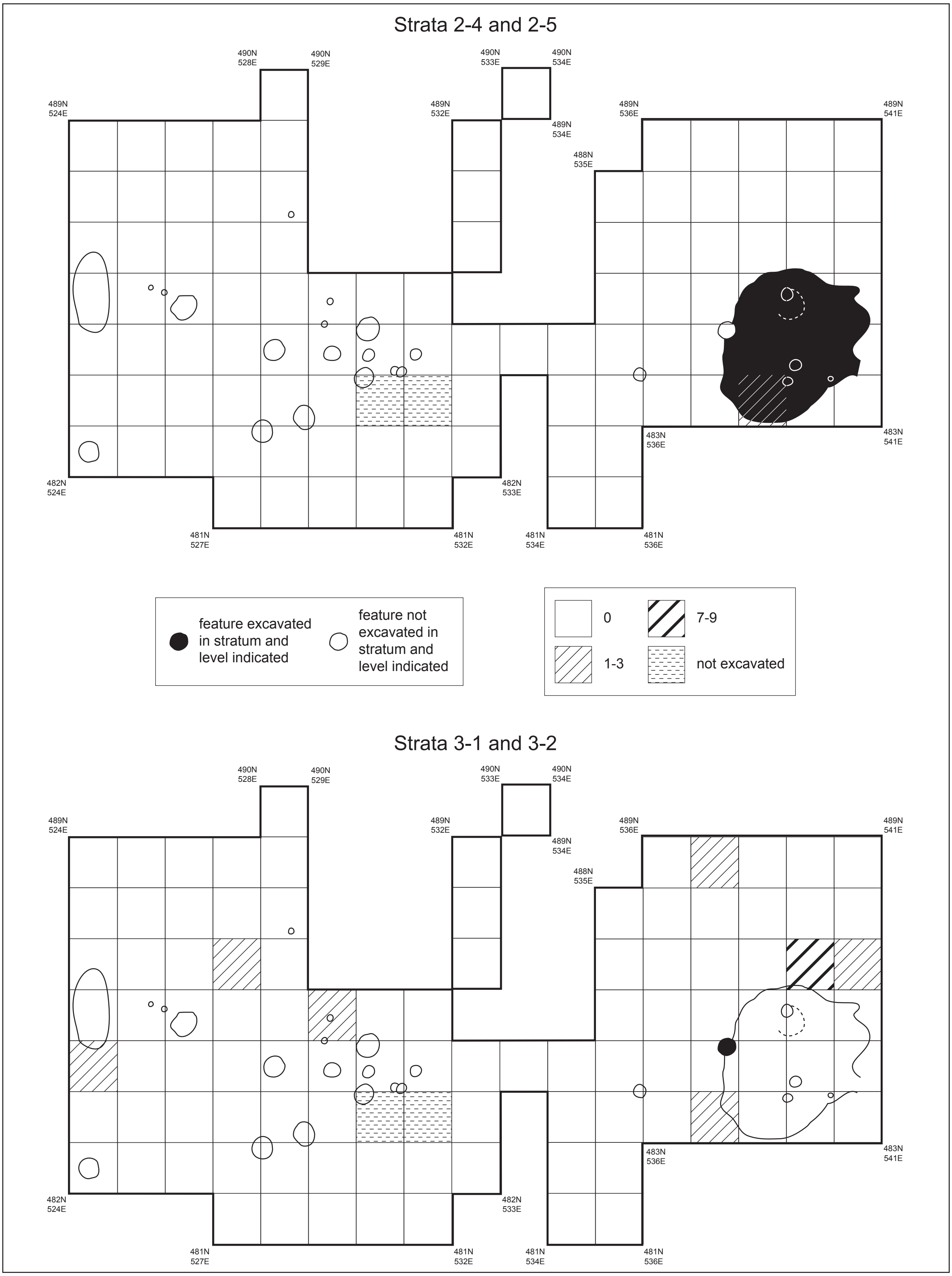

Figure 16.10. LA 129214, Blocks 5, 7, and 14, lithic debitage distribution.

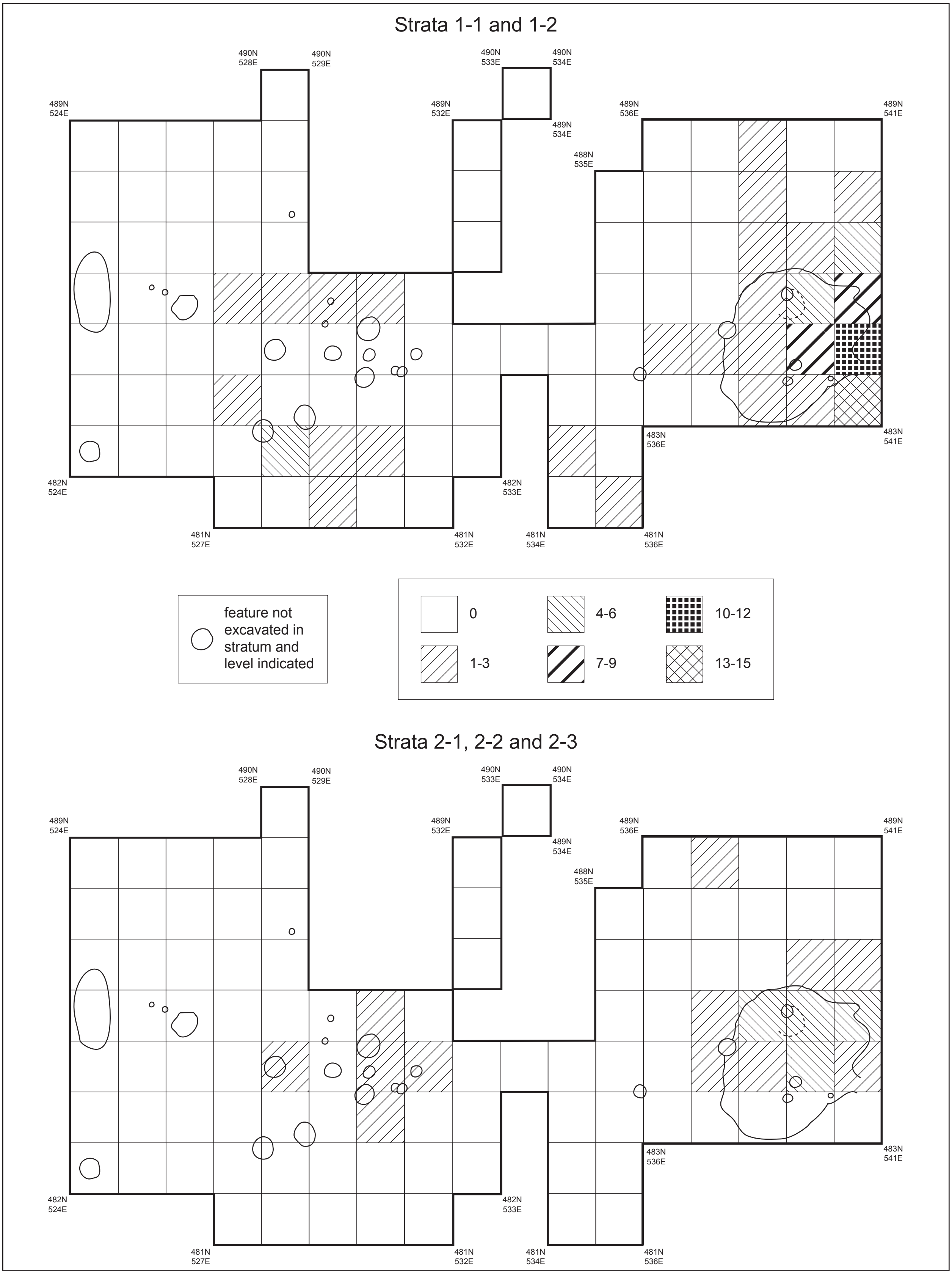

Figure 16.11. LA 129214, Blocks 5, 7, and 14, potsherd distribution.

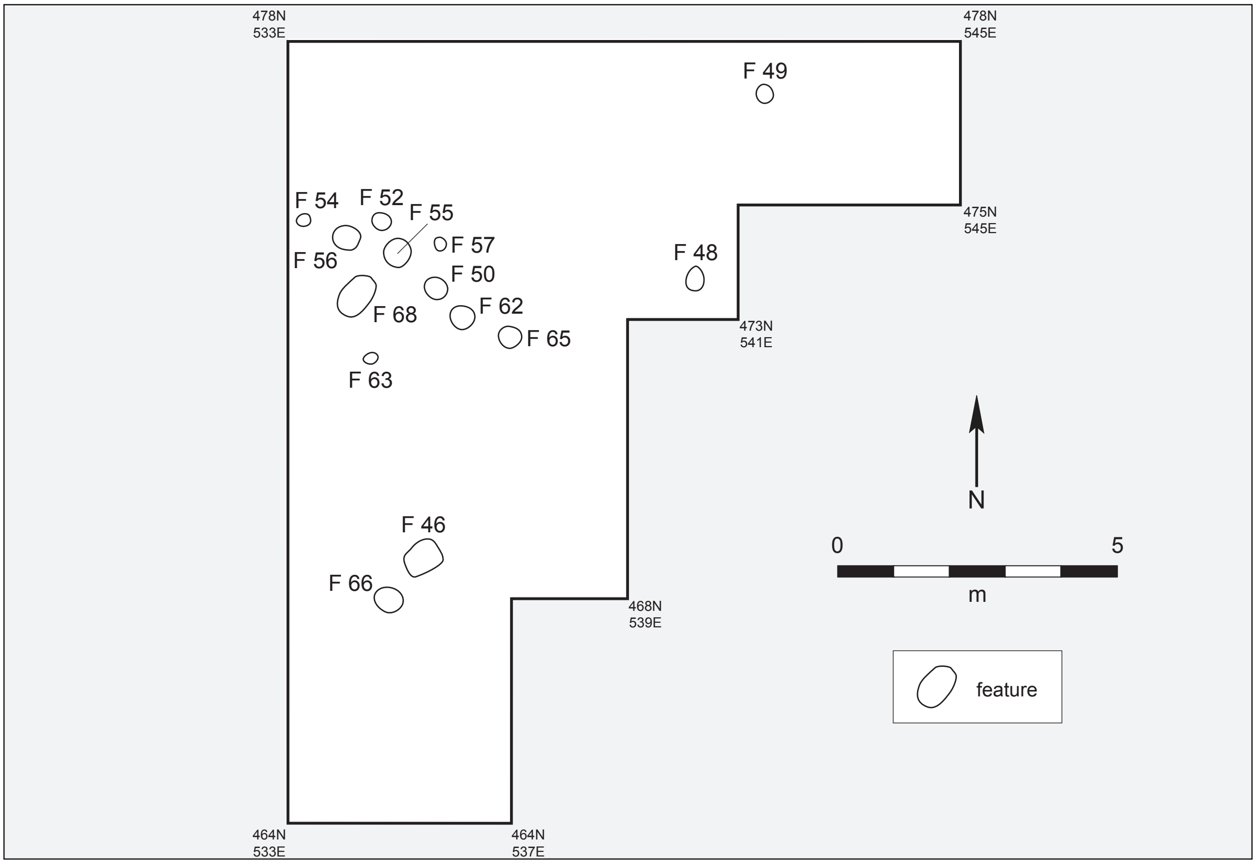

Figure 16.12. LA 129214, Block 6, feature distribution.

Block 7. In Block 5, the lithic and pottery fragment densities are strikingly higher in the squares overlying and immediately adjacent to Feature 300, the wickiup. Clearly, relatively serious refuse disposal took place in that location subsequent to the abandonment of the structure. The distribution and shape of the concentration indicate that part of it lies to the east and south of the southeast corner of the block.

Yet another strong contrast is to be seen in the central area (Block 14) that produced almost no artifacts. If this absence of artifacts can be explained as the fall-off zone between occupations in Blocks 5 and 7, then there is no mystery. It is even possible that the fall-off zone signals the presence of the dune at this locus during prehistoric occupations. Three squares in the middle of Block 14 produced one flake each, which may or may not pose a problem. After all, thermal features are present on both edges of the block, and the flakes may have derived from the use of those features.

A nagging problem does remain, however, because heavy equipment was used to remove the dune that once covered the Block 14 area. Could it be that the heavy equipment went too deep and accidentally removed the occupation level prior to commencement of hand excavations? Or did the hand excavations conducted after dune removal fail to go deep enough? Either way, the problem, if there is one, might have been exacerbated if the occupation level lacked an observable Stratum 2 (dark fill). This latter possibility seems especially plausible and, if true, signals that the edges of the occupations in both Blocks 5 and 7 were thinning out in the area of Block 14 and therefore were difficult to identify. I suspect that this was the case, though we cannot be absolutely certain.

Block 6

Thermal pit cluster: The dominant aspect of Block 6 is the cluster of Thermal Pits 50, 52, 54, 55, 56, 57, 62, 63, 65, and 68 (Fig. 16.12). The cluster occurs within an 11 sq m area that was also the area of the deepest and most darkly stained Stratum 2 sediments. Although the thermal pits were almost evenly split between small and medium in size, all but one are shallow in depth and suggest similarities in function. The exception, 52, is deep and may have functioned differently than the others in the cluster.

Widely ranging radiocarbon dates were obtained for all but 52 and 65 (Table 15.2). Calibrated intercepts, from earliest to latest, are: 550 (Feature 68, Beta 232974); 570 (Feature 63, Beta 258478); 620 (Feature 55, Beta 232972); 680 (Feature 57, Beta 258473); 710/750/760 (Feature 54, Beta 258472); 890 (Feature 52, Beta 258471); 1160 (Feature 50, Beta 232971); and 1160 (Feature 62, Beta 258477).

According to OxCal analysis, these dates probably represent as many as six different occupations of this locus. These occupations, in order from earliest to latest, are represented by Thermal Pits 63/68, 55, 57, 54, 52, and 50/62. Interestingly, the pits that may have been used simultaneously—63/68 and 50/62—are also physically paired within the cluster.

Two diagnostic projectile points were recovered from Block 6. Projectile point FS-9 is a wide-blade, Neff-style Livermore arrow point that came from the surface of Square 475N/532E. In the Lower Pecos and Trans-Pecos regions of west Texas (Prewitt 1995), Livermore points have been dated to the period AD 900 to 1400 (Turner and Hester 1993).

Projectile point FS-435, a Perdiz-like arrow point, came from Stratum 1, Level 1 of Square 474N/535E. This location overlies Thermal Features 55 and 57, indicating that its deposition post-dates the use of both features. Perdiz points are numerous in all areas of Texas excluding the Llano Estacado (i.e., the Panhandle) and the Rolling Redbed Plains to the east (Prewitt 1995). Turner and Hester date Perdiz points to the period AD 1200 to 1500.

Potsherds of El Paso Brown, Jornada Brown, South Pecos Brown, and Chupadero Black-on-white were recovered from Block 6. As discussed earlier, the manufacture dates for the brown types are estimated as follows: El Paso Brown, AD 200/600 to 1000/1100; Jornada Brown, AD 450/500 to 1350/1400; and South Pecos Brown, AD pre-900 to post-1200. Chupadero Black-on-white probably dates AD 1050/1100 to 1475 (Kelley and Peckham 1962:10; Snow 1986). Presumably, theses dates reflect the use of vessels of these types in conjunction

Table 16.4. LA 129214, Feature 300, Level 4, lithic and sherd count in floor fill, by square.

SQUARE	LITHIC	SHERD
483/538	–	–
483/539	–	1
484/538	–	–
484/539	1	1
485/538	1	–
485/539	2	3
485/540	–	1

with any of the features except perhaps for the earliest, Feature 68.

Sporadic uses of Block 6: The area encompassed within Block 6 was used on at least one other occasion and probably more. Four additional thermal pits were present within the block, two (48, 49) in the northeast area and two (46, 66) in the south area. All but 66 are shallow and either small or medium in size.

Number 66 is deep and either medium or large in size. Only 46 produced a radiocarbon date, this one with a calibrated intercept of AD 1020. According to OxCal analysis, this date represents yet another period of occupation, bringing to seven the minimum number of occupations represented in Block 6.

Distributions of artifacts across Block 6: The artifacts recovered from Block 6 have interesting distributions. In working with the figures for lithic debitage and pottery sherds, it soon became obvious that they patterned differently both horizontally and vertically.

The distribution of lithic debitage (flakes, cores, shatter) in Strata 1-1 and 1-2 displays two major concentrations, one in the east-central portion of the block and the other in the southwest part (Figs. 16.13a to 16.13b). These concentrations presumably represent the later occupations of the locus.

The distribution of lithic debitage in Strata 2-1, 2-2, and 2-3 (Figs. 16.13a to 16.13b) displays areas of concentration that differ on whole or in part from those of the previous strata/levels. Concentrations are less dense and focus mainly over and around the thermal pit cluster in the west-central part of the block.

The distribution of pottery sherds generally differs from that of lithic debitage. Perhaps most importantly, the greatest number of sherds (n = 163, 75 percent) come from the upper strata/levels

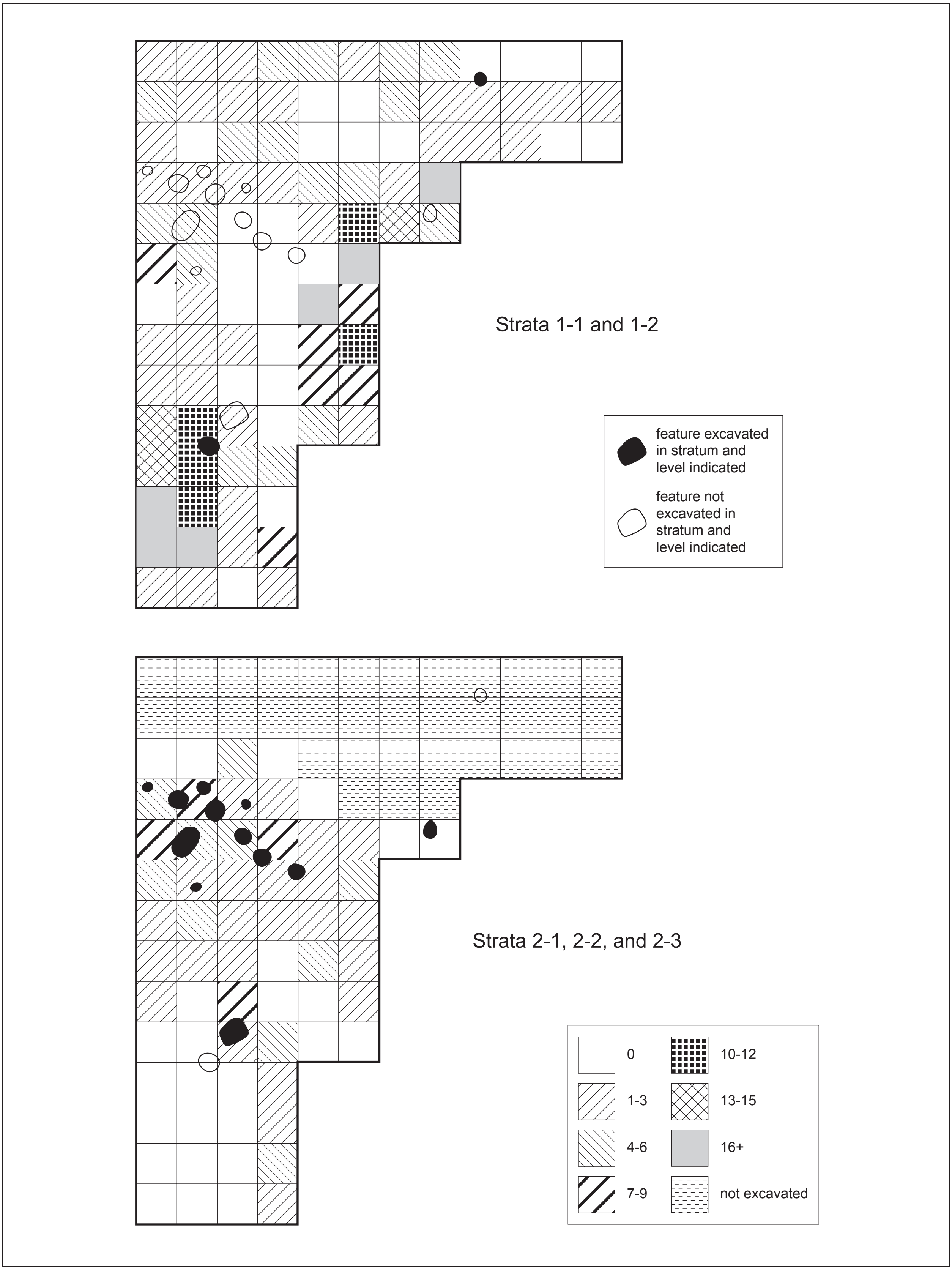

Figure 16.13a. LA 129214, Block 6, lithic debitage distribution.

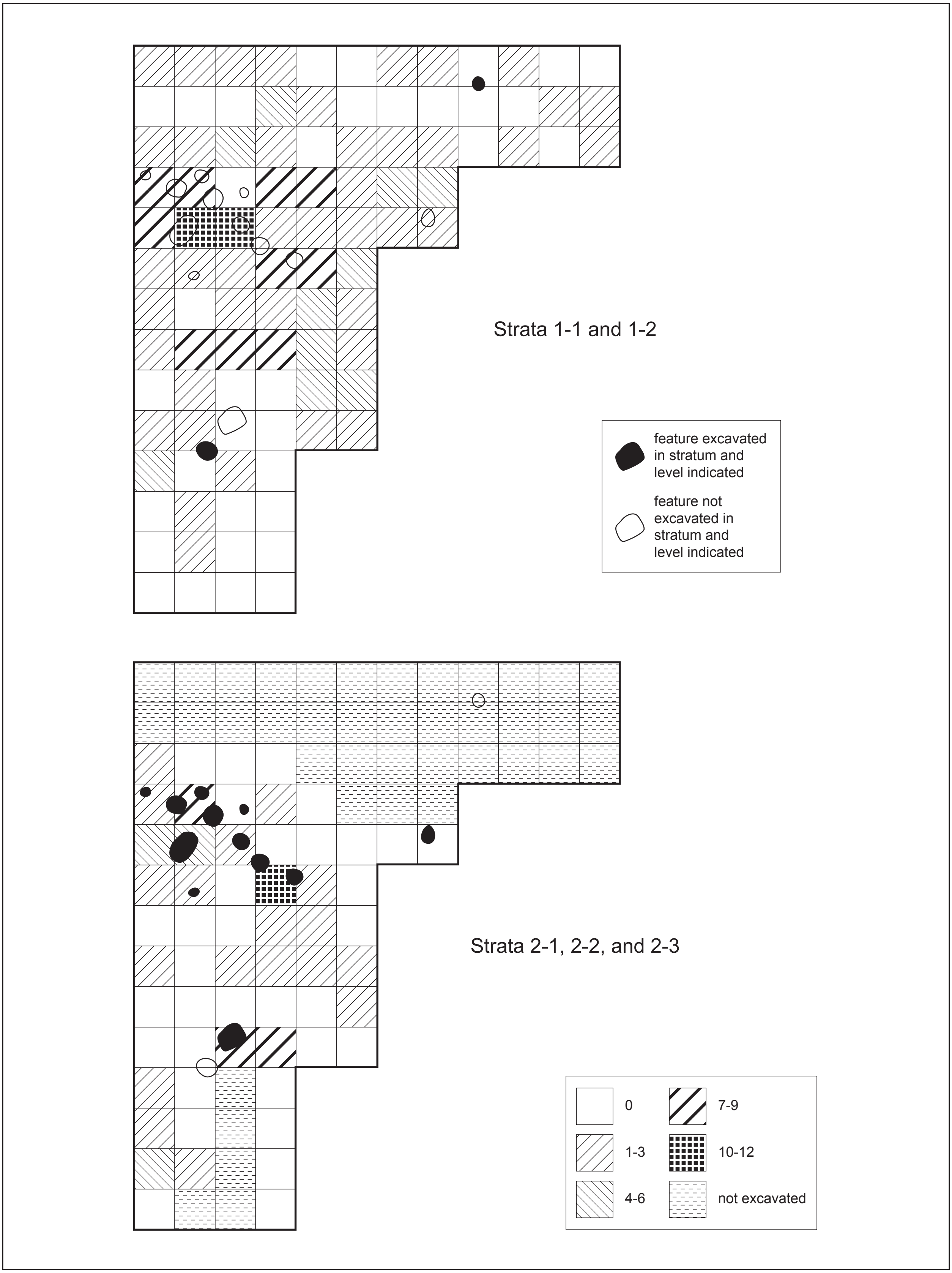

Figure 16.13b. LA 129214, Block 6, lithic debitage distribution.

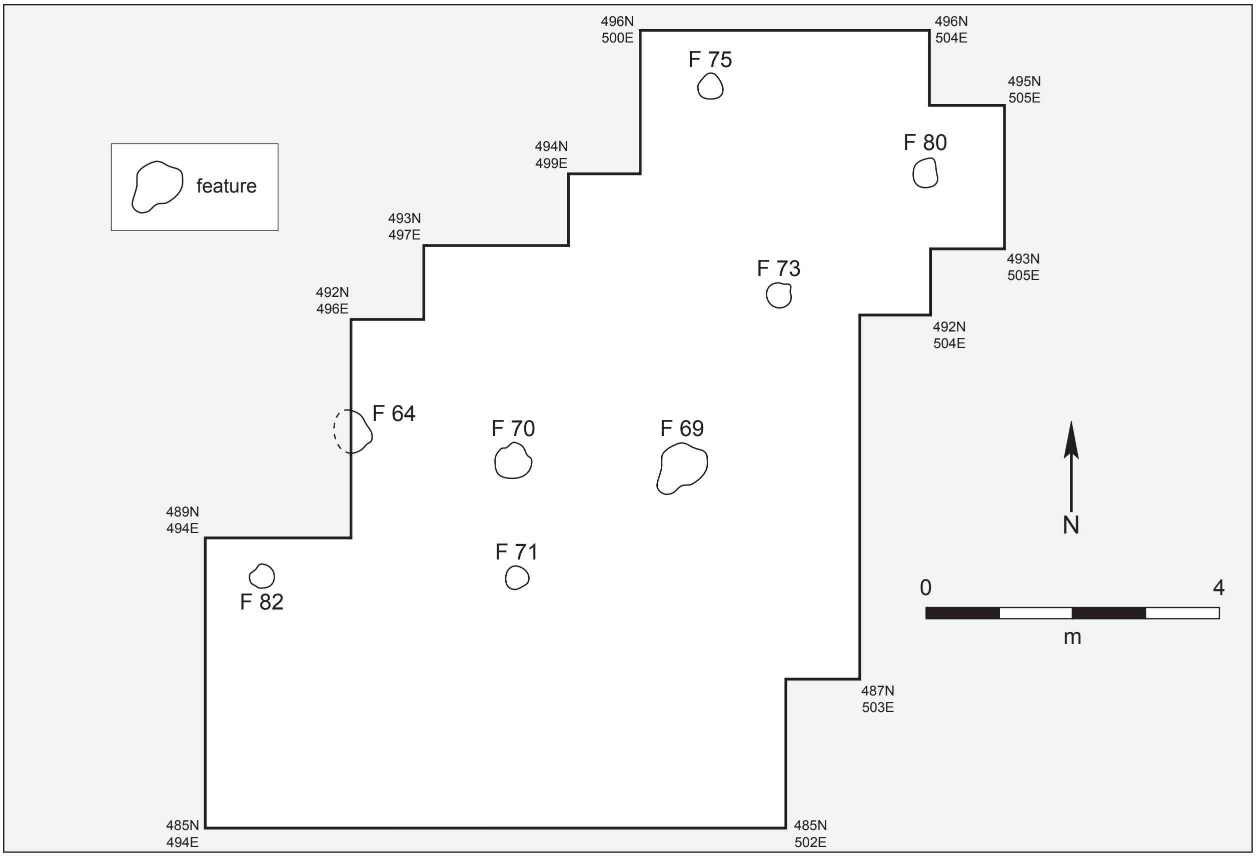

Figure 16.14. LA 129214, Block 8, feature distribution.

(Fig. 16.13b). Interestingly, the main concentration was within and immediately adjacent to the thermal feature cluster. A secondary concentration lay in the south-central part of the block.

Sherds in the lower strata/levels are far fewer in number (Fig. 16.13b) and were concentrated adjacent to thermal features.

Block 8

Block 8 contains a loose cluster of eight thermal pits, including three of rock (73, 75 and 80) and five that are non-rock (64, 69, 70, 71, and 82) (Fig. 16.14). All of these features are shallow, and all are of medium size, except 82, which is small.

Thermal feature dates: Unlike many blocks, the six thermal feature dates are tightly clustered in the first few centuries AD. Calibrated intercepts, in order from earliest to latest, are: 140 (Feature 75, Beta 258483); 380 (Feature 73, Beta 258482); 400 (Feature 64, Beta 258479); 410 (Feature 71, Beta 258480); 420 (Feature 80, Beta 258486); and 450/450/460/480/530 (Feature 82, Beta 258487). According to OxCal analysis, these dates represent three periods of occupation as follows: earliest, 75; middle, 64, 71, 73; and latest, 80, 82. The uses of the features within each period may or may not have been contemporaneous. Features 69 and 70 were not dated.

Very few potsherds were recovered from Block 8 and all of them are El Paso Brown. As discussed earlier, El Paso Brown dates between AD 200/600 to 1000/1100.

Distributions of artifacts across Block 8: Chipped lithic debitage recovered from Strata 1-1, 1-2, and 1-3 was concentrated in three parts of the block—the far northeast, the center, and the south-center (Fig. 16.15). The central concentration forms a partial arc around Feature 69, suggesting that it may have been generated by the users of this feature. The same is true of the northwest concentration relative to Feature 80. The few squares opened into Strata 2-1 and 3-1 are few in number, but they did expose Thermal Features 64, 70, and 71 and lithic debitage that may have been associated with their use.

Most of the very few pottery sherds recovered

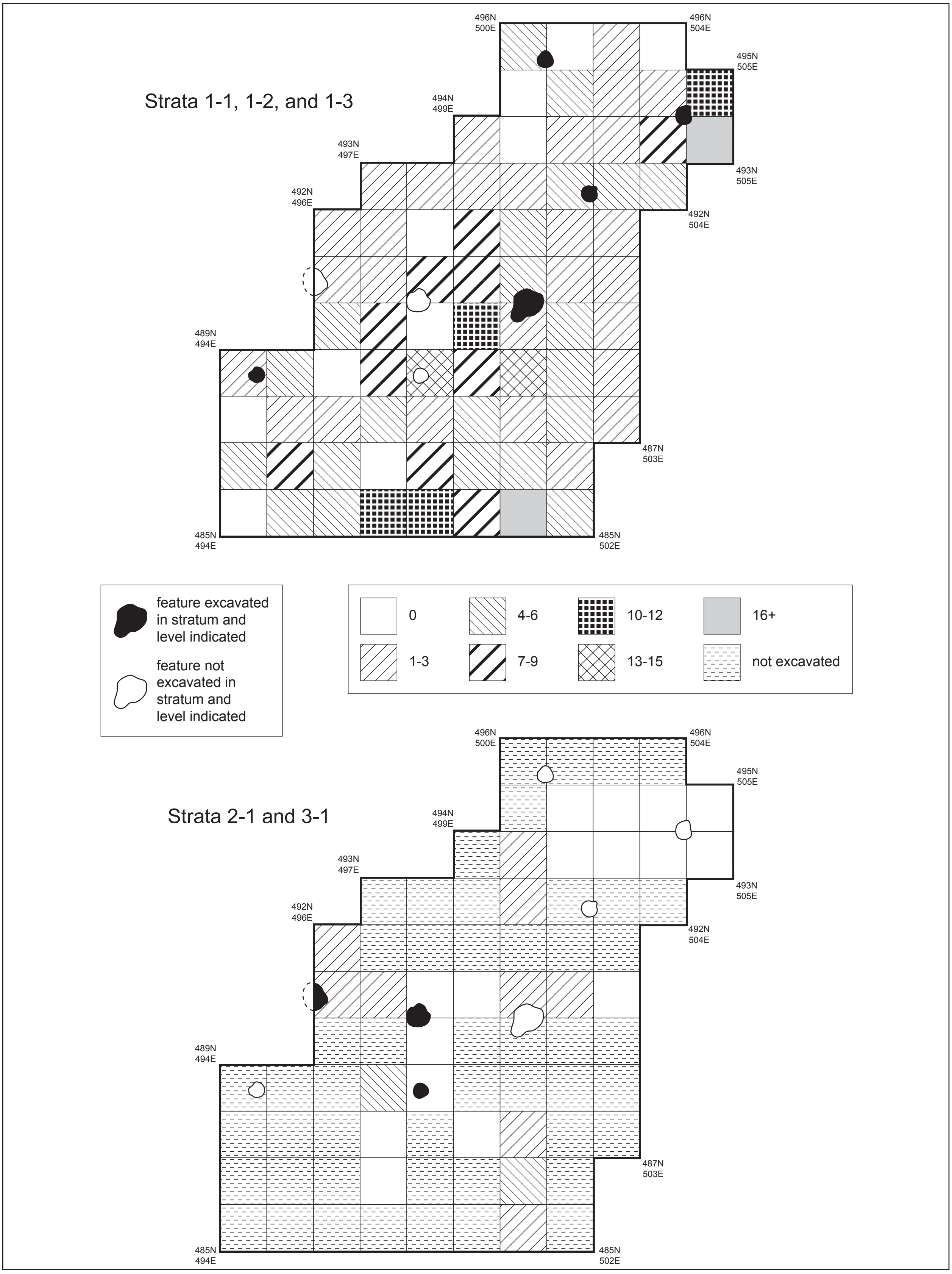

Figure 16.15. LA 129214, Block 8, lithic debitage distribution.

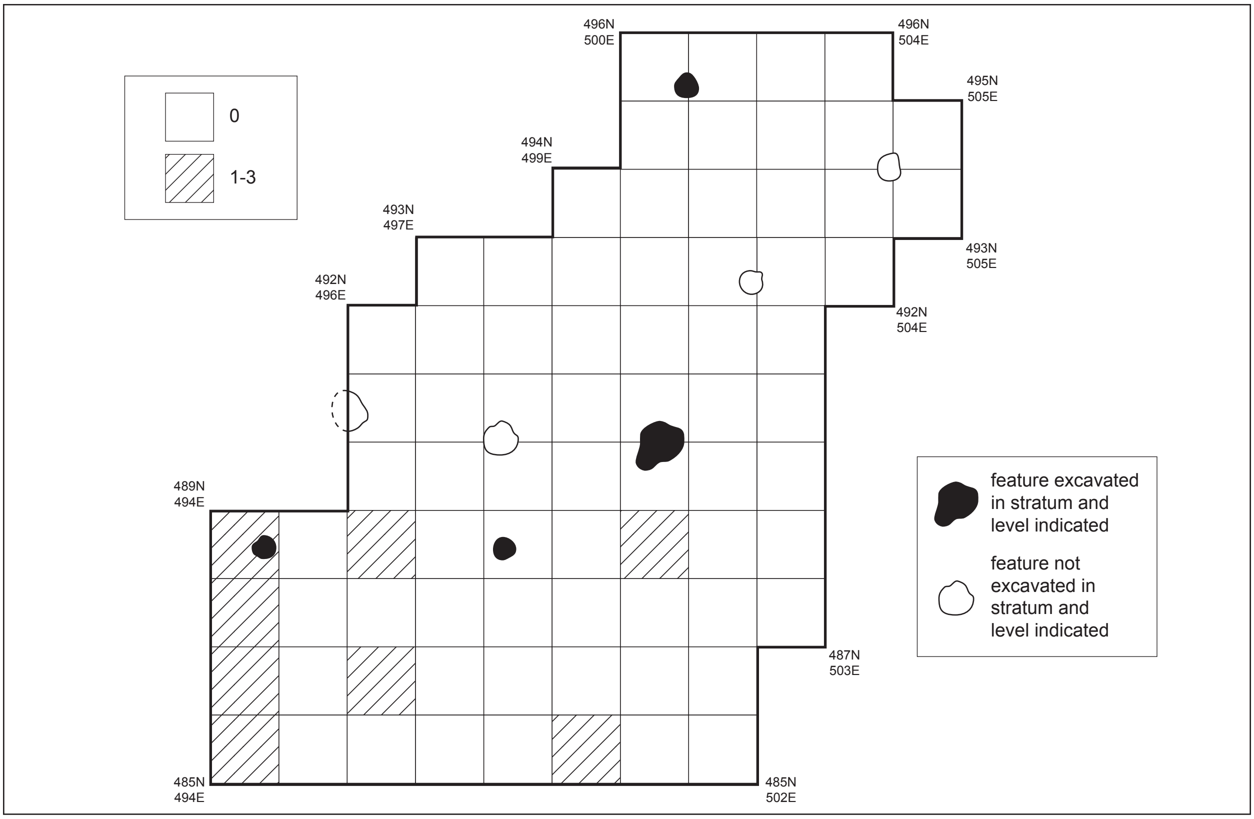

Figure 16.16. LA 129214, Block 8, pottery distribution.

from Block 8 (Fig. 16.16) came from Stratum 1-1 in the vicinity of Thermal Pit 82. If these sherds were associated with the use of this feature sometime during the second half of the fifth century or the first half of the sixth century AD, they would represent some of the earliest pottery made in southern New Mexico and traded to this part of the state.

Block 9

The Block 9 activity-area analysis includes features from both Block 9 and from Backhoe Trench 11. BHT 11 intersects the northeast corner of Block 9 and intrudes into the block for an unknown distance (Fig. 16.17). The uncertainty as to the distance of the intrusion derives from the fact that the trench was excavated quite some time after the completion of the Block 9 excavations. Between subsequent erosion in some parts of the block and piling of drift sand in other parts, landmarks by which to accurately coordinate the two units were missing. It should be noted that the grid outline encompassing the trench and most of its features in Figure 16.17 is for framing purposes only; none of the squares within the framed area were hand-excavated and no systematic collections were made from them. Thus, much of the following discussion of artifact distributions and densities pertain only to Block 9 proper.

Twenty-nine features were exposed and excavated in Block 9 and BHT 11. These include 25 thermal features (including one paired thermal feature, 86n and 86s) and four postholes (Table 16.2).

The non-rock thermal features embody a fair degree of variability, with eight shallow, small pits being the most common (86s, 106, 156, 191, 203, 204, 206, 207), followed by seven shallow, medium pits (86n, 93, 94, 95, 98, 99, 165), and two shallow, large pits (158, 195). Feature 96 is deep, and Feature 152 is very deep. Feature 205 was not completely excavated, leaving its full depth and size unknown.

Before continuing, a few remarks are necessary with regard to two of the thermal pits. First, the field profile of Feature 156 suggests that this feature comprised two separate chambers, one upper and one lower (reminiscent of the double pits discussed earlier). However, given the shallow nature of the lower "pit," its sharply defined curvature, and the length of the overhang between it and the upper "pit," I strongly suspect that the lower "pit"

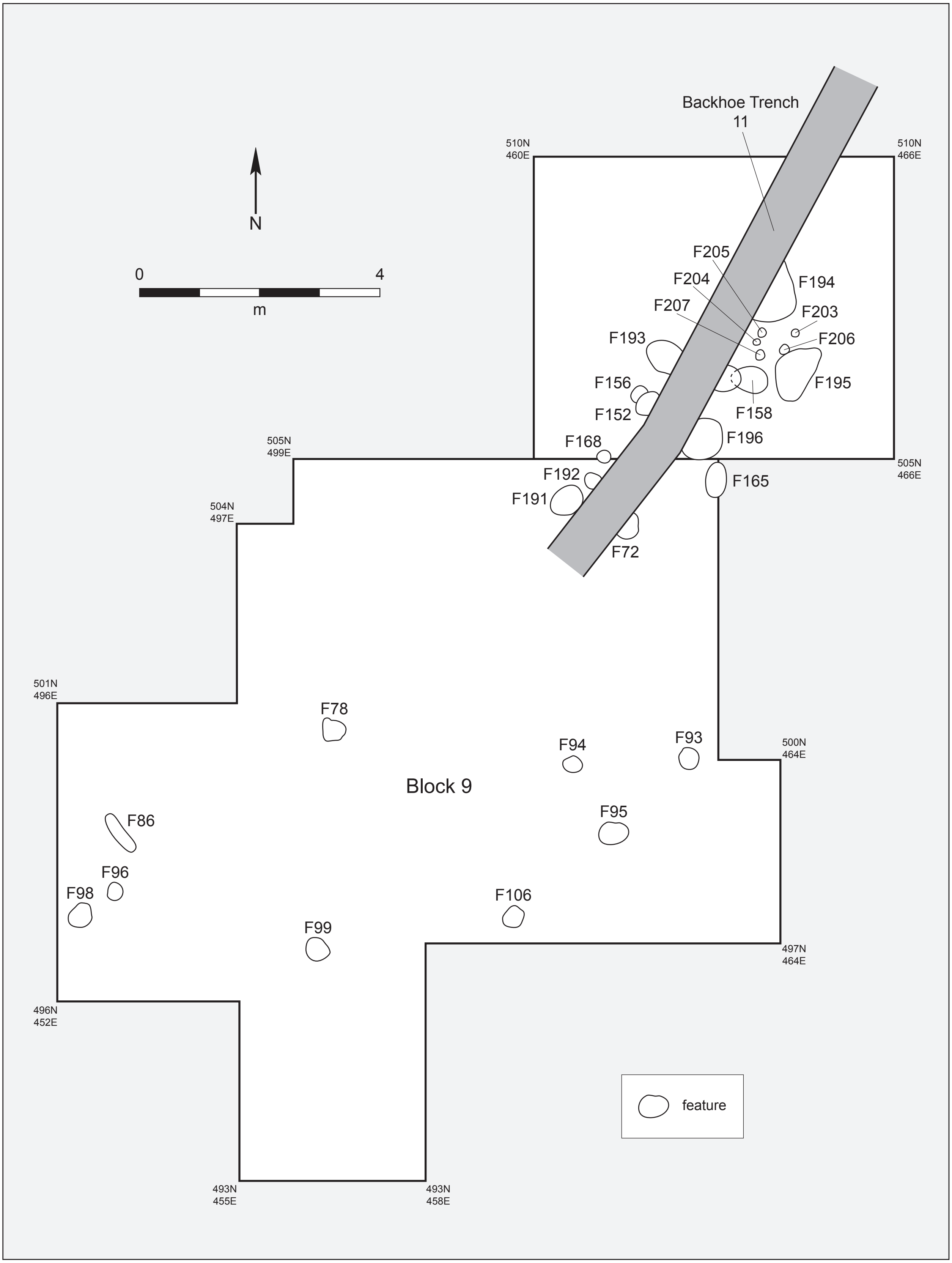

Figure 16.17. LA 129214, Block 9 and BHT 11, feature distribution.

Table 16.5. LA 129214, Block 12 and Backhoe Trench 11, summary of features and radiocarbon dates.

FEATURE NO.	CHARACTERISTICS	RADIOCARBON CALIBRATION I DATE (AD)	BETA ANALYTIC SAMPLE NO.
Block 9 - Nonrock Thermal Features			
86N	thermal n/s/m*	1000	258490
86S	thermal n/s/s	–	–
93	thermal n/s/m	770	258493
94	thermal n/s/m	670	232977
95	thermal n/s/m	810	258494
96	thermal n/d/s	1040	258495
98	thermal n/s/m	1210	258496
99	thermal n/s/m	890	258497
106	thermal n/s/s	870	258502
Block 9 - Rock Thermal Features			
72	thermal r/s/m	710/750/760	258481
78	thermal r/s/m	–	–
Backhoe Trench 11 - Nonrock Thermal Features			
152	thermal n/vd/m	650	232987
156	thermal n/s/s	670	258527
158	thermal n/s/l	770	232990
165	thermal n/s/m	–	–
191	thermal n/s/s	–	–
195	thermal n/s/l	–	–
203	thermal n/s/s	–	–
204	thermal n/s/s	–	–
205	thermal n/u/u	–	–
206	thermal n/s/s	–	–
207	thermal n/s/s	–	–
Backhoe Trench 11 - Rock Thermal Features			
193	thermal r/s/m	–	–
194	thermal r/vd/m	–	–
196	thermal r/s/u	–	–
Backhoe Trench 11 - Postholes			
168	posthole	–	–
169	posthole	–	–
170	posthole	–	–
192	posthole	–	–

*Characteristics: type/depth/size, where type n = nonrock; r = rock;
depth: s = shallow; d = deep; vd = very deep; u = unknown or uncertain;
size: s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

is the result of rodent tunneling. Second, the west boundary of Feature 158 is unclear because of the presence of what could be a separate pit, rather than a continuation of 158; the situation is further complicated by the fact that the latter was cut by BHT 11. Thus, the question remains—Does 158 extend to the edge of the trench or is a second pit involved?

Five rock thermal features are present: 72, 78, and 193 are shallow, medium pits; 196 is shallow but of uncertain size; and 194 is a very deep medium pit.

Four small-diameter features—168, 169, 170 and 192—thought to be postholes, are clustered near where BHT 11 joins Block 9. Such closely spaced features suggest that they represent sequential constructs rather than features that constituted a single, functioning shade, shelter, or rack. Perhaps

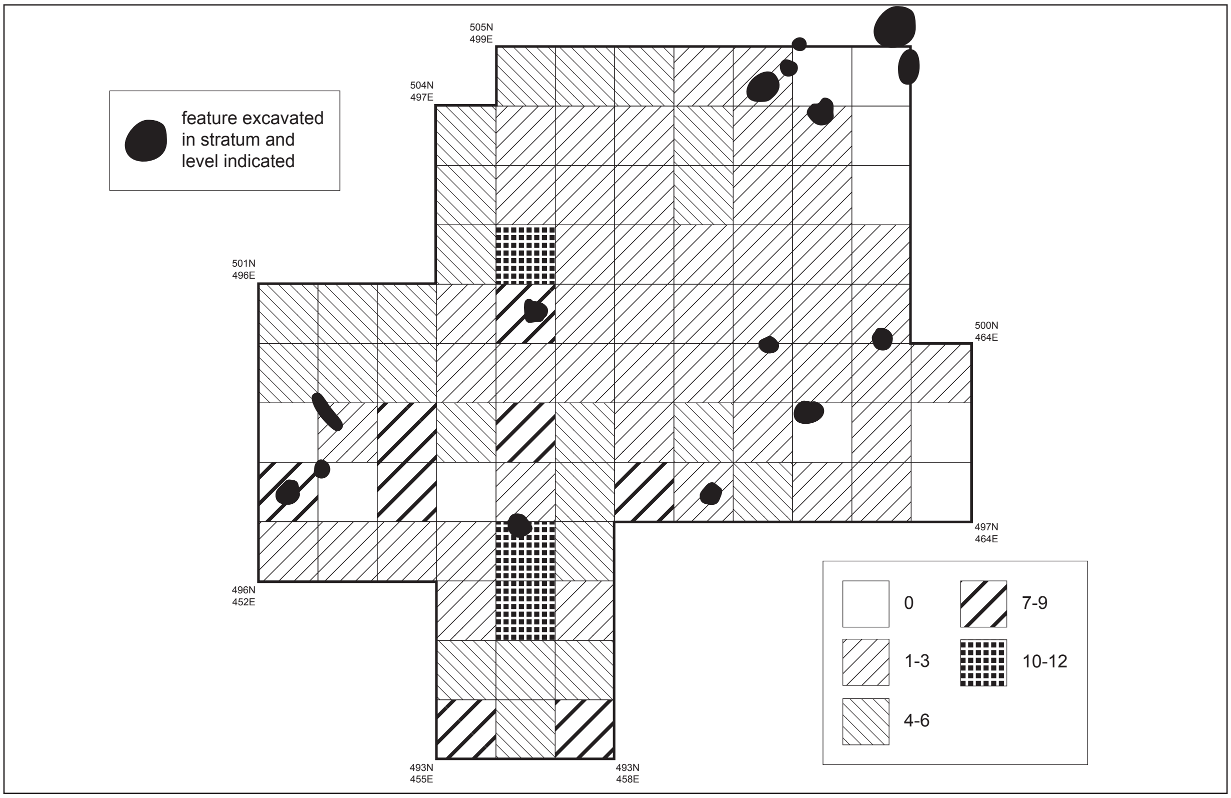

Figure 16.18. LA 129214, Block 9, lithic debitage distribution.

whatever structure they belonged to got blown down on several occasions and had to be re-erected.

Radiocarbon and diagnostic artifact dating: The nine radiocarbon dates from Block 9 have an interesting distribution (Table 16.5). The majority of dates represent the seventh and eighth centuries AD and are spread across the eastern three-quarters of the block (Features 72, 93, 94, 95, 99, and 106, ranging from AD 670 to 890). The latest dates are clustered in the southwest end of the block (Features 86, 96, and 98, ranging from AD 1000 to 1210). Feature 78 was not dated.

Thermal Features 152, 156, and 158 excavated in conjunction with Backhoe Trench 11 were dated. All three occur within the tight interval of the seventh and eighth centuries AD.

According to OxCal analysis, the 12 radiocarbon dates from Block 9 and Backhoe Trench 11 represent a minimum of eight periods of occupation. The features are, from earliest to latest: 152; 94/156; 72/93/158; 95/106; 99; 86; 96; and 98. One has to wonder just how many more periods of occupation are represented among the 13 undated thermal pits.

Both El Paso Brown and South Pecos Brown potteries were recovered from Block 9. Dates suggested for these types include AD 200/600 to 1000/1100 for El Paso Brown and AD pre 900 to post 1200 for South Pecos Brown.

Distributions of artifacts across Block 9: Lithic debitage is present in almost every square of Block 9, but is concentrated in the southwestern half of Block 9 (Fig. 16.18). The vicinities around Features 72, 93, 94, and 95—the earliest-dated thermal pits within the block—were practically devoid of artifacts, whereas relatively high concentrations of lithics and sherds occurred in the vicinities of the rest of the features, including all of the latest ones—86, 96, and 98. This is contrary to expectations that the majority of the lithics would be located above and around the earlier features and essentially absent from the latest ones.

This scenario assumes two things, the usual expectation expressed earlier, that debris generated during the use of a feature is not generally deposited in the immediate vicinity of that feature, and that all of the thermal features in the vicinity of Block 9 were discovered. Given the nature of the distribution of the artifacts and the lack of excavation of squares

Table 16.6. LA 129214, Block 12 and Backhoe Trench 13, summary of features and radiocarbon dates.

FEATURE NO.	CHARACTERISTICS	RADIOCARBON CALIBRATION I DATE (AD)	BETA ANALYTIC SAMPLE NO.
Block 12 - Nonrock Thermal Features			
97	thermal n/s/m*	–	–
101	thermal n/s/s	980	258498
102	thermal n/d/m	890	258499
104	thermal n/s/s	890	258500
107	thermal n/s/s	–	–
110	thermal n/vd/m	430	258503
119	thermal n/d/m	660	258509
121	thermal n/s/m	–	–
123	thermal n/d/m	260/290/320	232983
124	thermal n/s/m	–	–
176	thermal n/s/s	–	–
183	thermal n/s/m	–	–
184	thermal n/s/s	–	–
185	thermal n/s/s	–	–
Block 12 - Rock Thermal Features			
103	thermal r/s/m	690	232979
105	thermal r/d/m	640	258501
108	thermal r/s/m	–	–
109	thermal r/vd/m	420	232980
120	thermal r/d/m	680	232984
128	thermal r/s/m	–	–
129	thermal r/s/m	540	258510
130	thermal r/d/m	–	–
131	thermal r/d/m	810	258511
136	thermal r/d/m	690	258515
Backhoe Trench 13 - Rock Thermal Feature			
190	thermal r/d/l	–	–

*Characteristics: type/depth/size, where type n = nonrock; r = rock;
depth: s = shallow; d = deep; vd = very deep; u = unknown or uncertain;
size: s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

in the vicinities of Features 86, 96, 98, and 106, this second assumption is definitely unwarranted.

Like the lithic debitage, pottery fragments were present across the block (Fig. 16.19). However, less than half of the squares produced sherds.

Block 12

The Block 12 activity-area analysis includes features originally defined by hand excavation of the squares within Block 12 and a series of features later discovered by the mechanical excavation of Backhoe Trench 13 within the Block 12 limits (Fig. 16.20). Thermal Feature 190, also discovered by BHT 13, lies several meters north of Block 12.

Excavations in the Block 12 locus were initiated to investigate Surface Survey Feature 6 as defined by TRC (2000). Rather than a single, large feature as suggested by the surface evidence, Feature 6 turned out to be a complicated series of individual thermal pits spread over the western part of the block. Stratum 2 sediments in the block were generally so dark that feature definition was often more difficult than usual. Thus, the potential for entirely missing features or for only partially defining them was strong. It was not surprising that no footprints of individual camps were discernible in spite of the relatively large area examined.

Twenty-five features were exposed and excavated across Block 12 and in BHT 13 (Table 16.6).

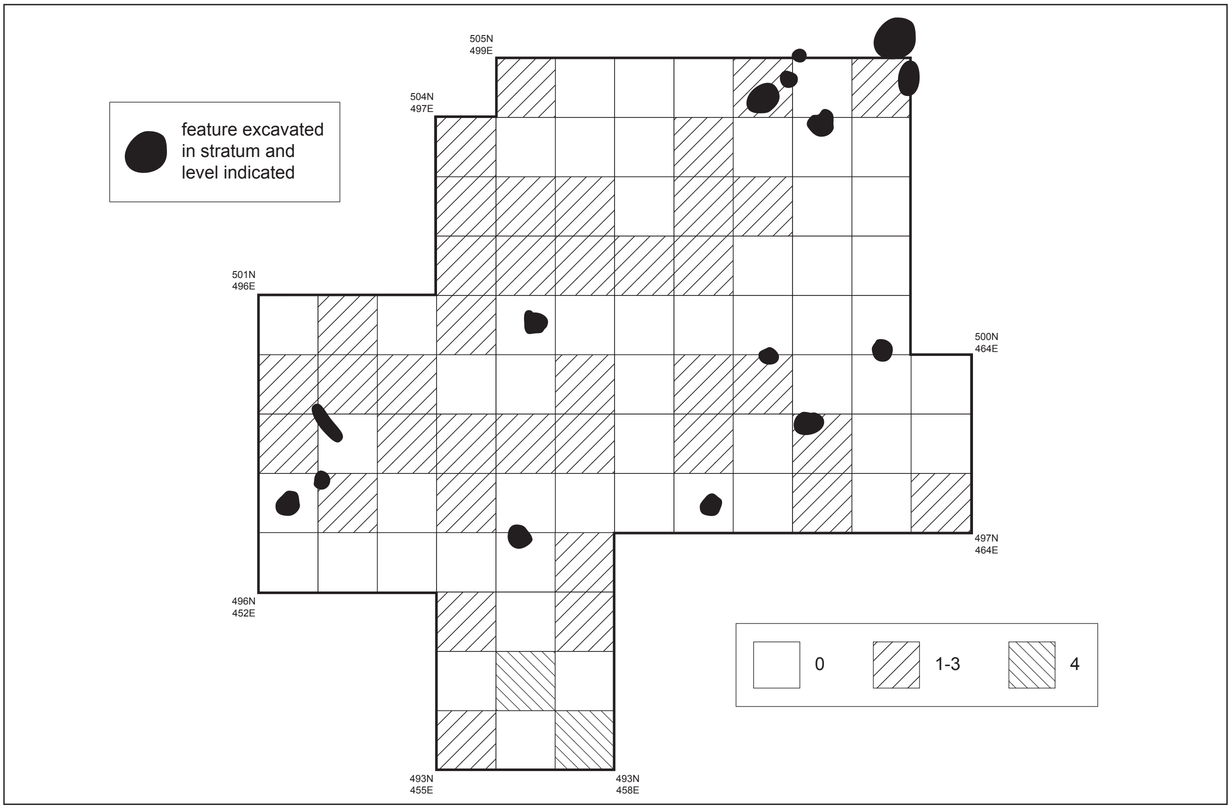

Figure 16.19. LA 129214, Block 9, pottery distribution.

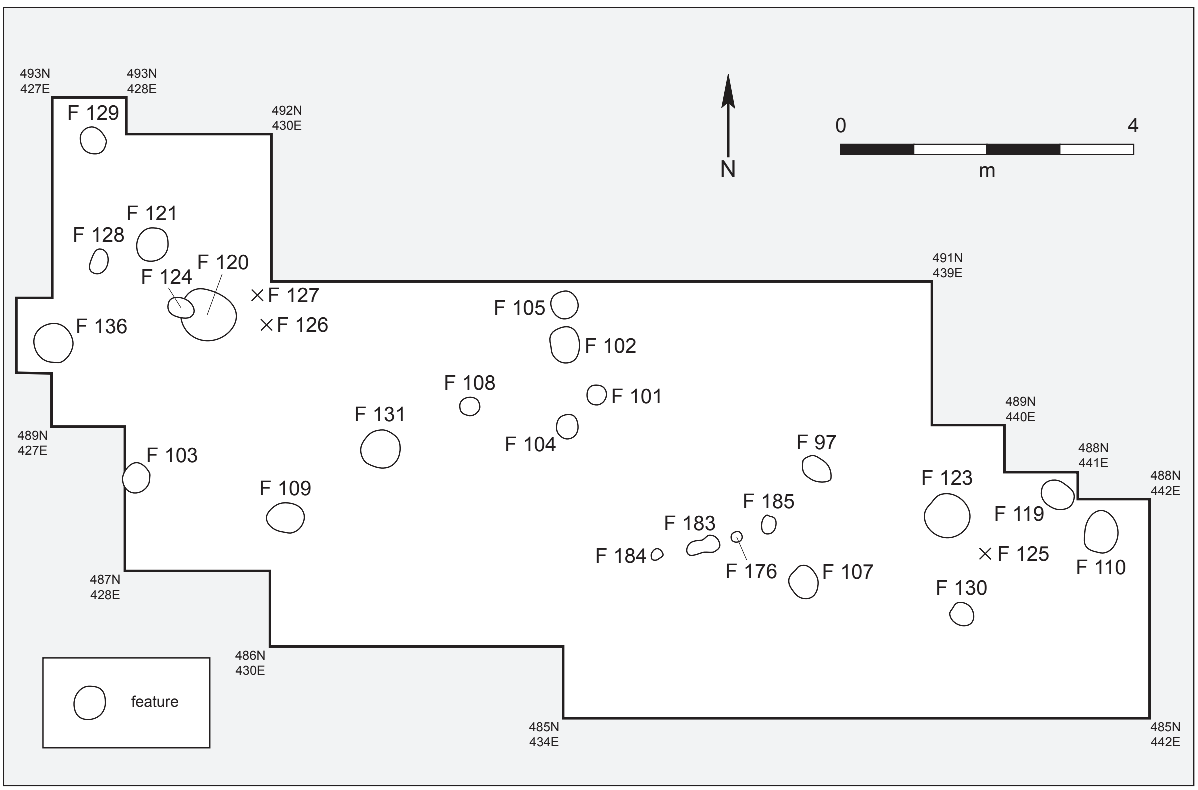

Figure 16.20. LA 129214, Block 12, feature distribution.

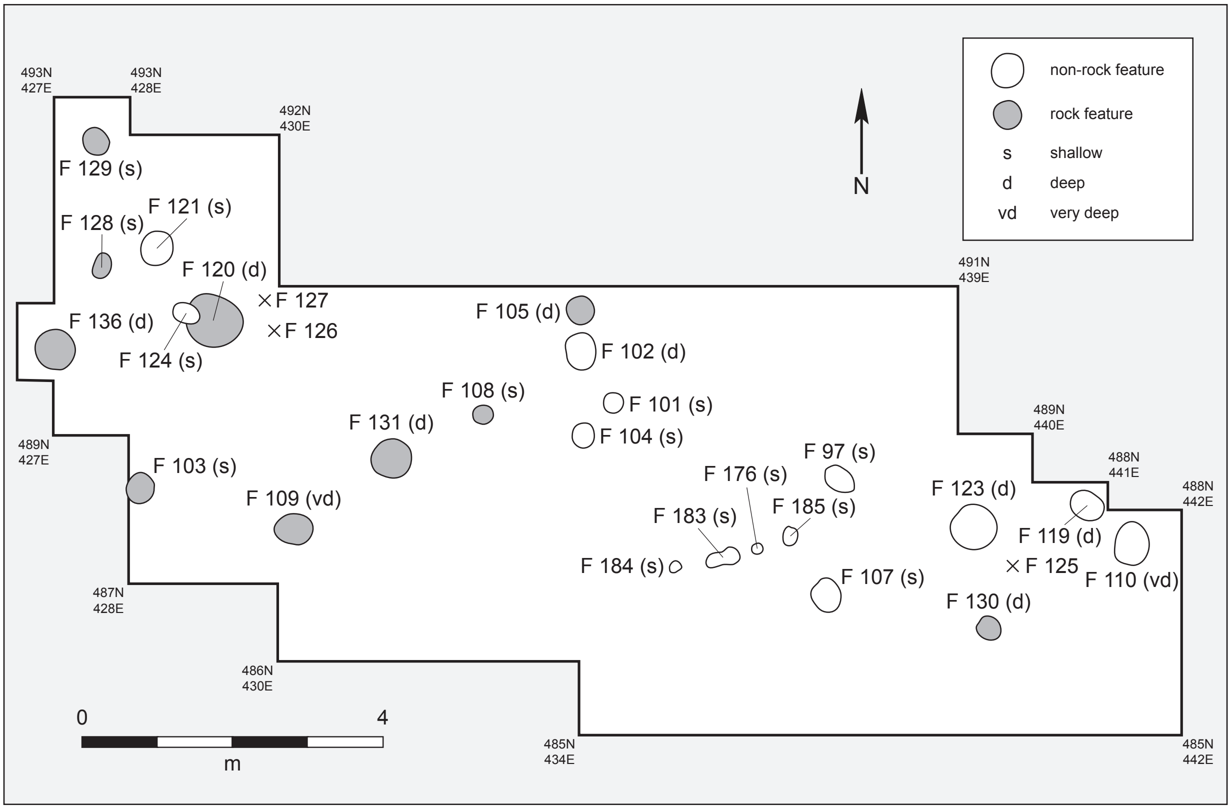

Figure 16.21. LA 129214, Block 12, features by type and depth.

All are thermal pits. There is a slight tendency towards clustering of pits, but none are tightly clustered relative to the amount of space opened up by excavation. Unlike many blocks, the rock thermal pit and deep and very deep features are more numerous, making for an interesting distributional mix across the block.

The 14 non-rock thermal features include a fair degree of variability. The shallow, small features are the most common with six examples (101, 104, 107, 176, 184, and 185). This is followed by shallow, medium examples (97, 121, 124 and 183), deep, medium examples (102, 119, 123), and one very deep, medium pit (110). No large non-rock thermal pits are present in Block 12.

The 11 rock thermal features also include a fair degree of variability. But, unlike the non-rock features, deep, medium pits are the most common (105, 120, 130, 131 and 136), followed by shallow, medium pits (103, 108, 128 and 129). Very deep, medium (109) and deep, large (190) pits are represented by single examples. No small thermal pits are present.

An examination of the thermal pits by depth reveals a roughly equal spread of all three categories (two, if deep and very deep are combined) across the block (Fig. 16.21). The western half of the block diverges slightly from this generalization in that the four deep and very deep pits (110, 119, 123, 130) cluster at the east end, and six shallow pits (97, 107, 176, 183, 184, 185) cluster a short distance to the west. Closer examination of the rest of the block suggests pairing of some like pits (shallow with shallow, deep/very deep with deep/very deep). To the degree that this pairing phenomenon is true, radiocarbon dates do not in any case indicate contemporaneity within the pairs—for instance, Pairs 109/131, 102/105, 101/104, 110/119.

An extensive examination of the distribution of thermal pits by type (rock versus non-rock) suggests some patterning (Fig. 16.21). For instance, all but one of the rock pits are located in the western half of the block, and most of the non-rock pits are located in the eastern half. But again, available radiocarbon dates indicate both halves of the block were intermittently occupied throughout the same, long period. Thus, the significance of the difference between rock and non-rock thermal features in Block 12 is not necessarily temporal in nature. This, of course, does not rule out the possibilities of differences due to feature function or the social identity of the site occupants.

It should be noted in the context of the earlier discussion about different thermal feature types—rock versus non-rock—that the second occupation group, 109/110/129, includes examples of both. Thermal Pits 109 and 129 are rock features in the western half of the block, and 110 is a non-rock feature at the far eastern end. In terms of actual distances, Features 110 and 129 are 18 m apart, and Features 110 and 109 are 10 m apart.

The two rock pits are only 7 m apart. Do these distances represent social distances, or are they merely coincidental? And, of course, just because these three dates are statistically one in the same does not mean that the uses of all three thermal pits were precisely contemporaneous. Their uses could have been a few days, weeks, months, or even years apart, and we would not be the wiser.

Radiocarbon and diagnostic artifact dating: Thirteen of the thermal pits in Block 12 are radiocarbon-dated (Table 16.6). The intercepts range in time from the AD 200s/300s to the 900s. With the exception of the latest dates, they are fairly evenly spread across the block. The AD 800s and 900s dates are clustered in the center of the block.

OxCal analysis suggests a minimum of eight separate occupations in Block 12. The thermal feature groupings representing these occupations are, from earliest to most recent, 123, 109/110/129, 105/119, 103/120/136, 131, 102, 104, and 101.

Excavations in Block 12 produced sherds of El Paso Brown, South Pecos Brown, and Jornada Brown. As discussed earlier in some detail, these types in the aggregate date between AD 200 and 1350/1400.

Distributions of Artifacts Across Block 12: Given the depth of the cultural deposits, especially in the western half of the block, the distributions and densities of lithic debitage are plotted according to the three main excavation levels that contain and overlie deposits and thermal features within.

Stratum 2-3 is the lowest level depicted and is the fifth one down from the modern ground surface (Fig. 16.22, lower). Although two more levels were excavated in some squares, they produced little in the way of artifacts, even though they were, at least in part heavily dark gray to black in color. As can be seen in the figure, artifact recovery in Stratum 2-3 was quite light. Only one, Thermal Feature 131, was associated with this level.

Stratum 2-2, the fourth one down from the surface, produced more pieces of lithic debitage than the lower one (Fig. 16.22, upper). The largest concentration occurs in the west end of the block. Importantly, this level also produced the most features.

Stratum 2-1, the third one down from the surface (Fig. 16.23, lower), produced a high number of debitage pieces, with the majority concentrated in the center of the block. One square containing a particularly high number of debitage also occurs in the square overlying Thermal Feature 136 at the west end of the block. This level constitutes the uppermost presence of the dark anthrosol layer.

Strata 1-1 and 1-2 are the light-colored levels that overlie the anthrosol (Fig. 16.23, upper). Nonetheless, these levels produced large numbers of debitage and three thermal features.

Pottery fragments were not particularly common in Block 12. Those that did occur were thinly spread across the block (Figs. 16.24 and 16.25) and were present in all levels except for the lowest (Stratum 2-3).

Block 13

In spite of the large area excavated, only seven features were uncovered. No individual camps could be defined (Fig. 16.26). The features include six thermal pits and one cluster of piled rocks believed to constitute a post support. Although Thermal Pits 132, 133, and 135 are clustered, their disparate radiocarbon dates demonstrate that their proximity to one another is probably fortuitous. Perhaps the most important aspect of this block is the comparatively large number of artifacts recovered.

Interestingly, non-rock thermal pits are in the minority in Block 13. Features 133 (n/s/m) and 135 (n/s/m) are very similar to one another and belong to the dominant class of these features at LA 129214, those that are shallow in depth and medium in size.

The rock thermal pits embody more variability. Feature 122 (r/s/m) and Feature 141 (r/s/m) are shallow, medium. Feature 132 (r/s/l) is shallow, large. The ultimate size of Feature 139 (r/u/u) is uncertain because only its bottom could be defined by the fire-blackening of the top of the calcrete.

Feature 140 is unique among the features of all

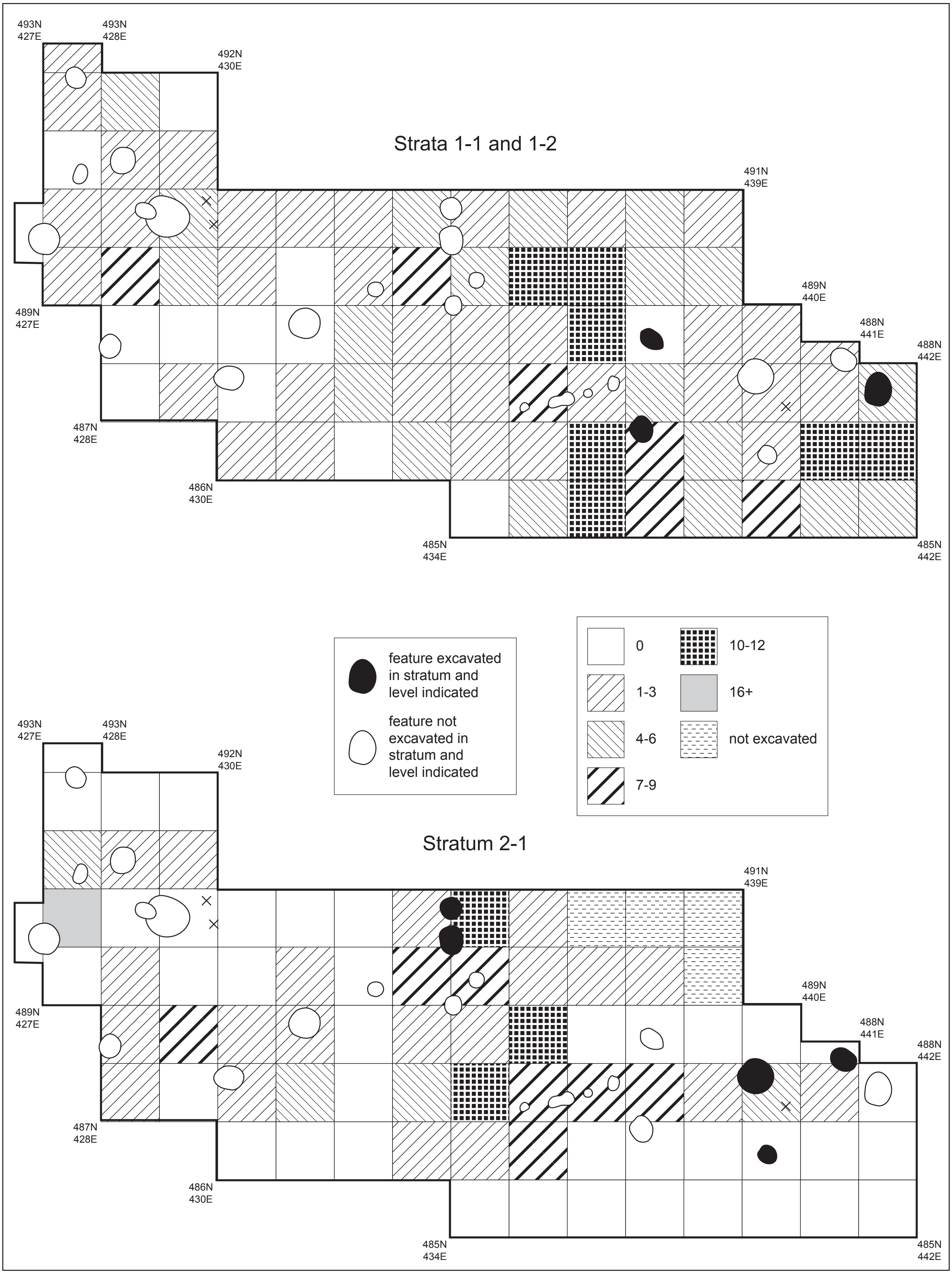

Figure 16.22. LA 129214, Block 12, lithic debitage distribution.

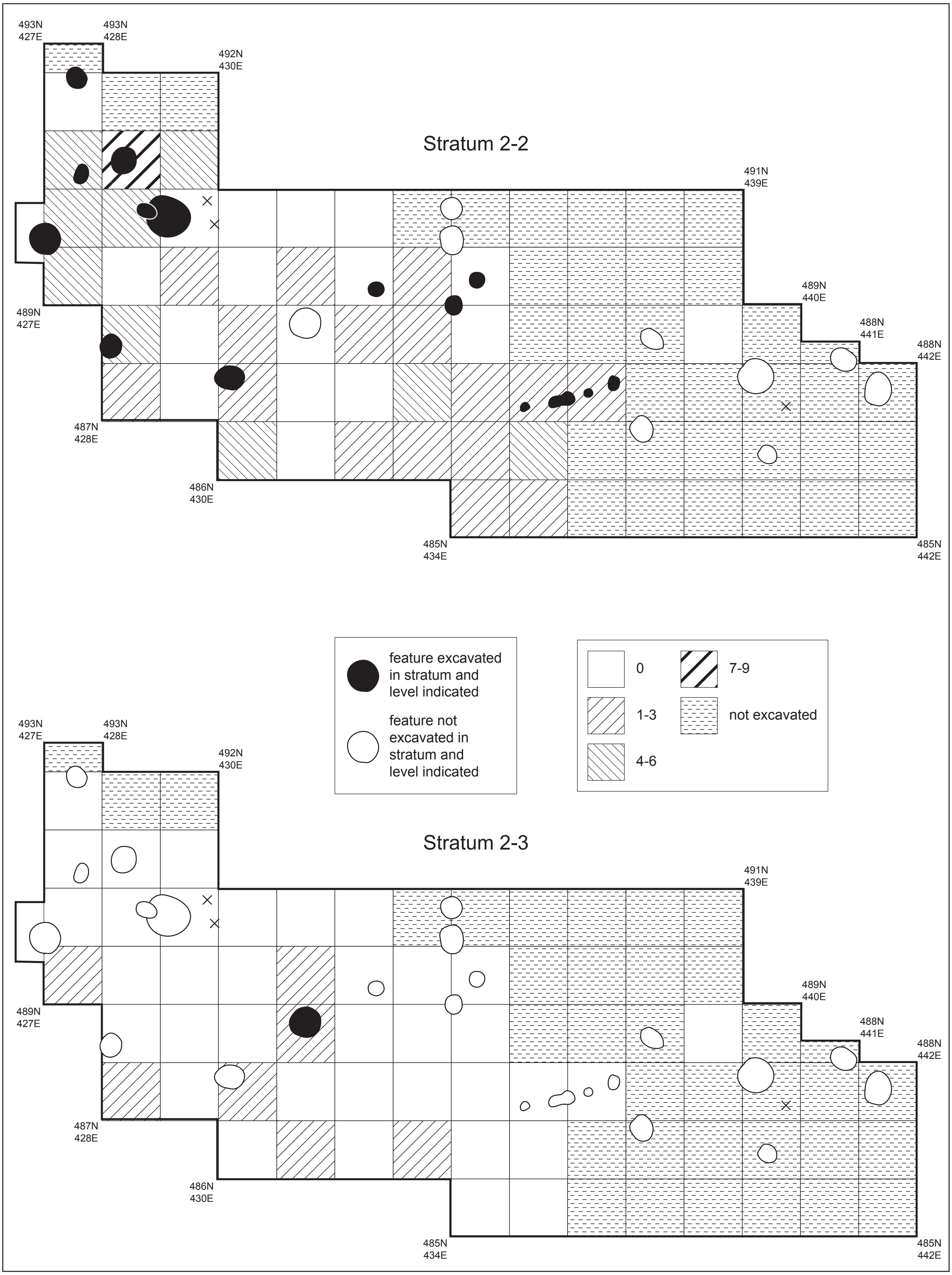

Figure 16.23. LA 129214, Block 12, lithic debitage distribution.

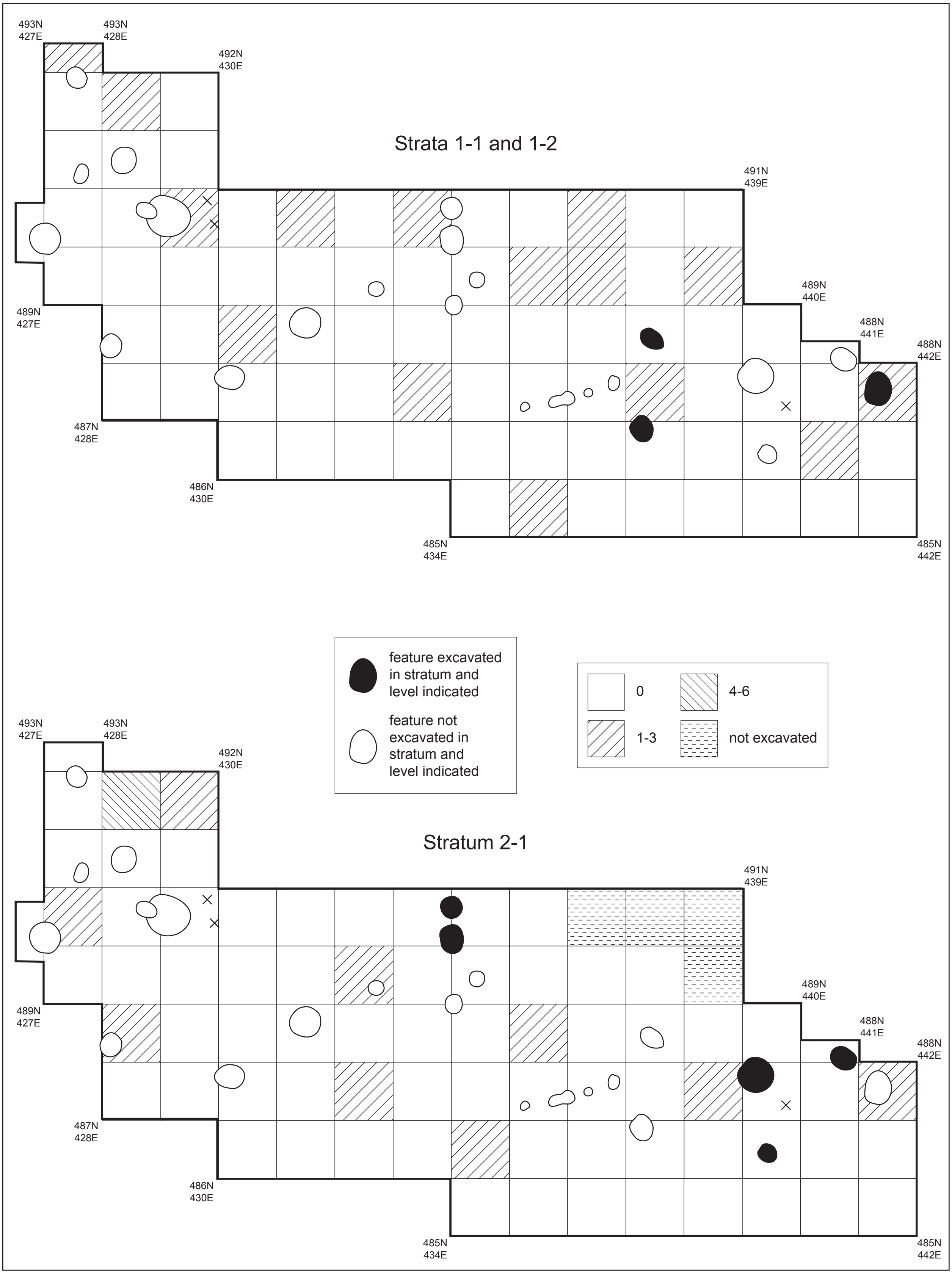

Figure 16.24. LA 129214, Block 12, pottery distribution.

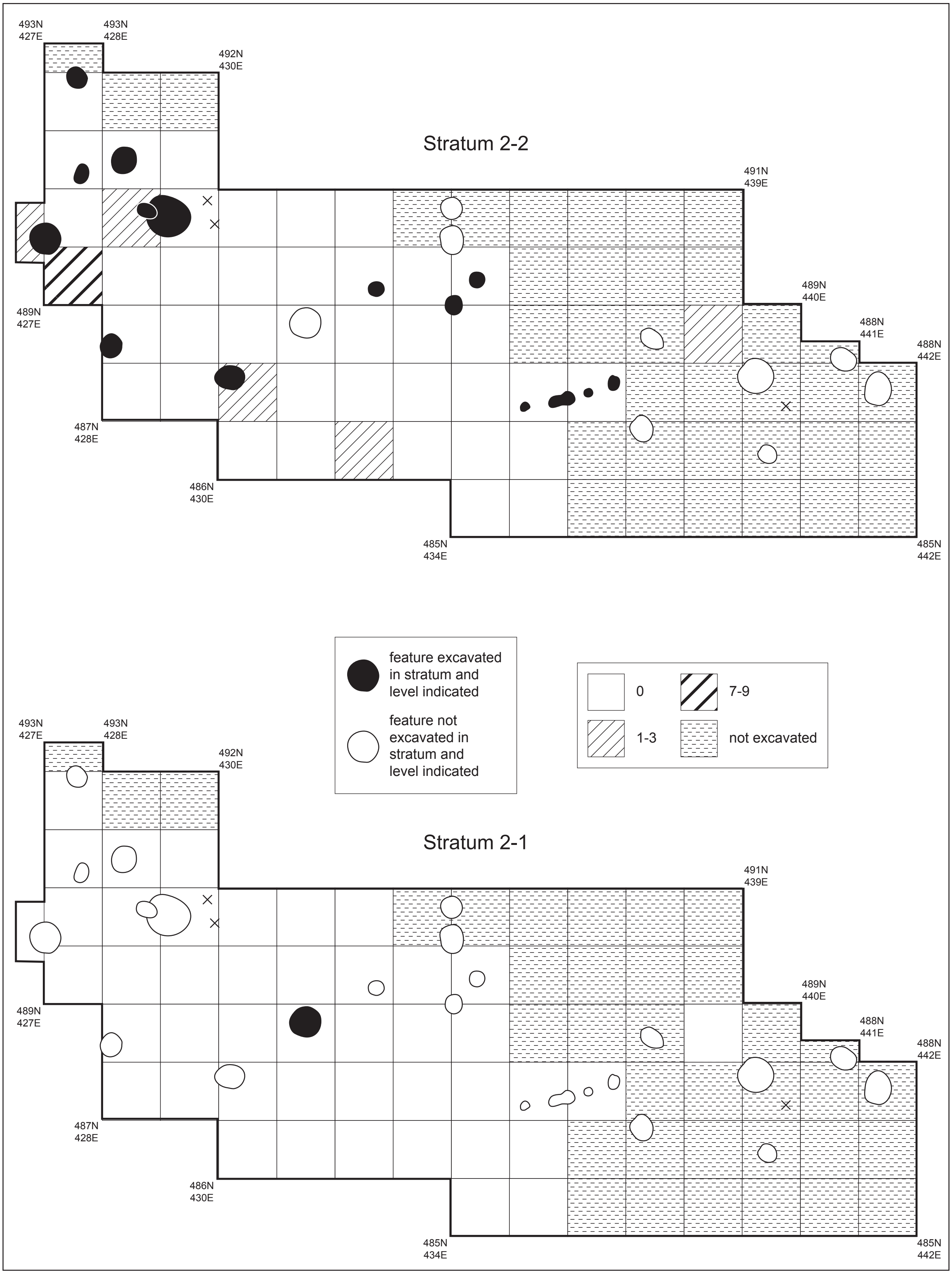

Figure 16.25. LA 129214, Block 12, pottery distribution.

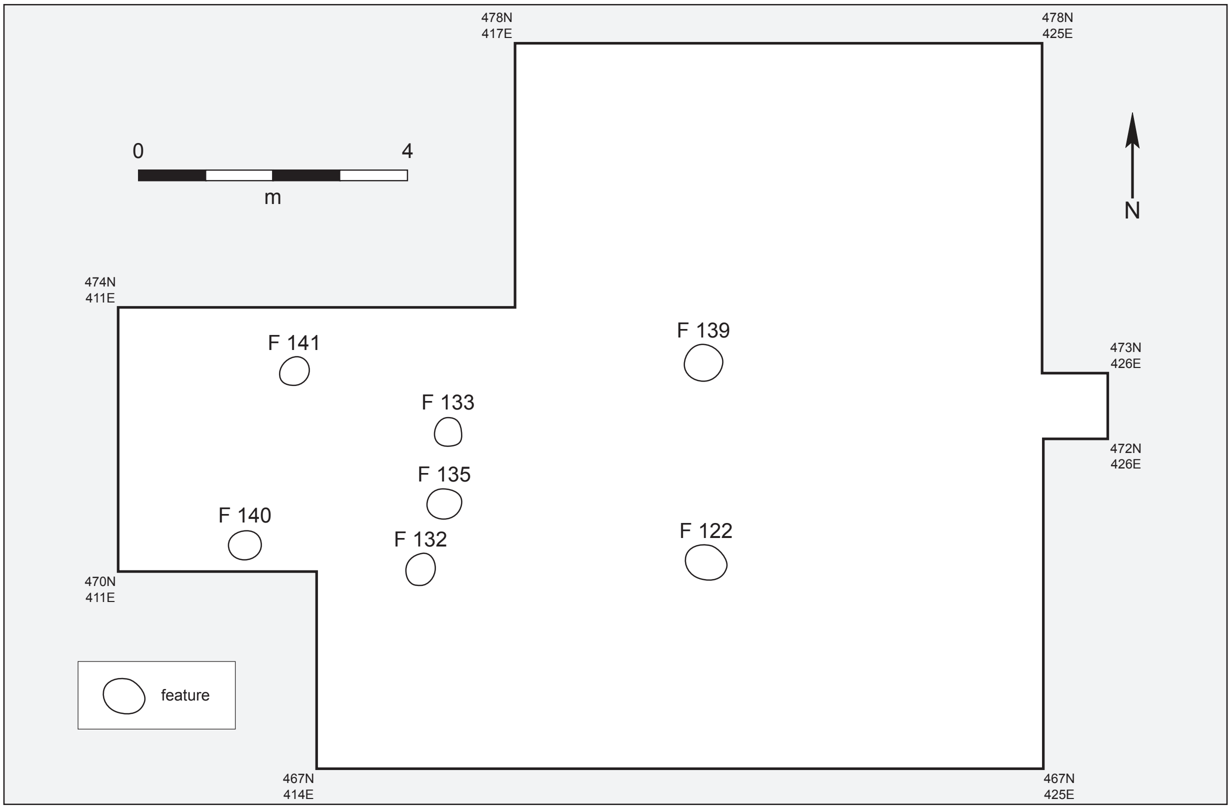

Figure 16.26. LA 129214, Block 13, feature distribution.

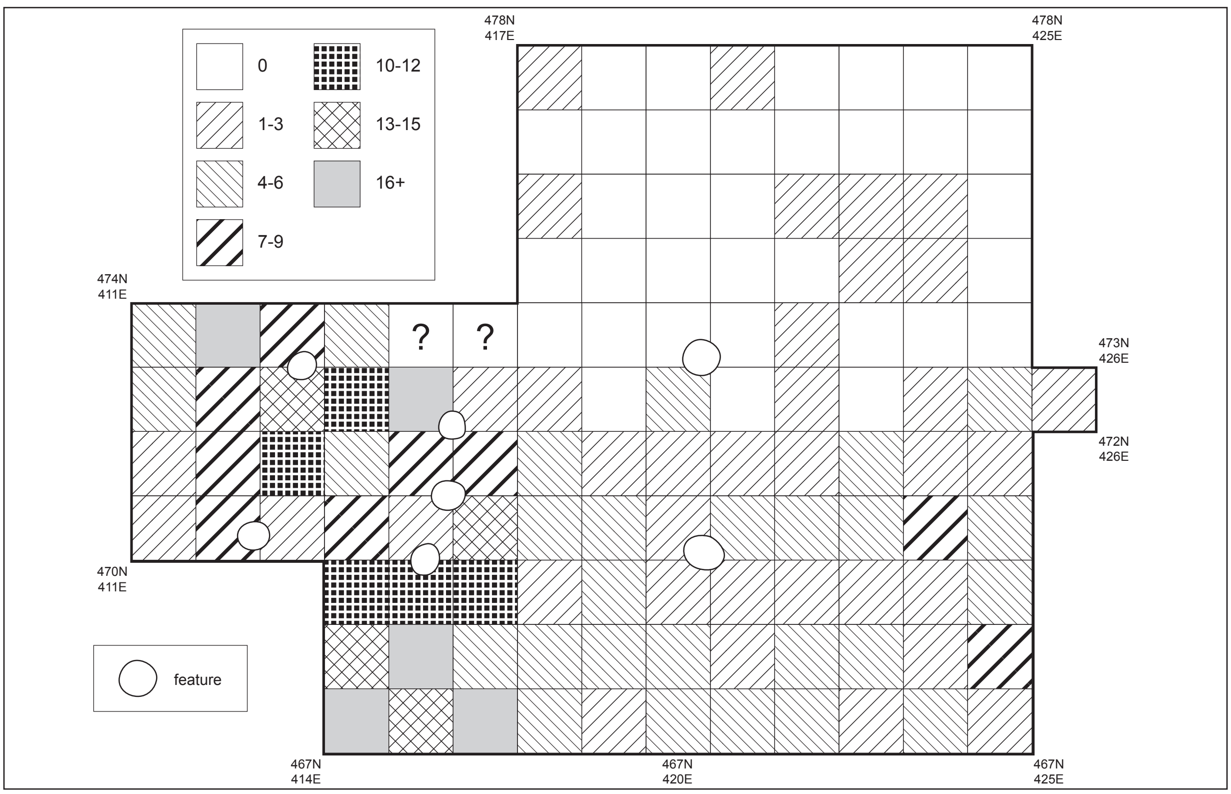

Figure 16.27a. LA 129214, Block 13, lithic debitage distribution.

seven prehistoric sites on the NM 128 project. It consists of a grouping of rocks around an open center. Although spread out somewhat at the time of excavation, they may have been piled up during use. About the only functional interpretation that comes to mind is that the rocks supported the upright position of a pole, perhaps as part of a structure or a rack of some sort. However, careful examination of the area below the opening failed to define a hole to confirm this interpretation. This fact does not negate such a function; dark Stratum 2 sediments are loosely compacted and would not necessarily retain the shape of a hole once the wood was removed. The very softness of the sediments and their tendency to collapse could have required some sort of brace to keep a vertical pole in position, particularly during the windy season.

Radiocarbon and diagnostic artifact dating: Radiocarbon determinations for the five dated features are the most widely spread of any of the blocks at LA 129214. The calibrated intercepts range from AD 250 (Feature 122, Beta 232982) to AD 1400 (Feature 133, Beta 258513). Other intercept dates are as follows: AD 260/280/330 (Feature 132, Beta 258512); AD 670 (Feature 141, Beta 232986); and 1060/1080/1150 (Feature 135, Beta 232985). Not surprisingly, OxCal analysis defines four separate occupations among these dates, with those for Features 122 and 132 representing potentially contemporaneous usages. Features 139 and 140 could not be dated.

Two projectile points were recovered from Block 13. Point FS-1320, a Dalton-like dart base made from Edwards Plateau chert, came from Stratum 1, Level 2 of Square 469N/424E. This primarily eastern United States projectile point type has been found in north-central and northeastern Texas (Prewitt 1995), not too far north of the Edwards chert sources. Since our fragment is a base that is not usable for making other artifacts (and therefore a "pick-up" for reuse by later Native Americans), it is possible that it was dropped at its find spot by a late Paleoindian hunter when he refurbished one of his atlatl darts. Turner and Hester (1993) give a date range of 8500 to 7900 BC for this type.

Projectile point FS-549, a Deadman's-like arrow point, is common on the Llano Estacado of the Texas Panhandle (Prewitt 1995). It was recovered from Stratum 1, Level 2 in Square 475N/417E. Turner and Hester (1993) simply list this point type as belonging to the Late Prehistoric (pottery) period in Texas. Boyd (1997:271ff) redefines the Palo Duro complex, the complex of which Deadman's points are characteristic, and provides dates of AD 500 to 1100/1200. The occupations in Block 13 that might have produced this artifact include Thermal Features 135 and 141.

Sherds of El Paso Brown, Jornada Brown, and South Pecos Brown recovered from this block date to the overall period of AD 200 to 1350/1400. These dates agree well with the range of radiocarbon dates from the features.

Distributions of Artifacts Across Block 13: Block 13 has one of the greatest densities of artifacts per excavated square meter of all blocks except for Block 16. Two major concentrations occur, one in Stratum 1-1 in the west end of the block (Fig. 16.27a), and the other in Strata 2-1 and 2-2 in the southeast-central area (Fig. 16.27b).

These debitage densities indicate that the position of the block on top of the ridge was one of the more important knapping loci on the site. This is particularly interesting, for the location of a men's station on a high point suggests that the placement was important for the long-distance view-shed. A high lookout point would be useful for watching for game animals and, presumably, for potential human enemies (Binford 1978).

It is pertinent in this regard to also note that, in the Guadalupe Mountains and surrounding lowlands to the west of the NM 128 project, knapping areas associated with annular burned-rock middens—communal baking facilities, midden circles, agave pits, etc.— are often found upslope from the middens by survey archaeologists (Dorothy Griffiths, personal communication, late 1990s).

Additionally, the high density of lithic debris around all of the thermal features in the block is most interesting with regard to my often stated assumption that this type of debris would not normally be expected so close to hearths. One potential explanation for this phenomenon is that this part of LA 129214 was a men's area and not subject to the same requirements that might be operative around thermal features frequented by families or other "mixed" camp groups.

The few pottery sherds recovered from Block 13 were thinly and evenly spread throughout the excavated area (Fig. 16.28a and 16.28b). About the only observation beyond this fact is that they were mostly in units located away from the thermal features.

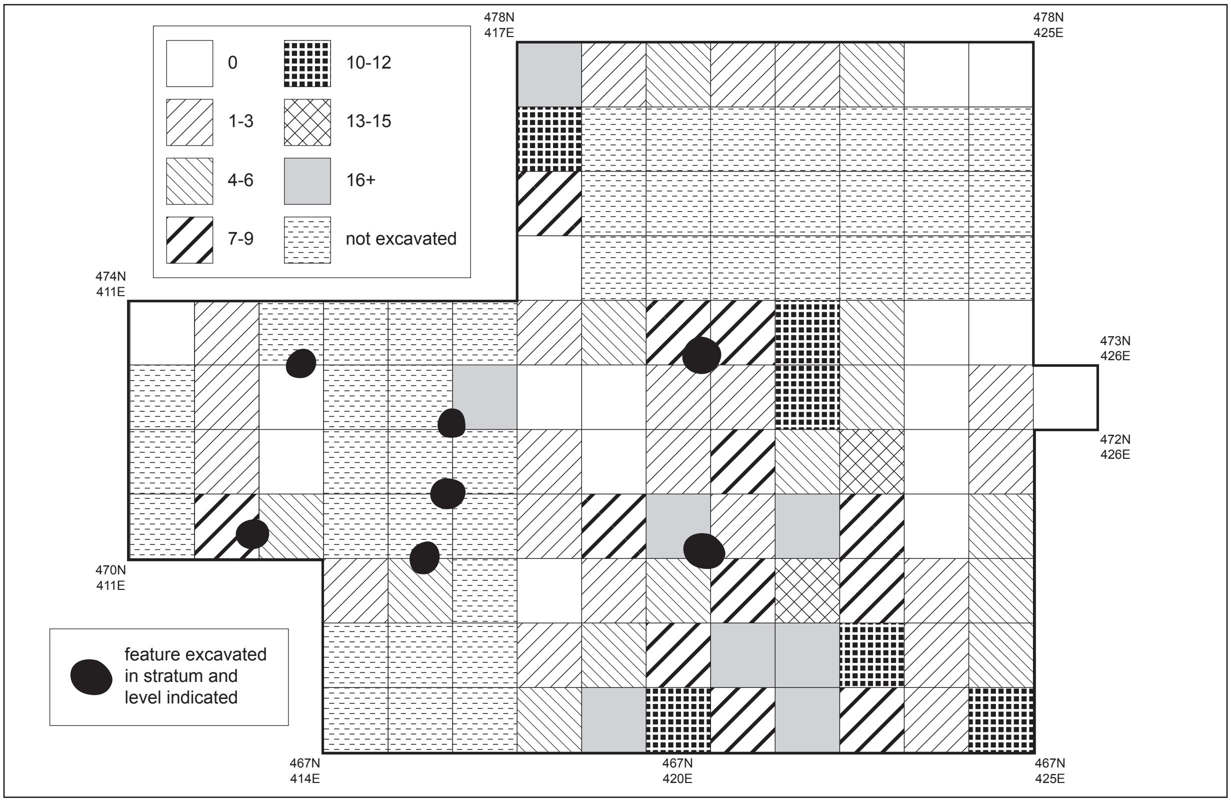

Figure 16.27b. LA 129214, Block 13, lithic debitage distribution.

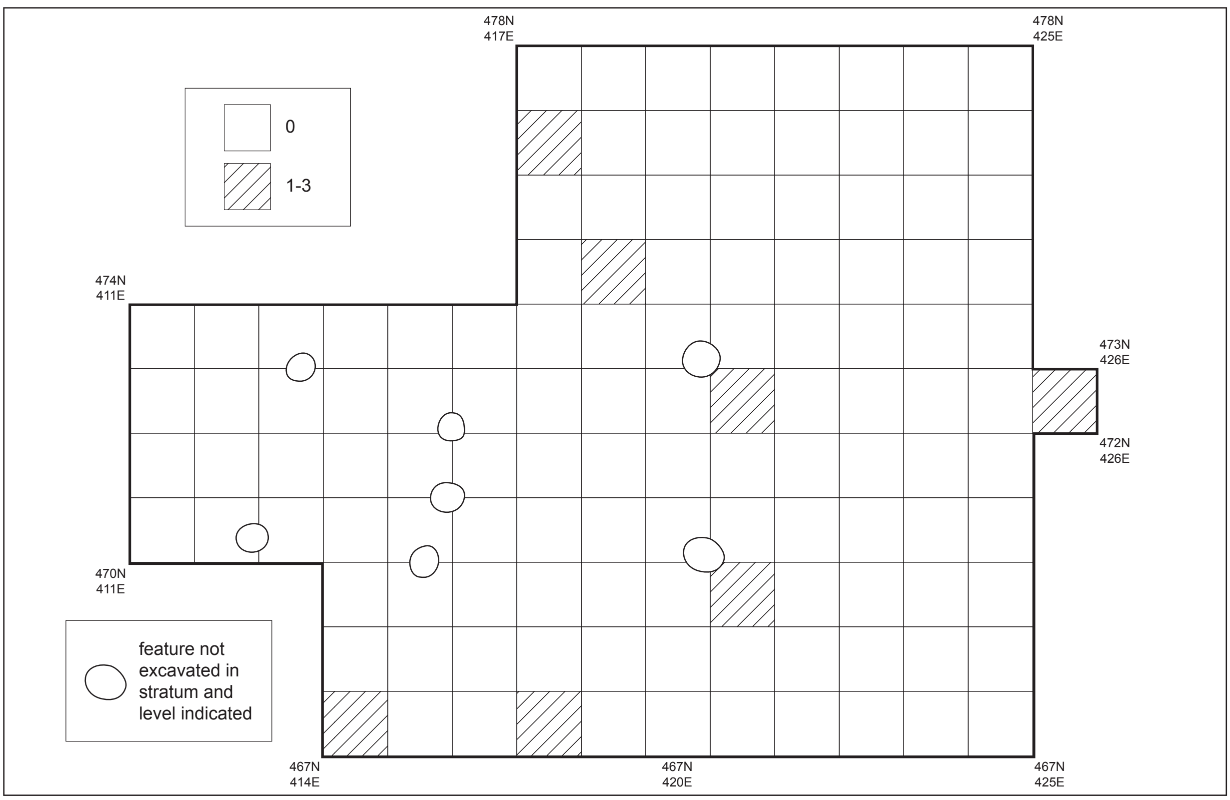

Figure 16.28a. LA 129214, Block 13, pottery distribution.

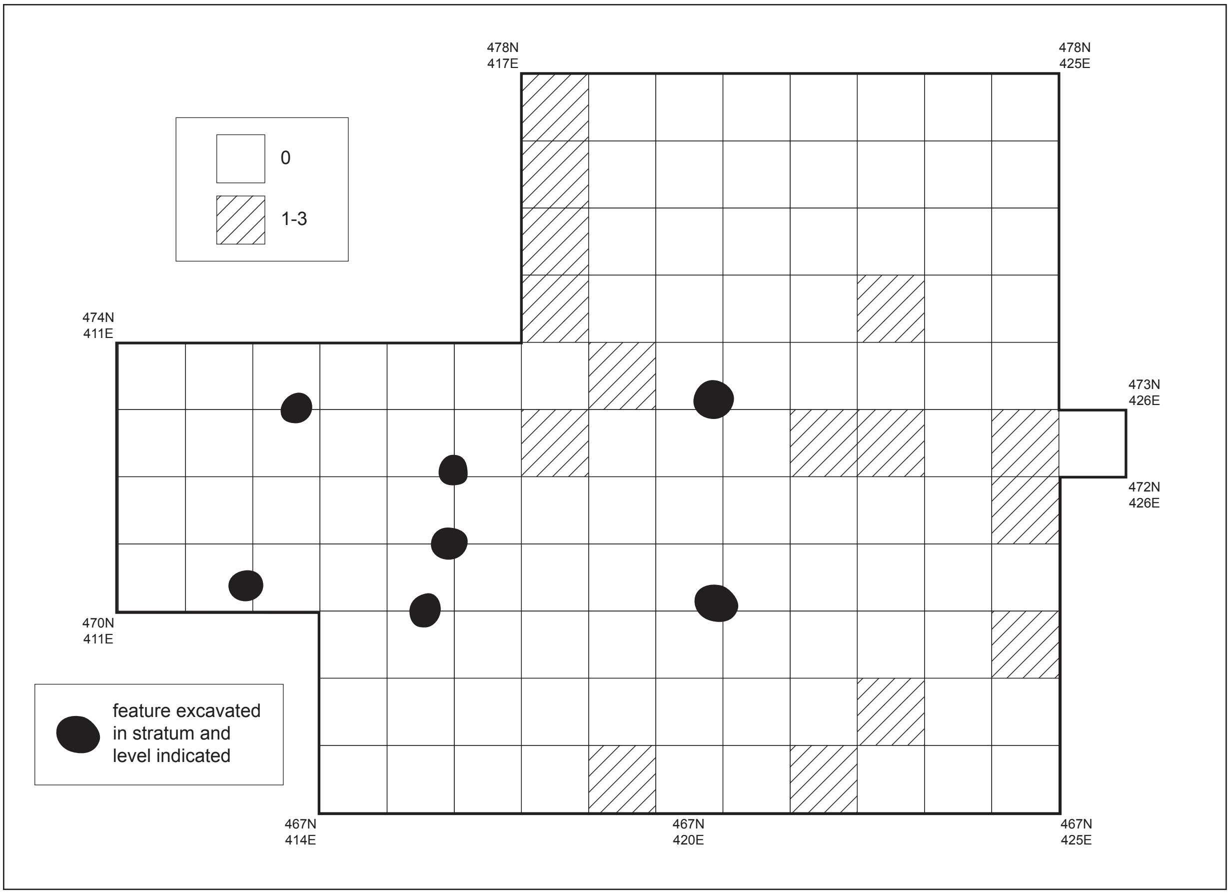

Figure 16.28b. LA 129214, Block 13, pottery distribution.

Block 16

Block 16 is small compared to those discussed above. The purpose of including it in this discussion of activity areas is because the artifact density is the greatest encountered at this and all other sites on the NM 128 project.

Block 16 is split into two sub-blocks (16W and 16E) spaced 3 m apart (Fig. 16.29). The number of features (n = 11), all thermal in type, and the artifact density of sub-block 16W are by far the greatest at LA 129214, whether we are considering the sub-block as a whole or each individual square separately.

By the same token, the excavation limits of sub-block 16W are so close to the cluster of features that we cannot discern whether other details of an Alyawara-like camp footprint (structures/shelters, cleared space, etc.) are present in the location. Sub-block 16E has three thermal features and a relatively high artifact density but one that is lower than that of 16W. As with 16W, the excavated space is too small to discern whether or not a camp footprint is present in 16E.

Sub-blocks 16W and 16E have 10 non-rock thermal features (Table 16.7). Of those for which full details are available, all but 138 features are shallow, half are medium in size, and the rest are either small or large. Feature 149 was only partly exposed, so its ultimate size is unknown.

All of the rock thermal features are shallow, but they also range from small to large in size.

Radiocarbon and diagnostic artifact dating: Radiocarbon dates were obtained for 12 of the thermal features. The calibrated intercepts range from AD 550 to 1270, with most centuries that lie in between being represented. OxCal analysis identifies at least eight periods of occupation of this block. These periods, represented by the thermal features arranged from earliest to most recent, are: 180, 182, 181, 148, 143/146/163, 144/145/162, 138, and 149. Feature 149, with an intercept date of AD 1270, represents the next to last occupation of the NM 128 sites.

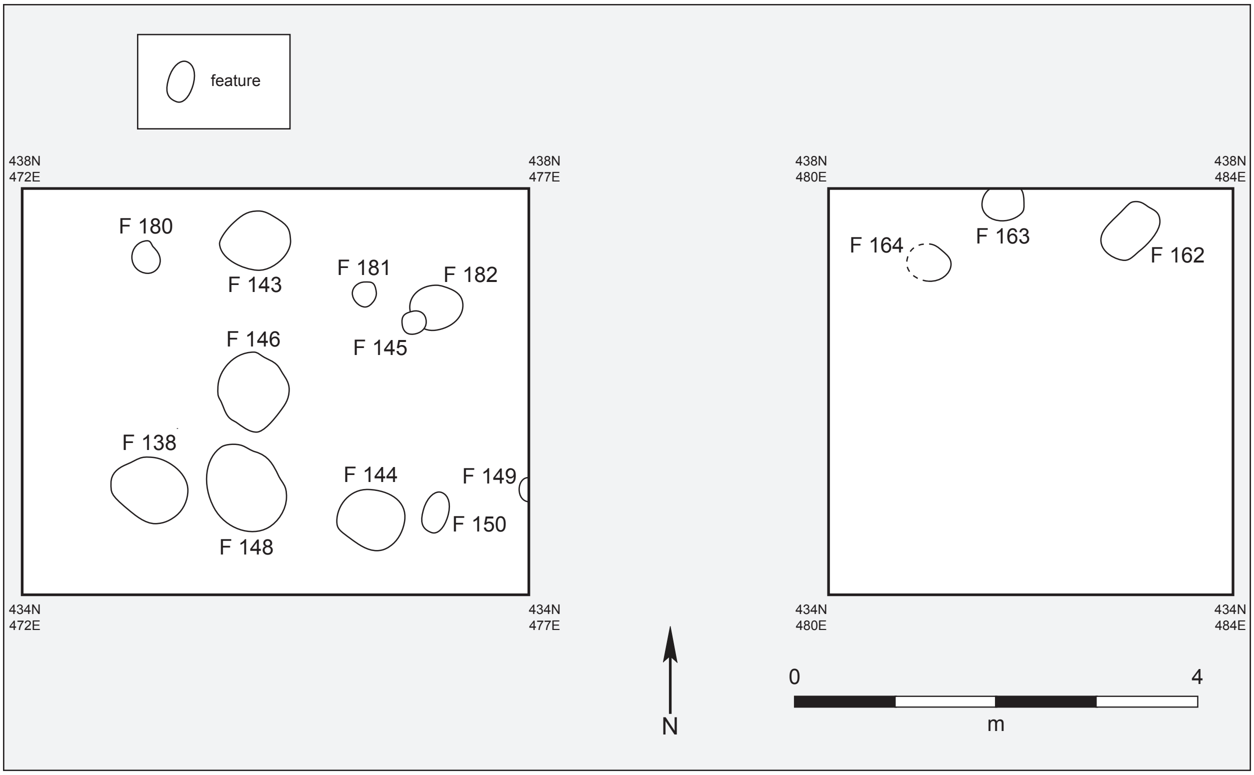

Figure 16.29. LA 129214, Block 16, feature distribution.

Table 16.7. LA 129214, Block 16, summary of features and radiocarbon dates.

FEATURE NO.	CHARACTERISTICS	RADIOCARBON CALIBRATION I DATE (AD)	BETA ANALYTIC SAMPLE NO.
Nonrock Thermal Features			
138	thermal n/d/l*	1060/1080/1150	258517
144	thermal n/s/m	1020	258520
145	thermal n/s/s	1020	258521
148	thermal n/s/l	890	258522
149	thermal n/s/u	1270	158523
150	thermal n/s/m	–	–
163	thermal n/s/s	970	258531
164	thermal n/s/m	–	–
181	thermal n/s/s	770	258535
182	thermal n/s/m	670	258536
Rock Thermal Features			
143	thermal r/s/m	900/920/960	258516
146	thermal r/s/l	900/920/950	232988
162	thermal r/s/l	1020	258530
180	thermal r/s/s	550	258534

*Characteristics: type/depth/size, where type n = nonrock; r = rock; depth s = shallow; d = deep; vd = very deep; u = unknown or uncertain; size s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

Potsherds recovered from this block are concentrated in a manner that suggests trash deposits rather than associations with specific features. Nonetheless, they could have been associated with most or all of the features uncovered in the block. The three main brown ware types El Paso, Jornada, and South Pecos are represented. Together, they encompass the period AD 200 to 1350/1400.

Distributions of artifacts across Block 16: Relative to the rest of the blocks at LA 129214 and the rest of the NM 128 sites as a whole, Block 16 produced an incredible number of pieces of lithic debitage (Fig. 16.30). Numbers of debitage per level, per 1 by 1 m square, run as high as 90 items, with 51 out of 142 levels in 29 out of 36 squares producing 20 or more items. Unfortunately, in sub-block 16E, few squares were excavated through Stratum 2-2, and none were excavated through Stratum 2-3 or Stratum 2-4. The lithic debitage concentrations were heaviest in Stratum 2-1 in both sub-blocks. The second densest concentrations were about equal in Stratum 1-1 and Stratum 2-2.

As throughout the NM 128 sites, pottery sherds were far less numerous in Block 16 (Fig. 16.31). The greatest number was found in the same level as the lithics, Stratum 2-1, and clearly concentrated along the west margin of sub-block 16W.

LA 129217

Blocks 1, 2, and 5 are referred to as Blocks 1/2/5. These three blocks were placed in a blowout and part of an adjacent dune that had been mechanically removed (Fig. 16.32).

Blocks 1/2/5

Only one feature was encountered in the 91 sq m excavated in these three blocks. Feature 10 is a shallow, large, non-rock thermal pit that did not produce enough charcoal for a radiocarbon date.

Projectile point FS-105, a dart point reworked to an arrow (?) tip, came from Stratum 7, Level 5 in Square 488N/482E of Block 5. This is one of the deeper excavations conducted in this block and at this site. If this point was used on an arrow, rather than a dart, then a date sometime in the second half of the first millennium AD or a little later is implicated. Thus, this deposit and all those above it probably belong to one or more of the Neo-Archaic periods in spite of the fact that no pottery was recovered in this block.

The distribution and density of lithic debitage in Blocks 1/2/5 are very interesting in that almost no items were recovered outside of two main concentrations, one in the eastern block (Block 5) and the other at the juncture of Blocks 1 and 2 to the west (Fig. 16.33). These concentrations were at the same absolute elevation—or the same aboriginal ground level—even though their excavation levels differed significantly. Since the space between the two concentrations was not excavated, we do not know whether they comprised a single deposit or two separate ones. And, we cannot judge how they related temporally with Feature 10 located 6 m north of the west concentration.

No pottery was recovered from Blocks 1/2/5.

Block 6

This large block produced only one feature (Fig. 16.34). Thermal Feature 11 is a shallow, small, non-rock thermal pit that did not produce enough charcoal to provide a radiocarbon date.

Projectile point FS-1, a Golondrina-like dart tip, was recovered from the modern surface of a blowout in Square 522N/475E. This position is 4 meters east of the eastern excavation limit of Block 6. In the Central, South, and Lower Pecos regions of Texas (Prewitt 1995), Golondrina points are dated to the period 7080 to 6830 BC (Turner and Hester 1993). It cannot be stated with certainty whether this specimen is a guide to the temporal and cultural affiliation of the archeological remains in Block 6, or anywhere else on this site for that matter.

The 20 pieces of lithic debitage were scattered throughout the squares and levels in the southern half of this block (Fig. 16.35). All were more than 2 meters away from Thermal Pit 11, suggesting that they may have been produced by the users of that feature.

No pottery sherds were recovered from Block 6.

Additional dating information was obtained from a large bifacial knife or projectile point recovered from a surface context well away from the excavation blocks. FS-11 is a broad point with very prominent shoulders; a short, slightly expanding stem; and relatively shallow corner notches. It is most similar to the Marcos point, a type that is found all over the state of Texas (Prewitt 1995) and

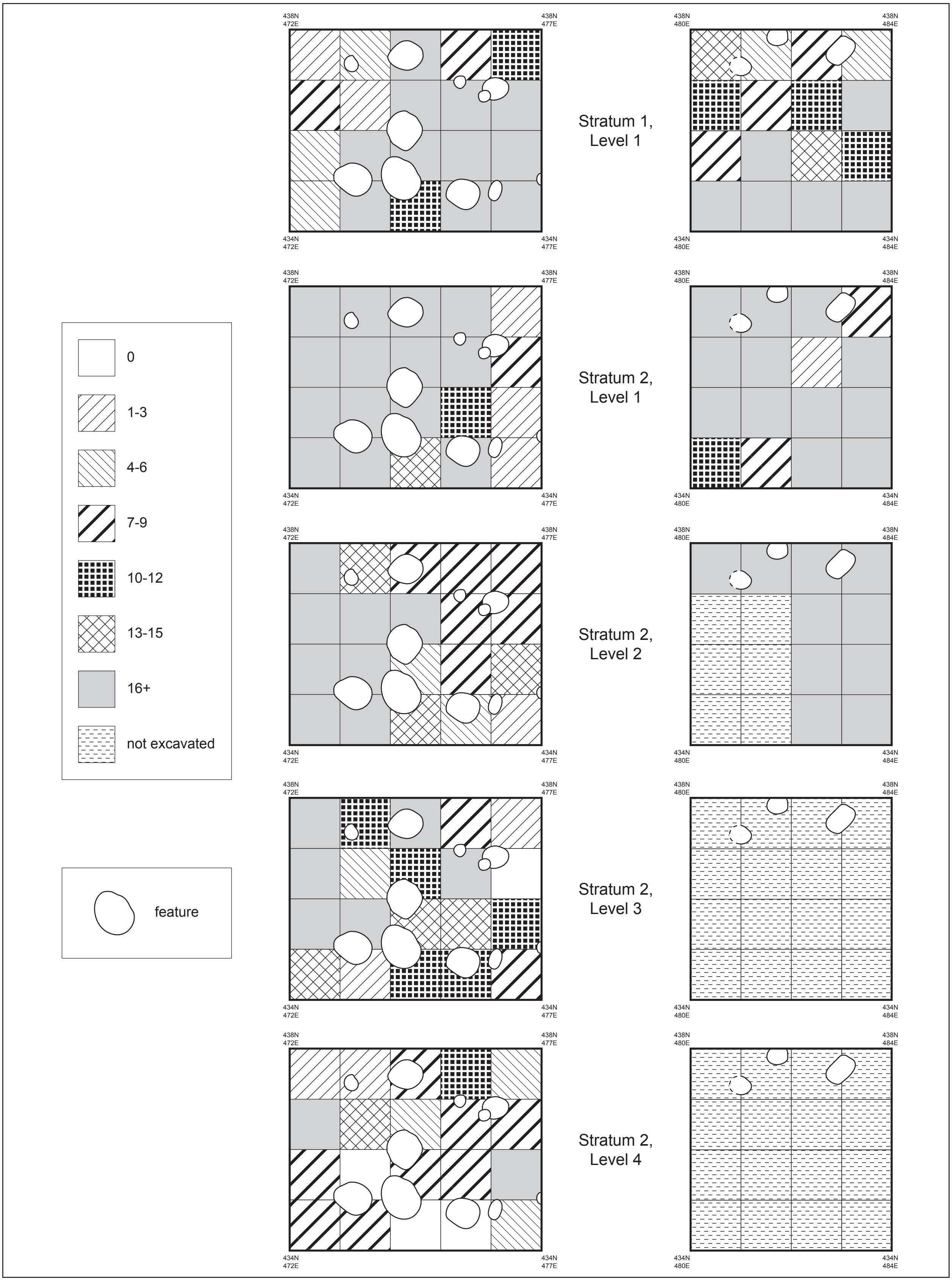

Figure 16.30. LA 129214, Block 16, lithic debitage distribution.

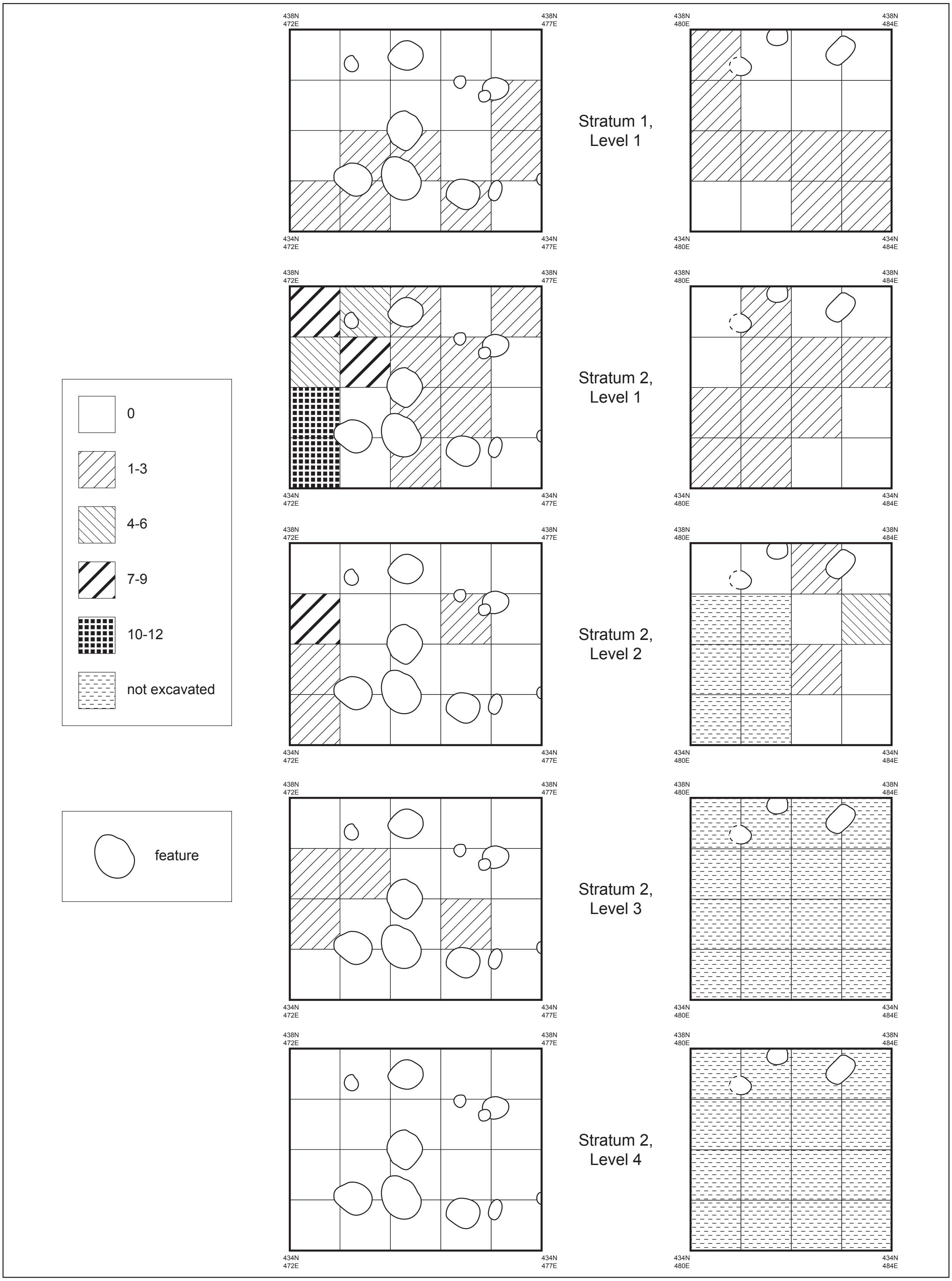

Figure 16.31. LA 129214, Block 16, pottery distribution.

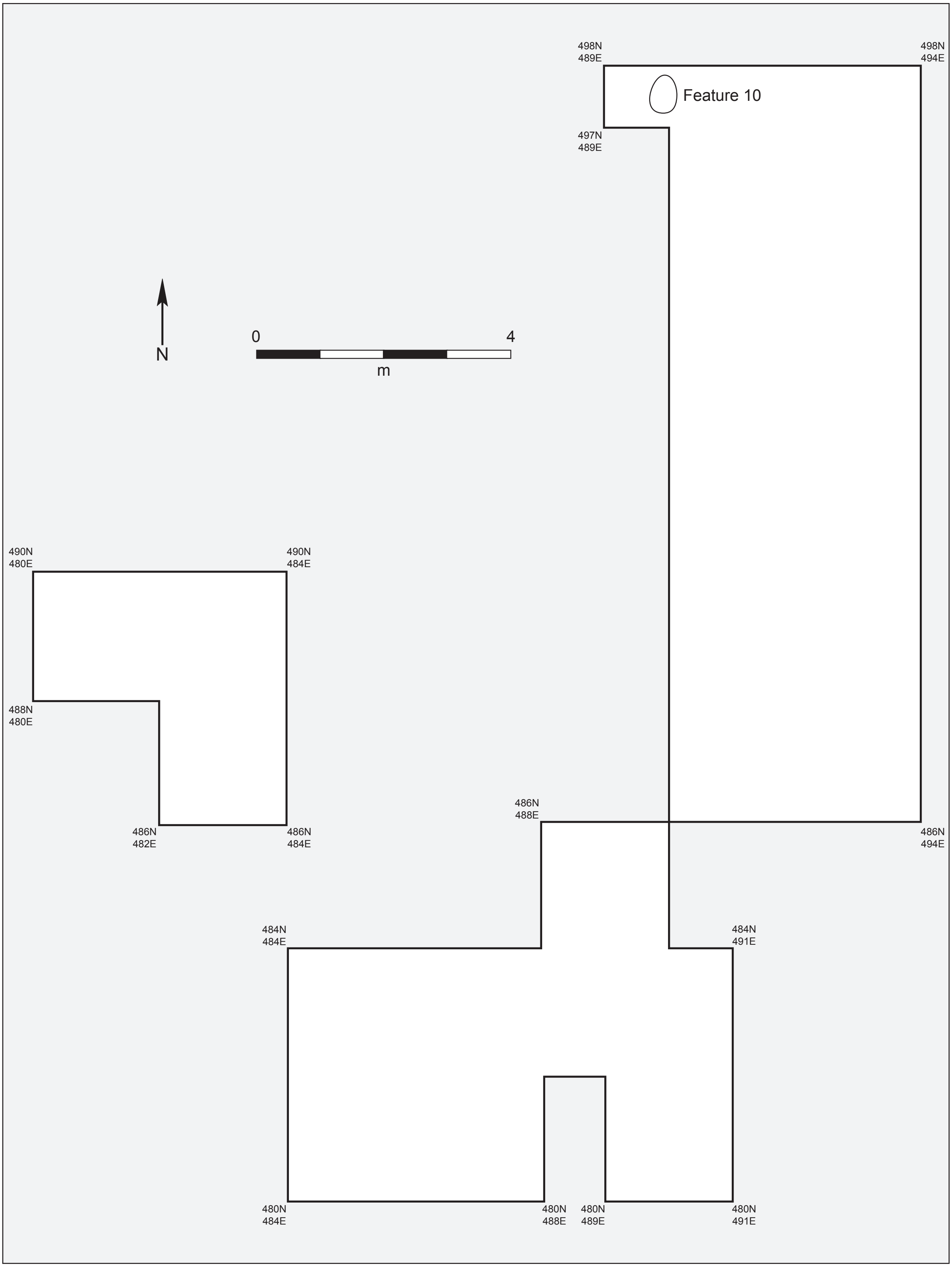

Figure 16.32. LA 129217, Block 1/2/5, feature distribution.

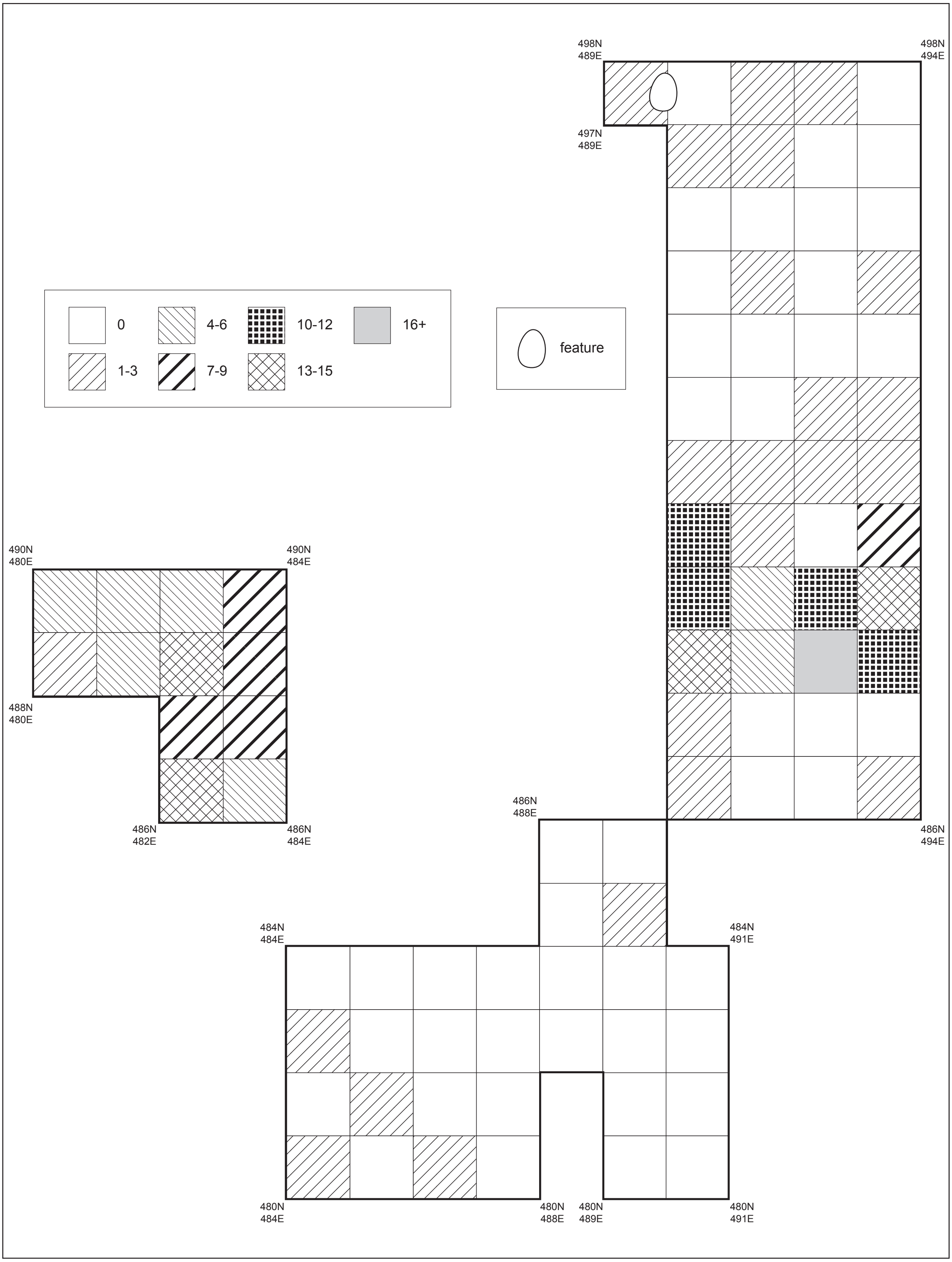

Figure 16.33. LA 129217, Block 1/2/5, lithic debitage distribution.

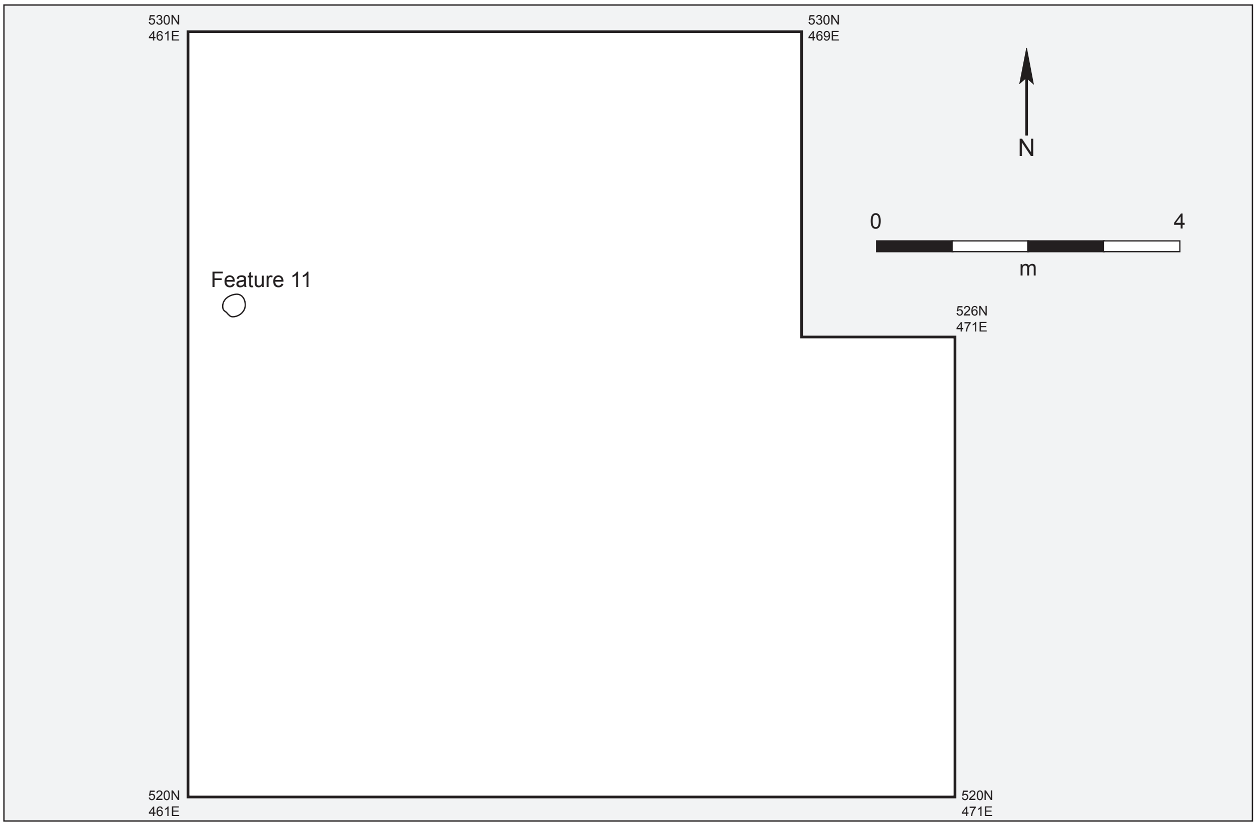

Figure 16.34. LA 129217, Block 6, feature distribution.

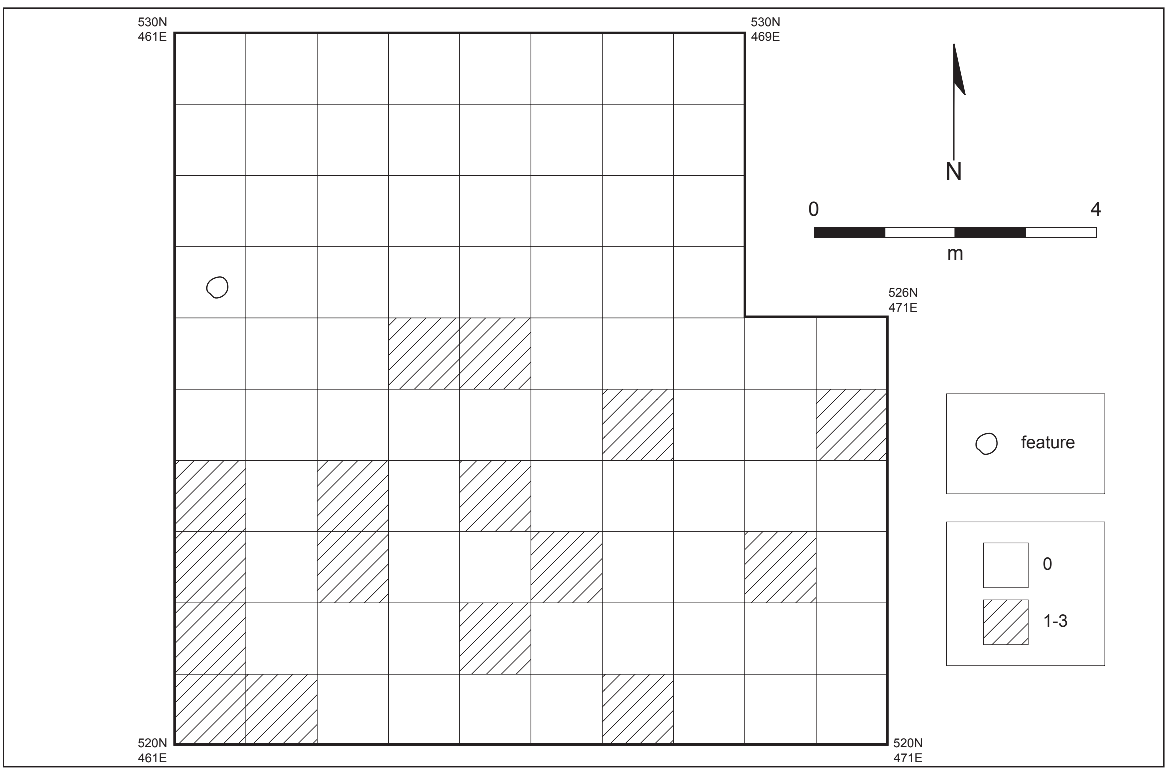

Figure 16.35. LA 129217, Block 6, lithic debitage distribution.

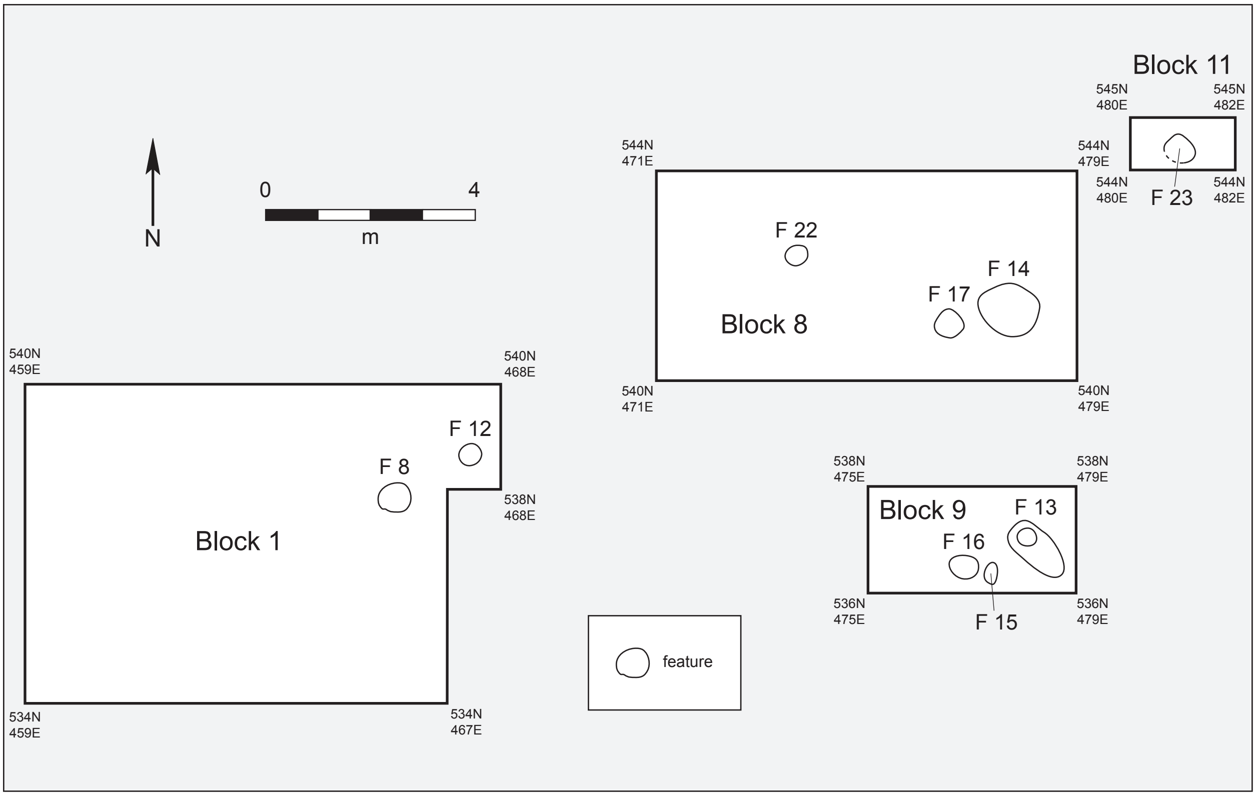

Figure 16.36. LA 128218, Blocks 1/8/9/10/11 feature distribution.

dates to the period 600 BC to AD 200, our Archaic 4 period.

LA 129218

Blocks 1, 8, 9, and 10 were placed within the space created by the mechanical removal of a dune. Block 11 targeted a feature exposed by a trench placed beside that dune (Fig. 16.36). In all, nine features were discovered and excavated in this group of blocks, referred to as Blocks 1/8/9/10/11.

All of the features are thermals, and they are about evenly split between rock and non-rock types (Table 16.8). Two basic configurations of non-rock features are present, those that are shallow and medium in size (12, 13, and 15) and the rest that are deep and small (22, 23L). In this regard, it is unclear if the entirety of Feature 13 was used as the fire pit or whether only the concentration of charcoal in the northwest end was the focal point. The latter spot is the one used to characterize the size of this feature as being medium; otherwise, Feature 13 might be characterized as large if the entirety of its configuration is considered.

The rock thermal pits are more varied: one is shallow and medium-sized (8); one is deep, medium-sized (17); one is very deep, medium-sized (16); and the fourth is very deep and large (14).

Radiocarbon and Diagnostic Artifact Dating: Six of the features were radiocarbon-dated. Interestingly enough, two major, widely separated time periods are represented. These periods also appear to be characterized by different thermal pit attributes relating to depth. The earlier calibrated intercept dates are 4340 BC (16, Beta 258927), 4350 BC (23L, Beta 258928), and 4540 BC (14, Beta 258926). OxCal analysis identifies three separate occupations, with Feature 14 being the earliest (equating with the Archaic 1, or the late Early Archaic); Feature 23L (Archaic 2, or the early Middle Archaic); and lastly, Feature 16 (also Archaic 2). All three features are deep to very deep, but sizes vary from small to medium to large, and both non-rock and rock types are represented.

The other major time period represented among the thermal features in Blocks 1/8/9/10/11 is the eleventh to early twelfth centuries. The calibrated intercepts are: AD 1010 (Feature 12, Beta

Table 16.8. LA 129218, Blocks 1, 8, 9, 10, and 11, summary of features and radiocarbon dates.

FEATURE NO.	CHARACTERISTICS	RADIOCARBON CALIBRATION I DATE (AD EXCEPT AS NOTED)	BETA ANALYTIC SAMPLE NO.
Nonrock Thermal Features			
12	thermal n/s/m*	1010	258924
13	thermal n/s/m	1050/1090/1130/1140	258925
15	thermal n/s/m	–	–
22	thermal n/d/s	–	–
23L	thermal n/d/s	4350 BC	258928
Rock Thermal Features			
8	thermal r/s/m	1030	258922
14	thermal r/vd/l	4540 BC	258926
16	thermal r/vd/m	4340 BC	258927
17	thermal r/d/m	–	–

*Characteristics: type/depth/size, where type n = nonrock; r = rock; depth s = shallow; d = deep; vd = very deep; u = unknown or uncertain; size s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

258924); AD 1030 (Feature 8, Beta 258922); and AD 1050/1090/1130 (Feature 13, Beta 258925). OxCal analysis identifies three separate occupations, with Feature 12 being earliest, then Feature 8, then Feature 13. All three of these features are shallow and medium sized. Feature 8 is a rock feature. Features 12 and 13 are non-rock.

Pottery was scarce and consisted solely of El Paso Brown. The type dates AD 200/600 to 1000/1100. These dates generally agree with the later set of radiocarbon dates obtained from some of the features.

Distribution of Artifacts Across Blocks 1/8/9/10/11: Lithic debitage and pottery fragments were not especially common in this block group. For the most part, lithics were thinly spread across the blocks, with none being recovered from Block 8 (Fig. 16.37a, 16.37b, and 16.37c). The vast majority of artifacts came from Stratum 1-1, suggesting those recovered from lower down may have been displaced from 1-1 through bioturbation.

In one place, lithics were concentrated in and around Thermal Feature 8, suggesting that the flintknapper had used Feature 8 or possibly Feature 12. The calibrated radiocarbon intercepts of both features date to the early AD 1000s.

Pottery was confined to Stratum 7-1 where it was concentrated in the vicinities of Features 8 and 12. For the most part, the sherds came from squares other than those that produced the heaviest concentrations of lithic debitage (Fig. 16.38). The tightness of their distribution suggests that a complete or partial vessel was broken during use at or next to one of the thermal features and the pieces scattered both horizontally and vertically from there.

LA 129222

Block 2 uncovered two features, a thermal pit and a storage pit (Fig. 16.39). Thermal Feature 4 is a shallow, medium-sized, non-rock example that did not produce enough charcoal for a radiocarbon date. The storage pit, Feature 7, lacked artifacts at the time of discovery. It is seemingly too small to serve as either a sleeping or a mortuary pit and too large for a small-items cache pit. Most squares in Stratum 1-1 produced at least a few pieces of lithic debitage (Fig. 16.40). Six small loci produced more, suggesting that chipped stone knapping took place regularly in this area of the site. The knapping loci were not structured as to their location, indicating that each episode was short in duration. Strata 2-2 and 2-3 produced very few artifacts, though Thermal Feature 4 was associated with Stratum 2-3. Two pieces of El Paso Bichrome or Polychrome and two more of El Paso Brown were re-

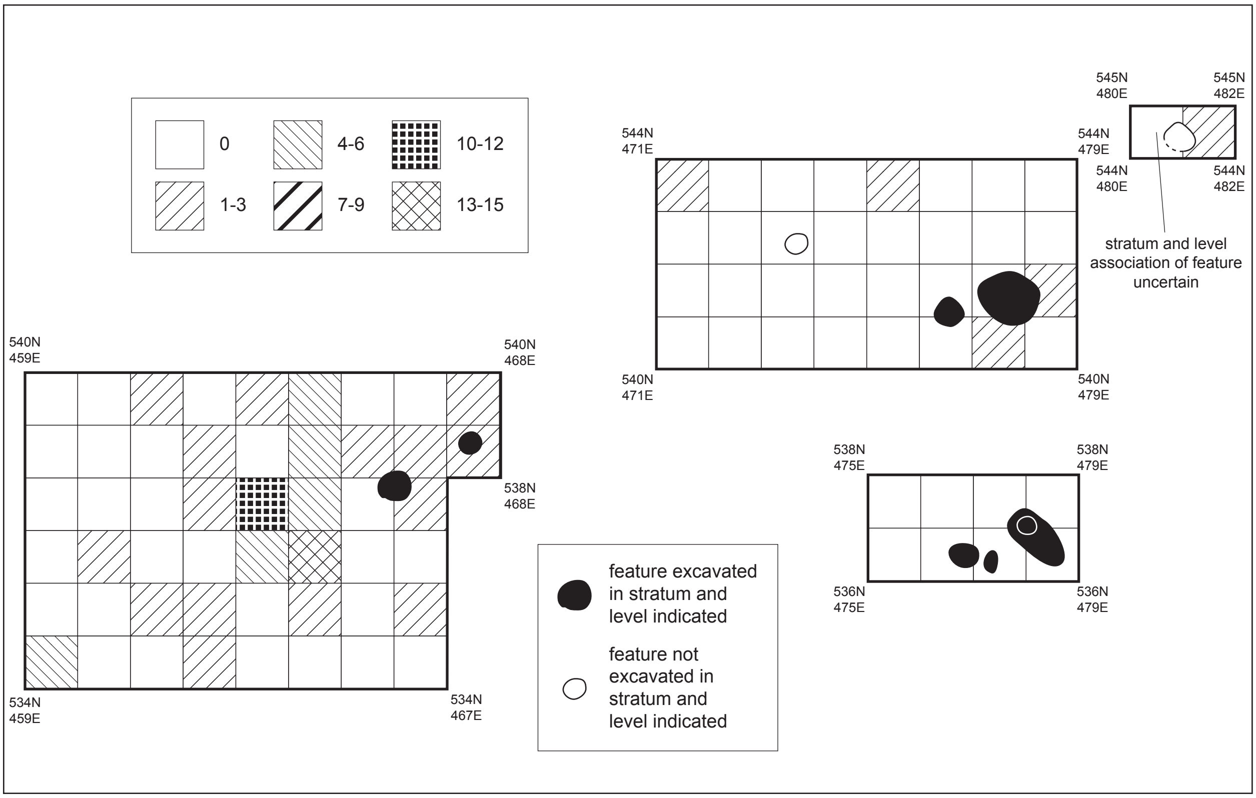

Figure 16.37a. LA 128218, Blocks 1/8/9/10/11, lithic debitage distribution.

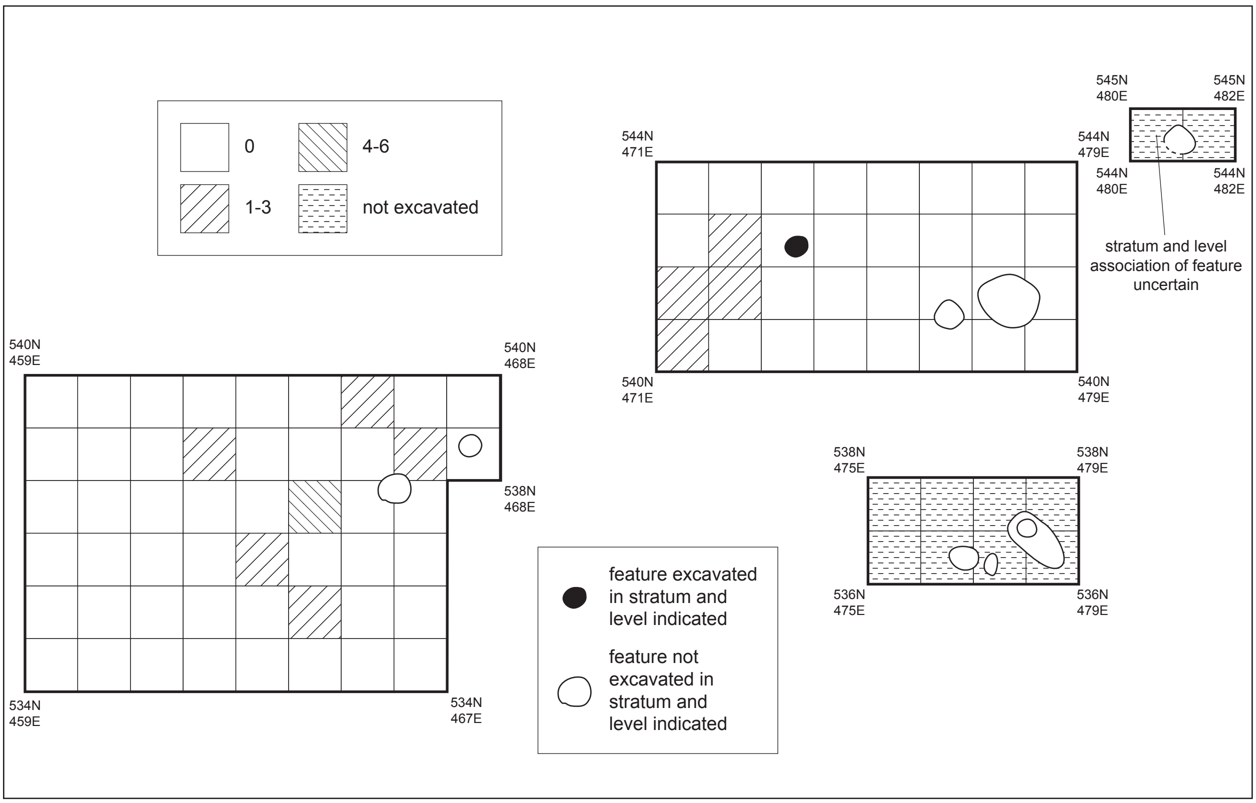

Figure 16.37b. LA 128218, Blocks 1/8/9/10/11, lithic distribution.

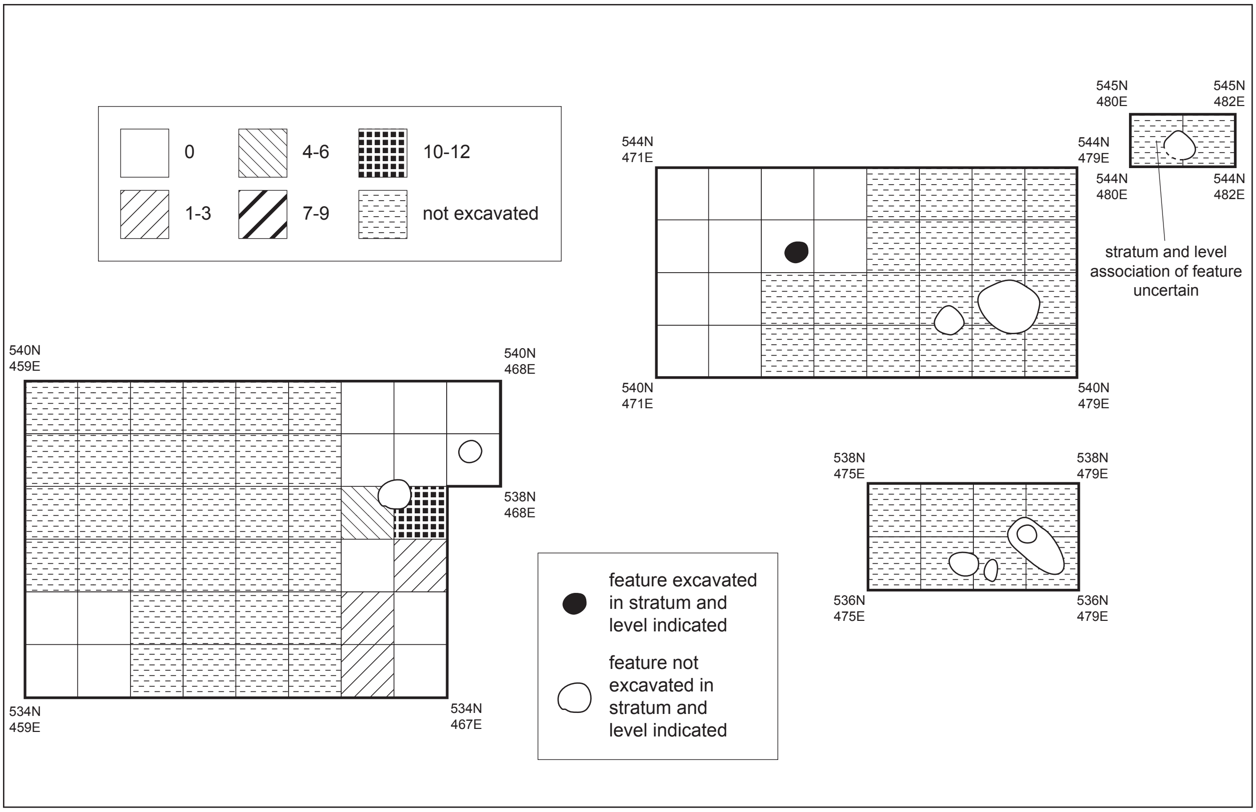

Figure 16.37c. LA 128218, Blocks 1/8/9/10/11, lithic distribution.

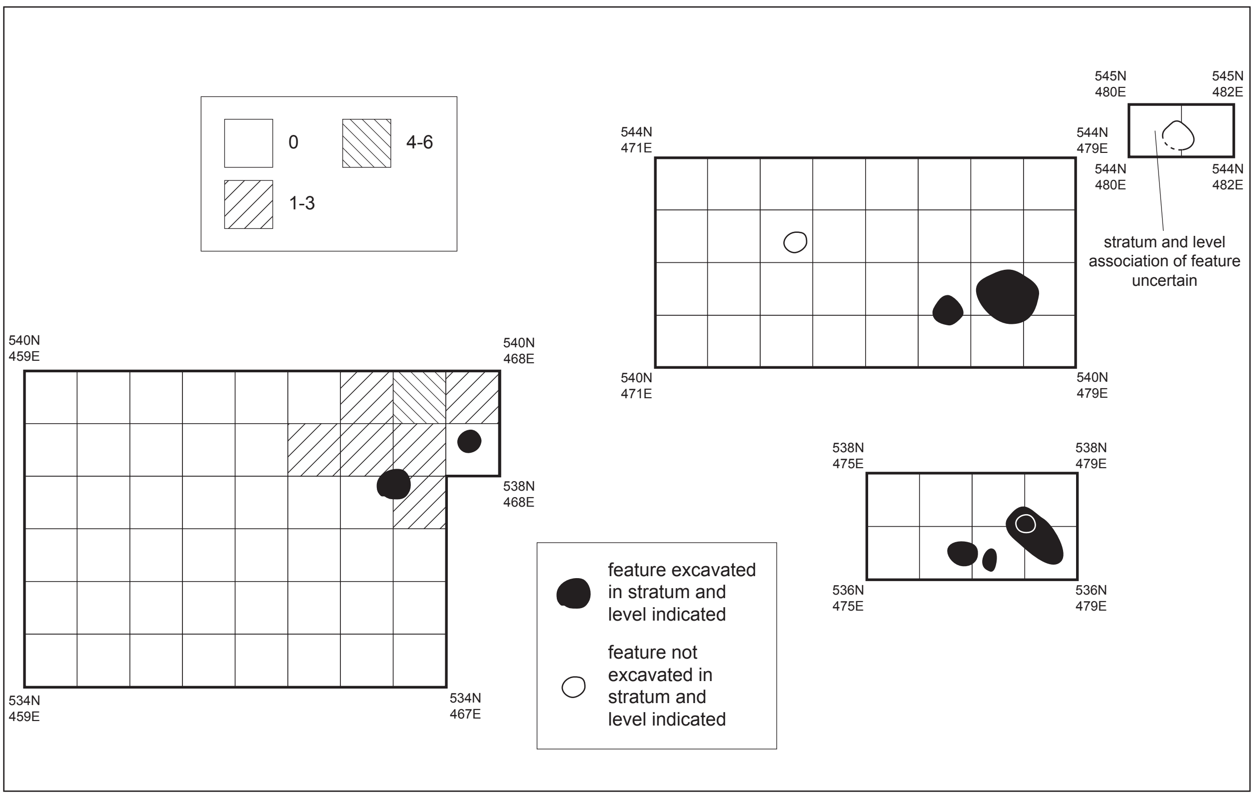

Figure 16.38. LA 128218, Blocks 1/8/9/10/11, pottery distribution.

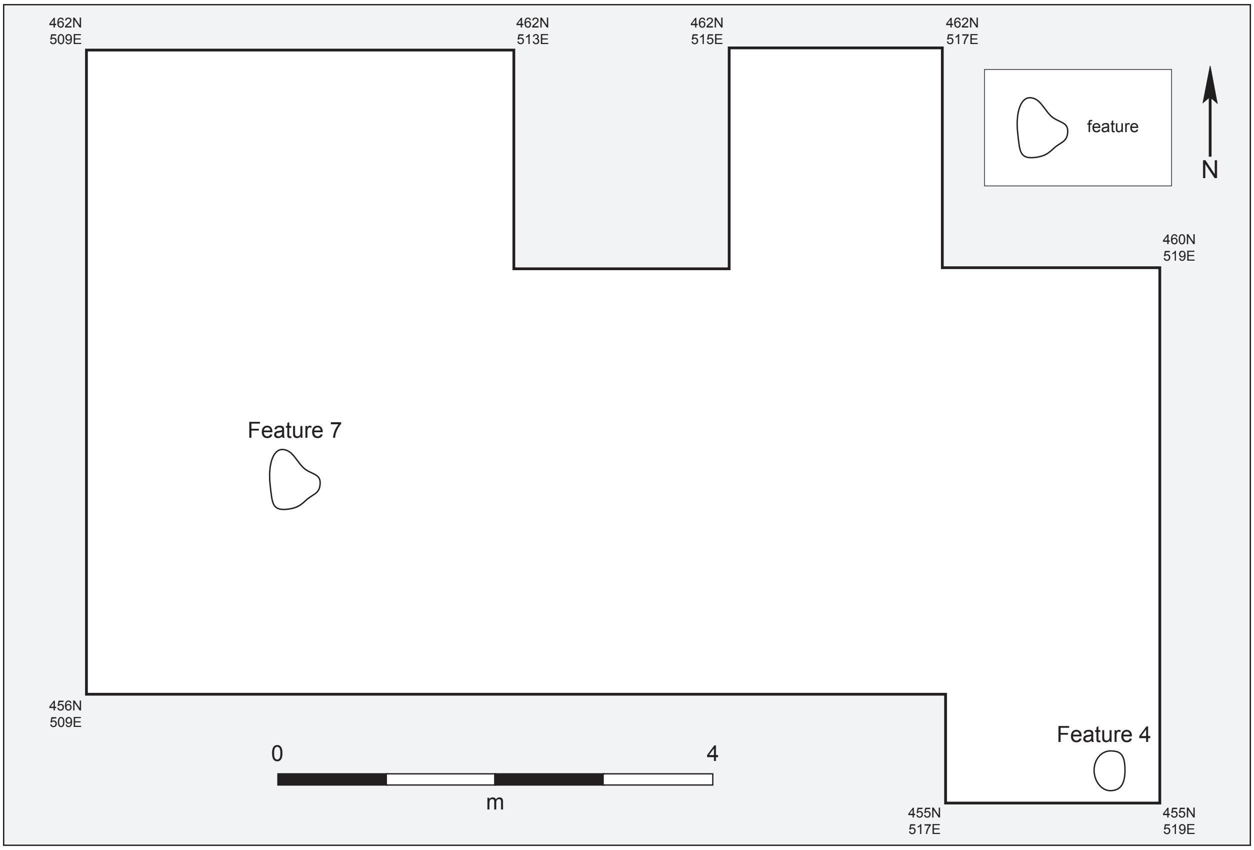

Figure 16.39. LA 128222, Block 2, feature distribution.

covered from Block 2. If we can assume that the plain brown sherds represent bottoms of bichrome or polychrome jars, then the pottery dates to the period AD 800/1000 to 1450 (Miller 1995:Table 4, p. 212).

LA 129300

Four thermal features (16, 17, 19, and 21) are identified in Block 1. All are in the northern half and are spaced almost equally apart at 2 to 3 m (Fig. 16.41). All are non-rock, with two (17, 19) that are shallow and medium in size, another (16) that is deep and medium in size, and another (21) that is unknown in size.

Block 1, Feature 21

Only Feature 21 provided a radiocarbon date, its calibrated multiple-intercept being AD 260/280/330 (Beta 258930). An un-typed, arrow-sized projectile point, FS-252, was recovered from the fill of this same feature. This short-stemmed, convex-bladed specimen is very curious because, if it was considerably larger, it would be fine for a dart point (though still unassignable to type). It has the all-around, steep edge angles of a reworked fragment from a much larger biface. Thus, although the radiocarbon date from Feature 21 is too early for any specific style of arrow point, this specimen may not have been, strictly speaking, used to tip an arrow. FS-458, a projectile point of similar form, but much larger size, was recovered from Feature 40 in Block 13.

Lithic Debitage: The lithic debitage distributions and densities are generally light and more or less evenly scattered across Block 1 in all levels (Fig. 16.42). While the deeper levels produced fewer pieces of debitage, it should be noted that Thermal Features 17 and 19 were recorded in one of the deepest strata, 3-4. This demonstrates that the deeper lithics cannot all be attributed to downward movement caused by bioturbation or gravitation.

Pottery: A few fragments each of El Paso Brown and Jornada Brown potteries were recovered from Block 1 (Fig. 16.43). As discussed in some detail

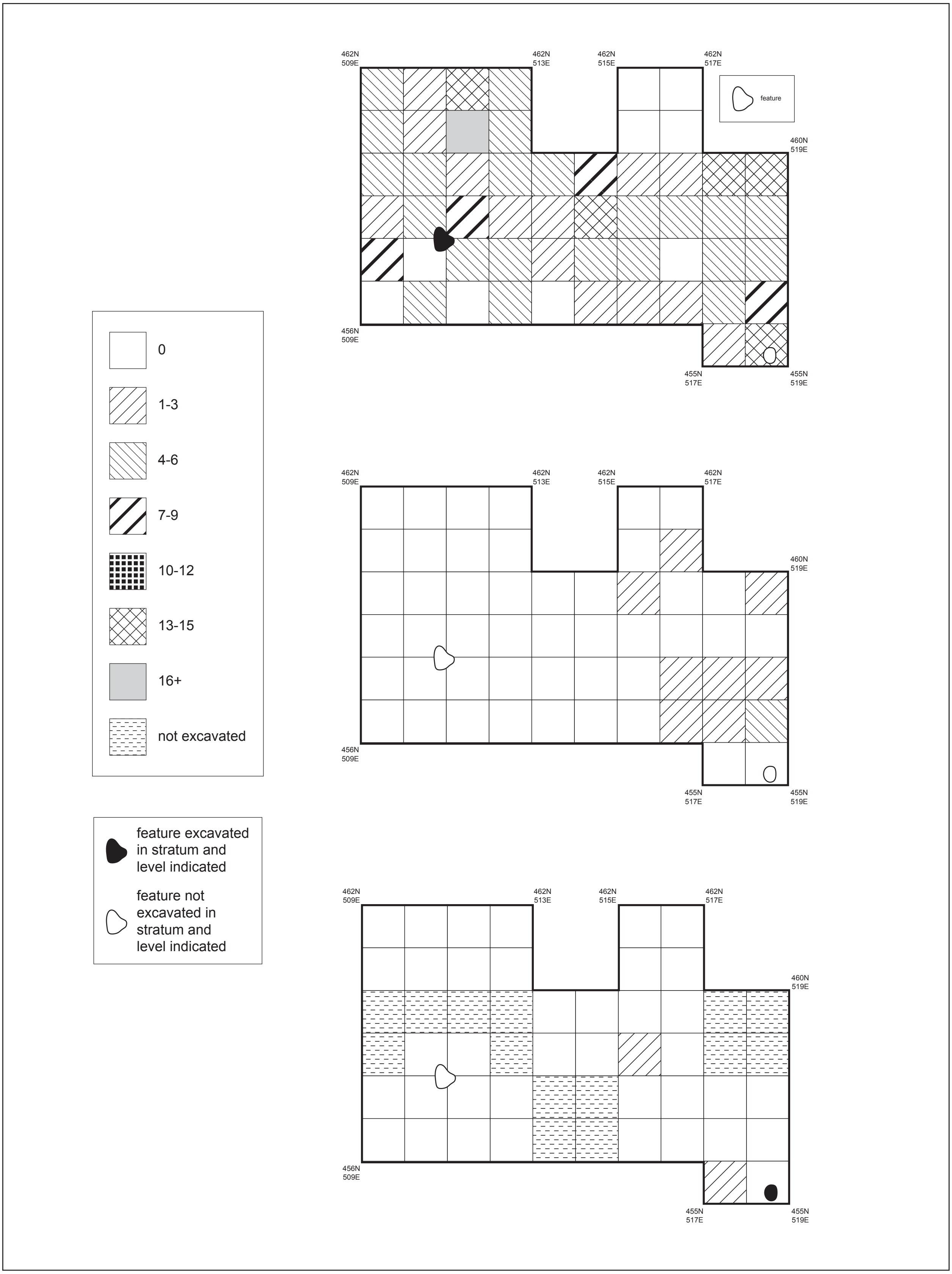

Figure 16.40. LA 128222, Block 2, lithic debitage distribution.

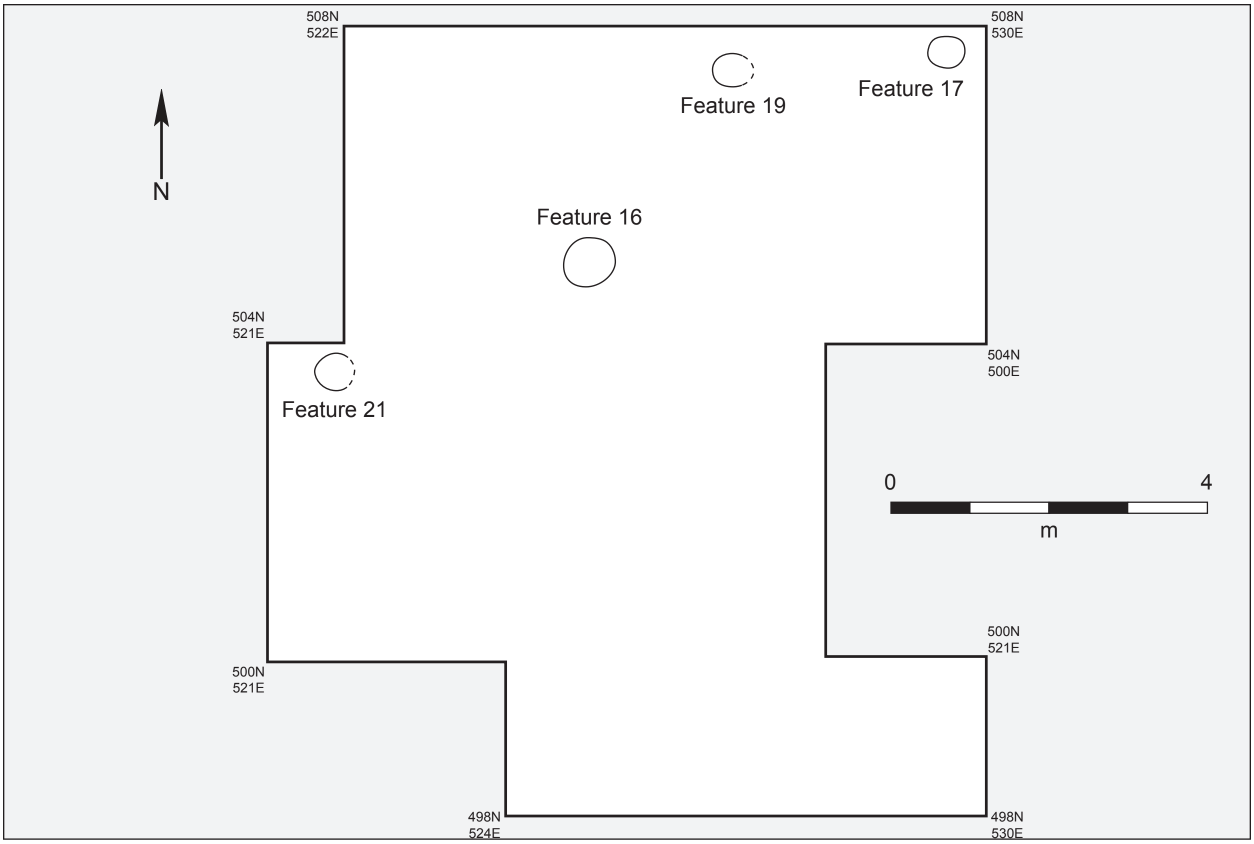

Figure 16.41. LA 128300, Block 1, feature distribution.

earlier in this section, these types were manufactured between AD 200 and about 1350 or 1400. Thus, these sherds probably post-date the radiocarbon dates for this block and therefore represent either later uses of the block or refuse thrown into the block from occupations elsewhere in the site.

Block 7

Although a small block of only 32 1 m squares, this unit exposed seven thermal features clustered in two groups (Fig. 16.44; Table 16.9). Depths are about evenly split between shallow (36, 37, 42, 43) and deep (38, 41, 44). Four of those with known sizes are medium (37, 38, 41, 42), one is small (43), and two are unknown due to partial excavation (36, 44). Feature 38 (north group) has a bell-shaped cross section. Thus, each group contains the full range of variation present within the block, suggesting functions ranging from heating/lighting/roasting to baking.

Five features—37, 38, 41, 43, 44—produced radiocarbon dates, all rather tightly clustered in the fifth, sixth, and seventh centuries AD (calibrated intercepts of AD 660, 540, 550, 550, and 430, respectively; Beta numbers in Table 16.9).

OxCal analysis indicates at least three separate occupations might be represented among these dates. Occupation periods and features are, from earliest to most recent: 38/44; 41/43; and 37. These dates and periods of occupation indicate that the feature groups do not represent single events within themselves and that at least two of the thermal pits, one from each group, could represent the simultaneous use. It is unfortunate that Feature 42 did not produce a date, for it is the lowest feature discovered in the block deposits and conceivably could date earlier than the others.

No pottery, projectile points, or other temporally diagnostic artifacts were ever recovered from Block 7.

Examination of vertical and temporal relationships among features: The close spacing of the features within each group (each being within 1 m of the next), the closeness of the groups (4 m apart), and the levelness of the modern (and presumably

Table 16.9. LA 129300, Block 7, summary of features and radiocarbon dates.

FEATURE NO.	CHARACTERISTICS	RADIOCARBON CALIBRATION IDATE (AD)	BETA ANALYTIC SAMPLE NO.
North Group			
36	thermal n/s/u	–	–
37	thermal n/s/m	660	258937
38	thermal n/d/m	540	258936
42	thermal n/s/m	–	–
South Group			
41	thermal n/d/m	550	258938
43	thermal n/s/s	550	258940
44	thermal n/d/u	430	258941

*Characteristics: type/depth/size, where type n = nonrock; r = rock;
depth s = shallow; d = deep; vd = very deep; u = unknown or uncertain;
size s = small; m = medium; l = large; u = unknown or uncertain
IDates are the calibrated radiocarbon intercepts.

aboriginal) ground surface permit an examination of vertical and temporal relationships of the features. More precisely, how significant are the differences in short vertical distances among features in open camps as measured by depths of features and timing of use?

Before getting into the analysis of the data in Table 16.10, several aspects should be mentioned. Relative to the elevations as determined using a total station, the total vertical difference between the openings or mouths of the highest and the lowest features is 31 cm, ranging from 98.01 to 97.70 cm above the datum established for the excavations at LA 129300.

The range in calibrated radiocarbon intercept dates is AD 430 to 660, or about 230 years. And, last but not least, the elevations of the openings of the features only approximate the aboriginal use-surfaces. This is because plant, insect, and animal bioturbation (including human treadage subsequent to abandonment of each feature), resulted in crushing and otherwise obscuring of the original openings of the features. Preservation and subsequent archaeological definition of the features, and especially of the orifices, are generally imperfect. Finally, potential problems with radiocarbon dating are numerous, as discussed in detail by Smiley and Ahlstrom (1998).

With these caveats in mind, examination of Table 16.10 is informative. For instance, Features 36, 37, and 38 in the northern group of features were measured at essentially the same elevation—98.01/98.00 cm.

Table 16.10. LA 129300, Block 7, data pertaining to vertical and temporal relationships among thermal features.

FEATURE NO.	ELEVATION OF FEATURE OPENING (CM)	EXCAVATION LEVEL	C-14 INTERCEPT DATE (AD)
36	98.0	bottom of Level 4	no date
37	98.0	bottom of Level 3	660
38	98.0	bottom of Level 4	540
41	97.9	bottom of Level 2	550
42	97.7	bottom of Level 5	no date
43	97.9	middle of Level 3	550
44	97.8	bottom of Level 3	430

Yet, the dates for 37 and 38 differ sufficiently (AD 540 versus 660) to suggest—through an earlier version of OxCal analysis not presented in this report—that the two represent different occupations (for more information, see End Note 1 at the end of this chapter). Features 41, 43, and 44 in the south group were all recorded at different elevations (97.93, 97.86, 97.82, respectively), yet 41 and 43, which have a 7 cm difference in elevation, provided identical intercept dates of AD 550. Feature 44, the lowest, or deepest, of the three, by 4 cm, provided an intercept date at AD 430, calculated by OxCal as a different occupation about 120 years earlier than Features 41 and 43. It appears that differences in elevation and time among features in

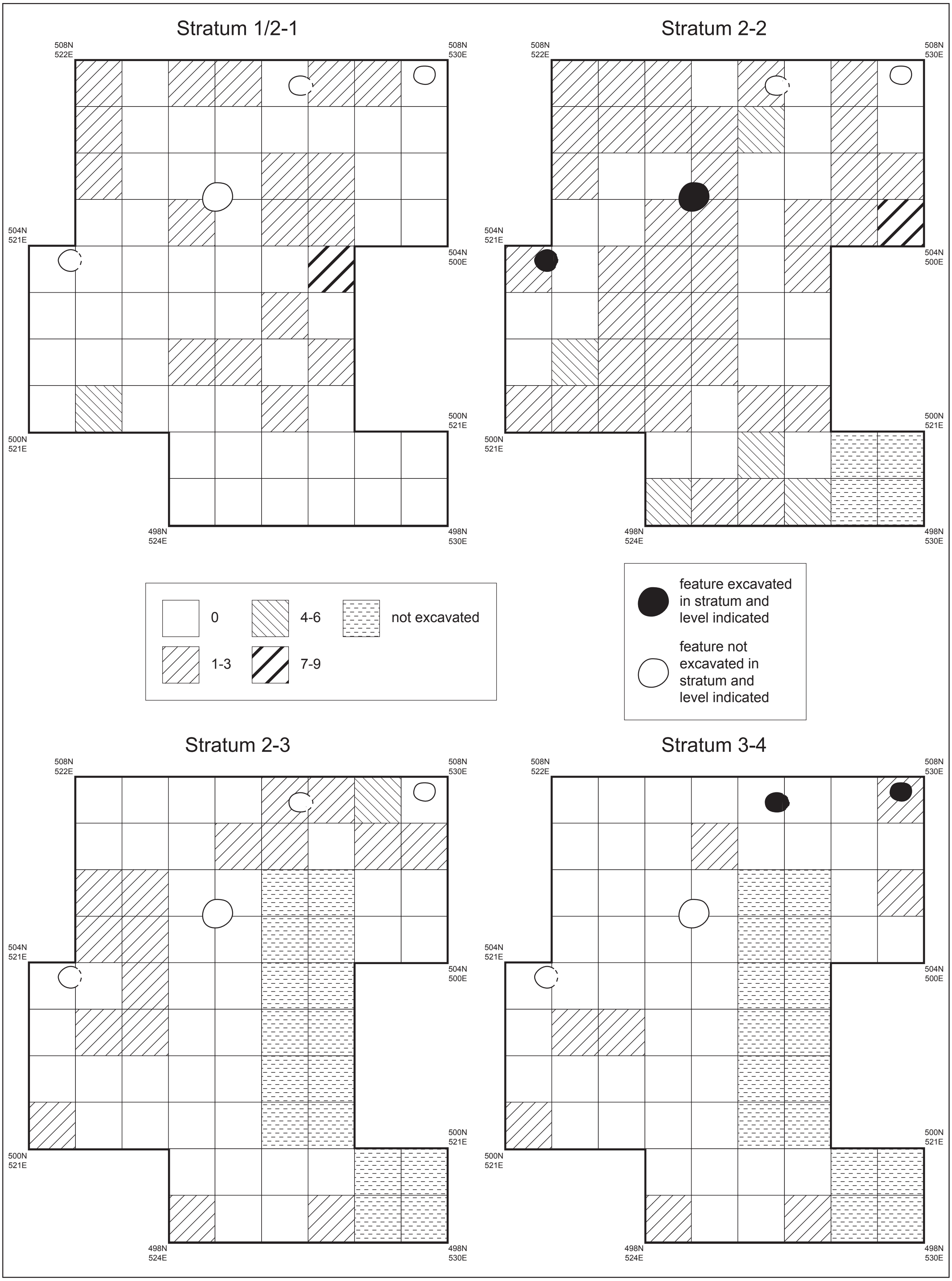

Figure 16.42. LA 128300, Block 1, lithic debitage distribution.

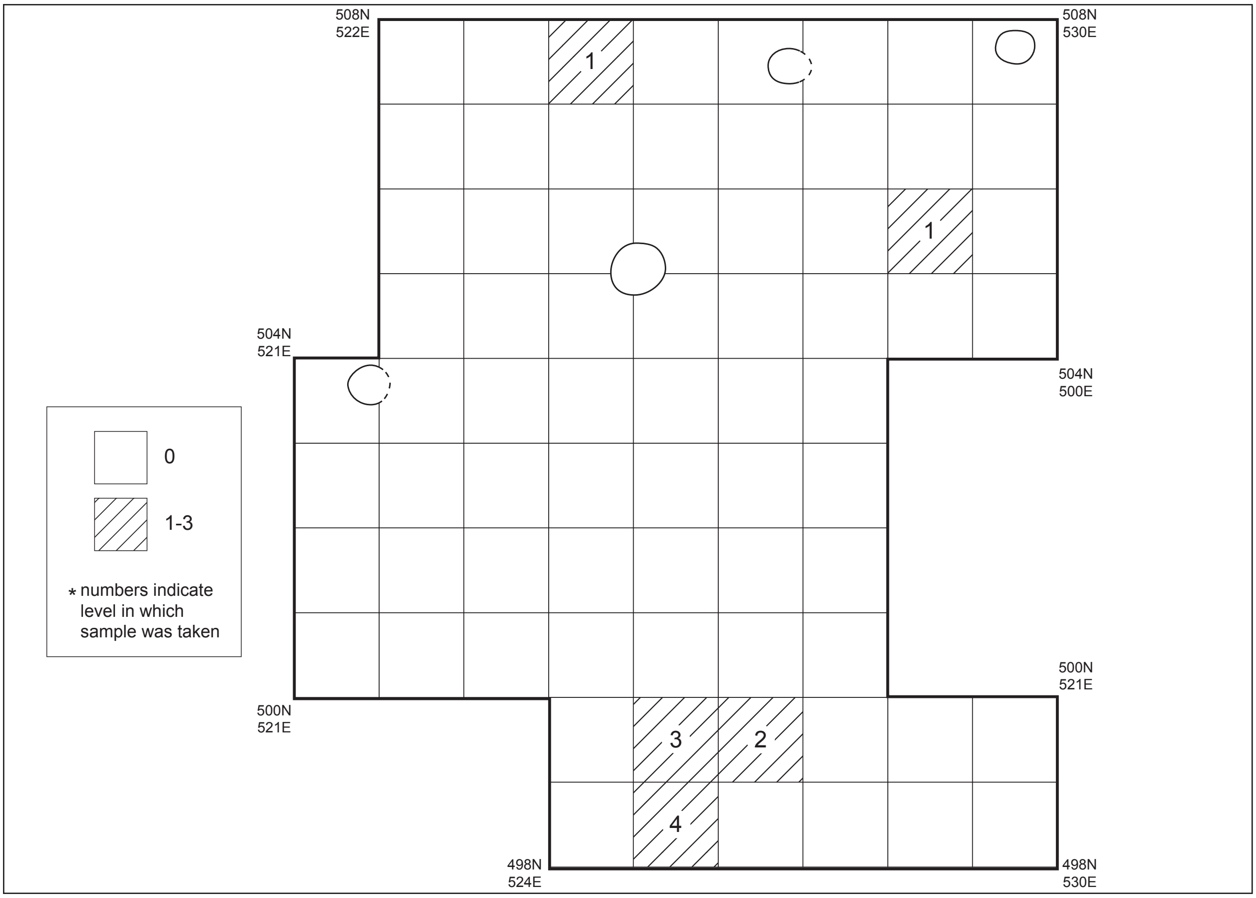

Figure 16.43. LA 128300, Block 1, pottery distribution.

open sites such as LA 129300, even when excavations are fairly tightly controlled, are not necessarily straightforward and unquestionably reliable. Some of the factors that might be responsible for this situation have already been mentioned.

Distributions of artifacts across Block 7: Lithic debitage was lightly scattered across Block 7 in six levels (Fig. 16.45). Four of the levels also produced features, illustrating that some of the artifacts in the deeper levels represent aboriginal deposition rather than bioturbation and/or gravitational deposition from upper levels.

Perspectives on Hunter-Gatherer Settlements: Camping-Group Size and Spatial Distribution

The definition of archaeological site boundaries is generally based on discovering discontinuities in the distribution of surface artifacts on the landscape. Although the criteria differ from agency to agency, the definition of a space devoid of artifacts as short as 20 to 50 m between one artifact concentration and another is often used for the demarcation between one site and another. Modern practical considerations such as project limits (reservoir impoundment areas, highway and pipeline rights-of-way, property lines, etc.), streams, arroyos, and the like are also used to delimit sites. These artificial beginning and ending points often result in the definition of sites when, in reality, two or more adjacent "sites" may have constituted one actual site or settlement.

Studies of modern day hunter-gatherer settlements such as Bendaijerum, which forms the basis of the Alyawara model used in this study, have documented contemporary family camps as far apart as 75 to 100 m and close enough together as to be considered contiguous to one another. At the time of O'Connell's study (1987), the settlement of Bendaijerum ultimately involved 23 families and men's groups spread over an area measuring 450 by 300 m. He also documented numerous instances where individual camps were moved up to five times to different spots within the same settlement over periods as short as a year. Thus, at the time of his study, the total area of inhabited and abandoned camps within Bendaijerum measured 550 by 400 m (O'Connell 1987:Fig. 7). Clearly, when it comes to hunter-gatherers, archaeologists' ideas of what constitutes a site or settlement are not particularly realistic.

In a previous study, with fewer sites, fewer features, and fewer radiocarbon dates, I pondered similar questions regarding camping-group size and terrain use, and I believe I achieved moderate success in the endeavor (Wiseman 2010).

When the opportunity afforded by the larger databases of the NM 128 project was presented, I naturally thought I could achieve even greater success in defining regional camping-group size. However, I was surprised to find that the much larger radiocarbon data set of the NM 128 project, when subjected to OxCal analysis, thwarted my objectives by creating some groupings of features that together spanned hundreds of years that could not be segmented into smaller groups and time spans. These large groupings were obviously too long to permit the identification of contemporary camping events, and therefore the loci, of cooperating families or other types of units.

Then the question arose as to whether I could proceed toward the same objectives by using the data in a different way. Examination of OxCal ordering revealed the duplication of many dates (Fig. 25.8). Some of the duplicates were from one site; some were from different, but nearby, sites; some were from sites that were as much as several kilometers apart; and others were variable combinations of all three. The 206 dates in this study were from 20 sites and six projects in the Nash Draw vicinity.

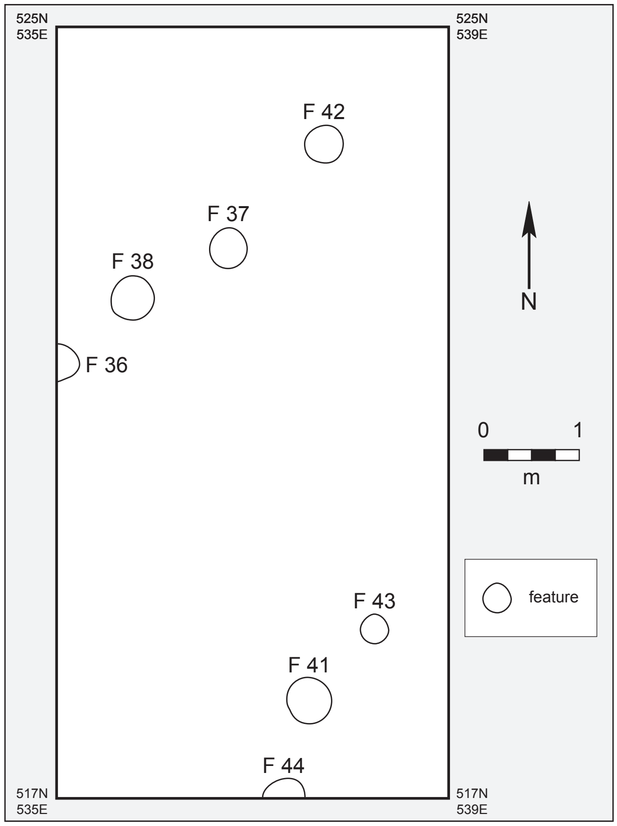

Figure 16.44. LA 128300, Block 7, feature distribution.

Identifying Concurrent Use of Thermal Features Which Potentially Identify the Presence of Camping Groups

This sub-section addresses the potential for identifying features at individual sites and among two or more sites that might have been used concurrently by members of the same group of campers. In effect, we infer that each of these groups was comprised of people who camped together and who cooperated in various activities on a day-to-day basis. These individual camps were not necessarily proximate to one another and could even have been spread over considerable distances, by modern standards.

In considering the possibilities, I have not restricted the search to single topographic features or sites but have considered adjacent topographic features and sites as well. In some instances, the number of individual camps defining a group was small and the camps widely spaced. It is likely that these figures were incomplete because not all member features of some camping groups were identified, excavated, or dated. Nevertheless, it is conceivable that features of a specific group were identifiable by means of identical dates even though those features were widely spaced. In some instances, the spacing of camps may have been desirable for reasons of privacy. In the project area, barriers to sight and sound like wooded terrain and rocky outcroppings are nonexistent. A particularly interesting ethnographic example of the wide spacing of camps by cooperating people is described for the Mescalero by Almer Blazer (1999). The Mescalero have three conflicting requirements for young married men: a mother-in-law avoidance rule; economic service to his in-laws; and a matrilocality rule for the first few years following marriage. This seemingly impossible situation was greatly facilitated by the fact that the matrilocality rule—living with the bride's parents—was satisfied even though the young couple might live as far as one-quarter mile, or 400 m, from her parents!

For this portion of the study, dated features are used from three NM 128—LA 113042, LA 129214, and LA 129216—from which there is plentiful data. These sites are especially suited for examination of the multiple-site/single-camp hypothesis, because they are situated on three adjacent, parallel, but separate, ridges. Two other sites, LA 129217 and LA 219218, are also potentially useful in this regard, but as mentioned elsewhere, they are situated next to one another on the same land form. In the analysis that follows, the term "camping group" refers to the people who used thermal features having the same radiocarbon date. Multiple camping groups can occur within the same OxCal period.

OxCal analysis (Table 16.11) identifies a total of 15 camping periods, comprised of 19 components, or groups of features, that are single-ridge, or site, specific (Table 16.12) and 14 components that involve sites on adjacent ridges (Table 16.13). No inter-ridge group has features on all three ridges. Not surprisingly, all of the inter-ridge groups have at least one camp feature on the central ridge, LA 129214, with the remainder being either on LA 129216 to the west or on LA 113042, to the east.

The numbers of thermal features associated with individual camping groups are all small, ranging from two to six. More than two-thirds of the groups have two features each. Using these figures and the rough estimations of camping-group size discussed earlier (Tables 16.12 and 16.13, far right column), the resulting the number of people inferred for each group is small. The numbers range from a minimum of two—very unlikely as an average—to a maximum of 18. It is probable that one or both figures are low due to the number of unexcavated and/or undated features at all three sites. I believe the figures reflect, to a significant degree, the general group sizes that operated in the region. If these numbers are correct, or at least in the ballpark of probability, they indicate that the camping groups probably represented fragments of local groups, rather than full-sized local groups and bands. Both local groups (sub-groups of bands) and bands are generally larger than our figures (Wiseman 2010:Table 12.1, p. 194).

Identifying Concurrent Use of Nash Draw by Two Or More Camping Groups

OxCal analysis of the radiocarbon dates from several projects along Nash Draw grouped duplicate dates and features that indicate almost contemporary occupations among the sites arrayed around and in the Nash Draw Valley (Fig. 25.1). The study area extends from Maroon Cliffs at the headwaters of Nash Draw on the north to the original edge of Salt Lake on the south. The original north shore of Salt Lake, and its freshwater springs, lies 1,200 m south of LA 129214 of the NM 128 project. Other projects used in this study include: WIPP (Lord and Reynolds 1985); Loop 1009 (Cunnar 1997); IMC Kalium (Acklen and Railey 2001); SWPSC Transmission Line (Staley et al. 1996a, 1996b); and AT&T NexGen/Core (Jones et al. 2010a) (Table 16.14).

Since the study area is large—24 km (15 mi) north–south by 16 km (10 mi) east–west—the concurrent occupations probably should be viewed as periods of activity, rather than the remains of cooperating groups, local groups, bands, or fragments of these units. Dates considered to be essentially contemporaneous are designated in two ways. Dates prior to the Christian era considered contemporaneous are either duplicates or are within 10 years of one another. Dates in the Christian era are considered contemporaneous only if they are actual duplicates.

Concurrent periods of activity are given in Table 16.15, and their distributions on the landscape are shown in Figures 25.3a through 25.3e. While we are interested primarily in camping groups involving two or more concurrent thermal features, thermal features representing single dates are included to round out the perspective.

Unfortunately, the sites are not evenly spread throughout the study area. Of the 20 sites, 6 are in the north sector, 1 is in the middle sector, and 13 are in the south sector. In the discussion that follows, sector locations are noted by parenthetic n, m, and s.

Three pairs of concurrent activities date prior to the Christian era. The earliest pair involves the two earliest dates in the study sample: LA 129218 and LA 129300 are in the south sector and represent

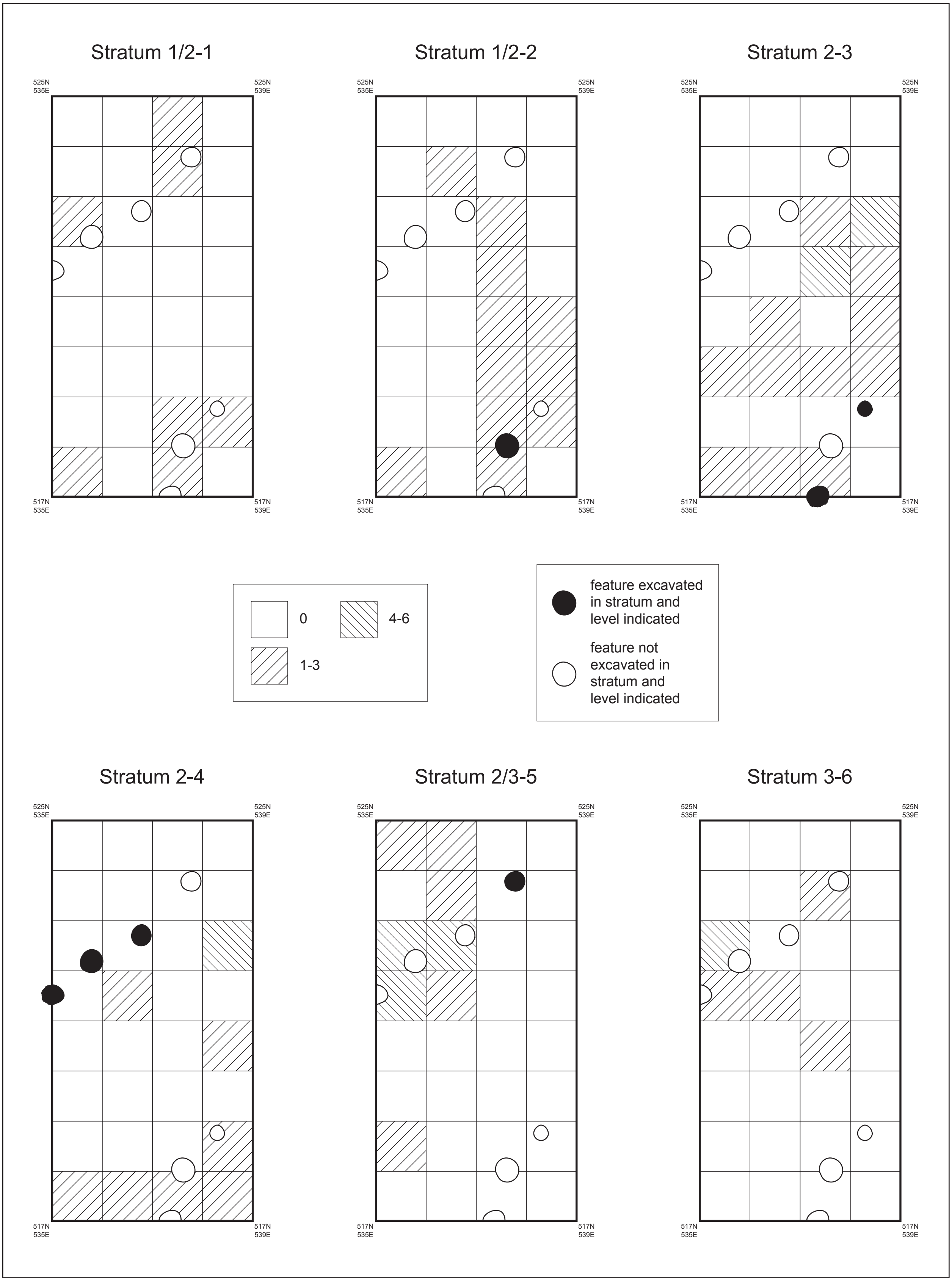

Figure 16.45. LA 128300, Block 7, lithic debitage distribution.

Table 16.11. OxCal periods, approximate dates, number of components, sites, and samples.

PERIOD	APPROXIMATE DATES	NO. OF COMPONENTS	SITE-BLOCK-FEATURE-SAMPLE NO.
1	4700–4000 BC	3	LA 129218 - 8 - 14
			- 11 - 23
			- 9 - 16
		2	LA 129300 - 4 - 20
			- 10 - 23
		2	LA 130738 - F19
			- F11
2	2300–2150 BC	1	LA 130738 - F10
3	1000–800 BC	1	LA 113042 - 1 - 40
1		1	LA 109291 - F36
2		2	LA 132494 - F3
			- F12
4	400 BC–AD 200	1	LA 129214 - 1 - 58
		2	LA 98820 - 539/540 - 544
		1	ENM 10418 - R2
5	AD 100–250	4	LA 113042 - 16 - 68
			- 14 - 63
			- 21 - 80
			- 19 - 78
		5	LA 129214 - 14 - 112
			- 1 - 89
			- 1 - 88
			- 8 - 75
			- 7 - 47
		3	LA 98820 - 539
			-542
			- 533/534
6	AD 200–450	8	LA 129214 - 1 - 59
			- 13 - 122
			- 12 - 123
			- 13 - 132
			- 8 - 73
			- 8 - 64
			- 8 - 71
			- 10 - 76
		3	LA 129216 - 7 - 10
			- 7 - 18
			- 7 - 17
		1	LA 129300 - 1 - 21
		1	LA 98820 - 2
		1	ENM 10418 - 33
7	AD 425–1025	12	LA 113042 - 2 - 64
			- 12 - 58
			- 18 - 77
			- 12 - 67
			- 17 - 73
			- 1 - 49
			- 15 - 82
	AD 425–1025	12	- 22 - 81
			- 6 - 46
			- 18 - 75

(Table 16.11, continued)

PERIOD	APPROXIMATE DATES	NO. OF COMPONENTS	SITE-BLOCK-FEATURE-SAMPLE NO.
		12	- 1a
			- 1 - 28
7	AD 425–1025	58	LA 129214 - 8 - 80
			- 12 - 109
			- 12 - 110
			- 8 - 82
			- 12 - 129
			- 6 - 68
			- 16 - 180
			- 18 - 159
			- 6 - 63
			- 6 - 55
			- 12 - 105
			- 15 - 151
			- 9 - 152
			- 5 - 300/67?
			- 5 - 300/61?
			LA 129214 - 12 - 119
			- 20 - 178
			- 9 - 94
			- 16 - 182
			- 13 - 141
			- 9 - 156
			- 12 - 120
			- 6 - 57
			- 5 - 74
			- 12 - 103
			- 12 - 136
			- 19 - 171
			- 9 - 72
			- 14 - 111
			- 6 - 54
			- 9 - 158
			- 9 - 93
			- 16 - 181
			- 7 - 87
			- 12 - 131
			- 9 - 95
			- 9 - 106
			- 10 - 77
			- 15 - 161
			- 20 - 177
			- 9 - 99
			- 6 - 52
			- 16 - 148
			- 12 - 102
			- 15 - 142
			- 12 - 104
			- 15 - 153
			- 16 - 146
			- 15 - 155
			- 15 - 154
			- 14 - 115
			- 16 - 143
			- 16 - 163
			- 15 - 137

(Table 16.11, continued)

PERIOD	APPROXIMATE DATES	NO. OF COMPONENTS	SITE-BLOCK-FEATURE-SAMPLE NO.
			- 12 - 101
			- 9 - 86
			- 19 - 167
			- 14 - 114
		5	LA 129216 - 6 - 13
			- 8 - 20
			- 8 - 19
			- 10 - 16
			- 10 - 15
		1	LA 129218 - 10 - 12
		1	LA 129222 - 4 - 2
		9	LA 129300 - 7 - 44
			- 7 - 38
			- 7 - 41
			- 7 - 43
			- 12 - 25
			- 7 - 37
			- 12 - 26
			- 14 - 32
			- 13 - 40
		1	LA 43276 - 2
		4	LA 98820 - 525/526 - 524
			- 527/528 - 1
		1	LA 109920 - FS33
		1	LA 109291 - FS40
		1	LA 109292 - FS67
		3	LA 109294 - FS79
			- FS63
			- FS49
		1	LA 113044 - 4
		1	LA 113045 - 2
		1	LA 113046 - 4
		1	LA 130738 - F4
		2	LA 130740 - F10
			- F9
		6	LA 132494 - F1
			- F5
			- F9
			- F4
			- F11
			- F6
		2	ENM 10230 - 1a
			- 1b
		9	ENM 10418 - FU
			-9
			- FQ
			-35
7 (cont'd)	AD 425–1025	9	-25
			-31
			-38
			- FL
			- FII

(Table 16.11, continued)

PERIOD	APPROXIMATE DATES	NO. OF COMPONENTS	SITE-BLOCK-FEATURE-SAMPLE NO.
8	AD 1000–1050	5	LA 113042 - 2 - 33
			- 2 - 36
			- 2 - 37
			- 11 - 55
			- 11 - 56
		10	LA 129214 - 1 - 39
			- 16 - 145
			- 7 - 84
			- 16 - 162
			- 6 - 46
			- 16 - 144
			- 14 - 118
			- 1 - 85
			- 15 - 134
			- 7 - 53
		1	LA 129216 - 9 - 14
		2	LA 129218 - 1 - 8
			- 6 - 11
		1	LA 113045 - 6
9	AD 1025–1075	2	LA 113042 - 1 - 41
			- 6 - 45
		6	LA 129214 - 9 - 96
			- 7 - 79
			- 13 - 135
			- 16 - 138
			- 6 - 62
			- 6 - 50
		1	LA 129218 - 9 - 13
		3	LA 113044 - 2
			-3
			-1
10	AD 1050–1300	4	LA 129214 - 18 - 157
			- 14 - 116
			- 9 - 98
			- 7 - 51
11	AD 1200–1325	1	LA 129214 - 16 - 149
		1	LA 113046 - 1
		1	LA 130738 - F2
		1	ENM 10418 - 30
12	AD 1300–1400	2	ENM 10230 - 6
			LA 129214 - 13 - 133
13	AD 1400–1500	1	LA 98820 - 537/538
14	AD 1450–1650	1	ENM 10418 - FBB
15	AD 1500–1800	1	ENM 10418 - 12

Table 16.12. Potentially concurrent occupations at individual sites LA 129216, LA 129214, and LA 113042, by OxCal period.

DATES (AD)	LA 129216		LA 129214		LA 113042		RANGE OF ESTIMATED CAMP GROUP SIZE
	BLOCK	FEATURE	BLOCK	FEATURE	BLOCK	FEATURE	
Period 5							
50–240	–	–	1	89b*	–	–	2–6
	–	–	14	112	–	–	
70–240	–	–	1	88	–	–	2–6
	–	–	8	75	–	–	
75–250	–	–	–	–	14	63b	2–6
	–	–	–	–	21	80	
Period 6							
270–440	–	–	8	71	–	–	2–6
	–	–	10	76	–	–	
Period 7							
420–610	–	–	6	68	–	–	2–6
	–	–	16	180	–	–	
600–775	–	–	–	–	1	49	2–6
	–	–	–	–	15	82	
650–775	–	–	9	94	–	–	4–12
	–	–	9	156	–	–	
	–	–	13	141	–	–	
	–	–	16	182	–	–	
650–780	–	–	6	57	–	–	2–6
	–	–	12	120b	–	–	
670–875	–	–	6	54	–	–	2–6
	–	–	9	72	–	–	
680–890	–	–	9	93	–	–	3–9
	–	–	9	158	–	–	
	–	–	16	181	–	–	
690–940	–	–	9	95	–	–	2–6
	–	–	12	131b	–	–	
700–950	–	–	9	106	–	–	2–6
	–	–	10	77	–	–	
780–1030	–	–	6	52b	–	–	5–15
	–	–	9	99	–	–	
	–	–	12	102	–	–	
	–	–	16	148	–	–	
	–	–	20	177	–	–	
780–980	–	–	12	104	–	–	2–6
	–	–	15	142b	–	–	
890–920	–	–	14	115	–	–	2–6
	–	–	16	143	–	–	
Period 8							
975–1150	–	–	6	46	–	–	2–6
	–	–	16	144	–	–	
990–1160	–	–	1	85u	–	–	2–6
	–	–	15	134	–	–	
Period 9							
1020–1210	–	–	13	135	–	–	2–6
	–	–	16	138b	–	–	

(Table 16.12, continued)

DATES (AD)	LA 129216		LA 129214		LA 113042		RANGE OF ESTIMATED CAMP GROUP SIZE
	BLOCK	FEATURE	BLOCK	FEATURE	BLOCK	FEATURE	
Period 10							
1050–1275	–	–	7	51	–	–	1–12
	–	–	9	98	–	–	
	–	–	14	116	–	–	
	–	–	18	157	–	–	

*Feature symbols: b = baking facility (deep); u = unknown depth/function;
no symbol = hearth (shallow - heating, lighting, roasting)

OxCal Period 1. The other two pairs represent OxCal Period 3 but involve three sites, 132494 twice and LA 113042 and 109291 once each. OxCal Period 2 is represented by one site. Given the small number of BC dates, activities are remarkably well distributed across the study area, even though only six sites are involved. Three of the activities occurred during OxCal Period 1 at site LA 129218, located in the south sector of Livingston Ridge.

OxCal Period 4, which spans the time of Christ (BC/AD), is represented by four individual activities, but no pairs. All took place in the south sector, two of them at 98820.

OxCal Period 5, the first period fully within the Christian era, is represented by four pairs of concurrent activities, one triplet, and only one single, for a total of 12 episodes of activity. All occurred at three sites in the south sector—LA 113042, 129214, and 98820.

OxCal Period 6 is represented by two pairs, one triplet, and seven single episodes of activity. As during OxCal Period 5, all took place in the south sector but were even more heavily involved at LA 129214.

OxCal Period 7 is the longest period, extending 600 years from about AD 425 to 1025. The reason for the length of the period is that the dates are fairly evenly and closely spaced throughout, disallowing for discernible breaks by which to subdivide the range.

Accordingly, the activity episodes include 18 singles, 17 pairs, eight triplets, five quadruplets, three quintuplets, and one septuplet. All 20 sites in the sample had at least one of these activity episodes. But also as can be expected for such a large number of episodes, and in view of the fact that so many of the dates come from the NM 128 project sites, the vast majority of activities took place in the south sector of the study area. One has to wonder to what degree the balance would tip back towards the north sector if an equal number of dates were ever obtained from northern sites.

Not only do the south-sector sites figure prominently in the OxCal Period 7 distributions, but activity episodes are also dominated at LA 129214. That is, 13 of 16 pairs, six of eight triplets, four of five quadruplets, all three quintuplets, and the only septuplet involve at least one activity date from that site. Again, this is not surprising since 45 percent of the south-sector dates derive from LA 129214.

OxCal Period 8 is a curious period. Not only is it short (50 years), but it overlaps the end of OxCal Period 7 in terms of standard deviations of dates. Nevertheless, the 19 dates/activity episodes in this period display three interesting aspects. All dates are duplicates, with two pairs, one quadruplet, one quintuplet, and one sextuplet. All activity episodes occur in south-sector sites. And, true to form, LA 129214 is involved at least once in every episode.

OxCal Period 9, which also spans approximately 50 years, portrays a dramatic reduction in the number of activity episodes. But, like OxCal Period 8, all of the activity episodes occur in south-sector sites. LA 129214 figures prominently in five of the six episodes.

OxCal Periods 10–15 are represented by minimal evidence for activity, and all but one episode—LA 130738 in OP11—took place in south sector sites. Of the 11 activity episodes in these last six OxCal periods, two involve pairs, and all the rest are singles. LA 129214 is represented in most of the activity episodes through OxCal Period 12 but is absent from those in Periods 13–15.

In summary, this activity study of the Nash Draw Valley and immediate environs involves 206 radiocarbon-dated features from 20 sites in the northern,

Table 16.13. Potentially concurrent occupations among sites LA 129216, LA 129214, and LA 113042, by OxCal period.

DATES (AD)	LA 129216		LA 129214		LA 113042		RANGE OF ESTIMATED CAMP GROUP SIZE
	BLOCK	FEATURE	BLOCK	FEATURE	BLOCK	FEATURE	
Period 6							
200–450	7	18 b	8	73	–	–	2–6
Period 7							
375–550	6	13	8	80	–	–	–
	–	–	12	109b	–	–	3–9
425–575	8	19b	12	129	–	–	2–6
440–650	–	–	6	63	12	58	2–6
600–675	–	–	5	300s	17	73	2–6
650–780	–	–	12	103	6	46	3–9
	–	–	12	136b	–	–	
700–990	–	–	15	161	no blok Cunn	1a u	2–6
890–990	10	15	15	154	–	–	4–12
	–	–	15	155b	–	–	
	–	–	16	146	–	–	
900–1020	–	–	9	86	1	28b	4–12
	–	–	14	114	–	–	
	–	–	19	167	–	–	
1000–1040	–	–	1	39	2	33	6–18
	–	–	7	84b	2	36	
	–	–	16	145	–	–	
	–	–	16	162	–	–	
Period 8							
1000–1030	9	14	14	118	–	–	2–6
1000–1030	–	–	7	53	2	37	4–12
	–	–	–	–	11	55	
	–	–	–	–	11	56	
Period 9							
1020–1060	–	–	9	96b	1	41	2–6
1020–1060	–	–	6	62	6	46	2–6

*Feature symbols: b = baking facility (deep); no symbol = hearth (shallow - heating, lighting, roasting); no blok Cunn = no block number, from Cunnar, 1997

middle, and southern sectors of the landscape. The data are presented in two ways—by OxCal analysis, which breaks the data into 15 time periods, and by smaller groups of sites/dates formed of duplicate conventional ^{14}C determinations

The latter groups each contain from one to seven dates that denote activities occurring at the same, or nearly the same, times. The two main problems highlighted by this exercise are that the preponderance of sites and dates are from south-sector sites and that 69 percent of those dates are from the same site. The skewing caused by these factors provides less than satisfactory results, especially since only a glimpse of the numbers and dating of activity episodes in the north and middle sectors has been obtained.

Summary and Conclusions

The activity area analysis conducted on the NM 128 project data was only partly successful.

A model of a camp layout and organization based on James O'Connell's work among the Alyawara of Australia was used to examine maps of the larger blocks excavated at sites LA 113042, 129214, 129217, 129218, 129222, and 129300.

No blocks of sufficient size were excavated at LA 129216.

A total of 15 blocks and block groups were investigated during this study. In addition, two additional, ancillary studies were conducted. The results of these studies follow.

Table 16.14. *Number of features and dates by project and study area sector.*

SITE	NO. OF FEATURES	NO. OF DATES	PROJECT	REFERENCE
South Sector of Study Area				
LA 113042	23	23	NM-128	this report
LA 129214	93	93	NM-128	this report
LA 129216	9	9	NM-128	this report
LA 129218	7	7	NM-128	this report
LA 129222	1	1	NM-128	this report
LA 129300	12	12	NM-128	this report
ENM 10230 (LA 32623)	3	3	WIPP	Lord and Reynolds, 1985
ENM 10418 (LA 18161)	14	14	WIPP	Lord and Reynolds, 1985
LA 43276	1	1	Loop 1009	Cunnar, 1997
LA 98820	2	2	Loop 1009	Cunnar, 1997
LA 113042	1	1	Loop 1009	Cunnar, 1997
LA 113044	4	4	Loop 1009	Cunnar, 1997
LA 113045	2	2	Loop 1009	Cunnar, 1997
LA 113046	2	2	Loop 1009	Cunnar, 1997
LA 98820	9	9	IMC Kalium	Acklen and Railey, 2001
Middle Sector of Study Area				
LA 109294	4	4	SWPSC Line	Staley et al., 1996b
North Sector of Study Area				
LA 109291	2	2	SWPSC Line	Staley et al., 1996b
LA 109292	1	1	SWPSC Line	Staley et al., 1996b
LA 109920	1	1	SWPSC Line	Staley et al., 1996b
LA 130740	2	2	NexGen/Core	Jones et al., 2010
LA 130738	5	5	NexGen/Core	Jones et al., 2010
LA 132494	8	8	NexGen/Core	Jones et al., 2010

Identification of Camp Footprints through Use of the Alyawara Camp Model (O'Connell 1987).

Only one block exposed a good example of the camp model: Block 1 at LA 113042 produced evidence of an east–west oriented camp with a windbreak structure on the east end; a clear space to the west; a group thermal of features further west; and concluded, at the west end, with the main refuse accumulation area.

A second example of a camp footprint might be present in the west end of Block 7 of the Blocks 5/7/14 group at LA 129214. This possible camp footprint, designated Feature 301, is comprised of a possible sleeping surface on the west, with a more-or-less clear living space to the east, then a thermal pit (Feature 47) and associated postholes, and at the east end, a poorly defined refuse accumulation.

Unfortunately, only two camp footprints have been identified among 15 excavated blocks and block groups. The following reasons might account for the inability to successfully identify these camp footprints:

1. All other occupations exposed at the project sites were of a duration and/or nature that did not result in the formation of model camp footprints;

2. Human re-occupation and/or natural, non-human bioturbation of most blocks obliterated or severely impacted most of the camp footprints, thereby eliminating recognition of their presence;

3. Excavations in the subject blocks were too limited to expose entire camp footprints. In several instances, features in the NM 128 blocks are at or very near the limits of the excavations, potentially leaving undiscovered and undefined associated materials and features outside the block. A particularly poignant problem is that excavations were initiated in the more obvious loci—especially where thermal

Table 16.15. Concurrent activities of sites and sectors by OxCal period.

STATUS	ACTIVITY/SITE	CALIBRATION DATE**
	Period 1	
Pair	LA 129218 (s)*, LA 129300 (s)	3770 BC and 3760 BC
Single	LA 130738 (n)	3640 BC
Single	LA 129218 (s)	3570 BC
Single	LA 129218 (s)	3530 BC
Single	LA 129300 (s)	3440 BC
Single	LA 130738 (n)	3310 BC
	Period 2	
Single	LA 130738 (n)	1980 BC
	Period 3	
Pair	LA 113042 (s), LA 132494 (n)	820 BC and 810 BC
Pair	LA 132494 (n), LA 109291 (n)	770 BC and 760 BC
	Period 4	
Single	ENM 10418 (s)	320 BC
Single	LA 98820 (s)	90 BC
Single	LA 98820 (s)	10 BC
Single	LA 129214 (s)	AD 50
	Period 5	
Pair	LA 129214 (s), LA 129214 (s)	both AD 70
Pair	LA 113042 (s), LA 98820 (s)	both AD 90
Triplet	LA 98820 (s), LA 129214 (s) (2x)	all AD 100
Pair	LA 113042 (s) (2x)	both AD 110
Single	LA 113042 (s)	AD 120
Pair	LA 98820 (s), LA 129214 (s)	both AD 150
	Period 6	
Single	LA 129214 (s)	AD 180
Single	LA 129214 (s)	AD 190
Single	LA 129214 (s)	AD 210
Pair	LA 129300 (s), LA 129214 (s)	both AD 220
Single	ENM 10418 (s)	AD 230
Single	LA 129216 (s)	AD 240
Pair	LA 129214 (s), LA 129216 (s)	both AD 260
Single	LA 129216 (s)	AD 280
Single	LA 129214 (s)	AD 290
Triplet	LA 129214 (s) (2x), LA 98820 (s)	all AD 300
	Period 7	
Quadruplet	LA 129214 (s) (2x), LA 129216 (s), ENM 10418 (s)	all AD 340
Single	LA 129300 (s)	AD 350
Pair	LA 129214 (s), ENM 10418 (s)	both AD 360
Single	LA 129216 (s)	AD 370
Single	LA 129214 (s)	AD 380
Triplet	LA 129214 (s), LA 129300 (s), LA 132494 (n)	all AD 390
Single	LA 98820 (s)	AD 400
Triplet	LA 113042 (s), LA 129300 (s), LA 132494 (n)	all AD 410
Single	LA 113044 (s)	AD 420
Quintuplet	LA 129214 (s) (2x), LA 129300 (s) (2x), ENM 10418 (s)	all AD 430
Single	LA 129214 (s)	AD 440
Pair	LA 113042 (s), LA 129214 (s)	both AD 450
Single	LA 98820 (s)	AD 470

(Table 16.15, continued)

STATUS	ACTIVITY/SITE	CALIBRATION DATE**
Single	LA 129216 (s)	AD 480
Single	LA 98820 (s)	AD 490
Triplet	LA 113042 (s), LA 132494 (n) (2x)	all AD 500
Pair	LA 149214 (s), LA 43276 (s)	both AD 510
Pair	LA 113042 (s), ENM 10418 (s)	both AD 520
Pair	LA 129214 (s), LA 132494 (n)	both AD 530
Pair	LA 129214 (s), LA 129300 (s)	both AD 550
Pair	LA 129214 (s), LA 129300 (s)	both AD 560
Triplet	LA 113042 (s), LA 129214 (s) (2x)	all AD 570
Triplet	ENM 10230 (s), LA 129214 (s), LA 129300 (s)	all AD 580
Single	LA 109920 (n)	AD 590
Quadruplet	LA 113042 (s) (2x), LA 109294 (m), ENM 10418 (s)	all AD 600
Single	LA 113042 (s)	AD 620
Quintuplet	LA 129214 (s) (4x), LA 129300 (s)	all AD 630
Pair	LA 129214 (s) (2x)	both AD 640
Single	LA 129214 (s)	AD 650
Quintuplet	LA 113042 (s), LA 129214 (s) (2x), LA 130740 (n), ENM 10418 (s)	all AD 660
Pair	LA 113042 (s), ENM 10230 (s)	AD 670
Quadruplet	LA 129214 (s) (3x), LA 109294 (m)	AD 680
Triplet	LA 129214 (s) (3x)	AD 700
Pair	LA 129214 (s), LA 109291 (n)	AD 710
Pair	LA 113045 (s), ENM 10418 (s)	both AD 720
Single	LA 132494 (n), LA 109291 (n)	AD 730
Single	LA 129300 (s)	AD 740
Quadruplet	LA 129214 (s) (2x), LA 109292 (n), LA 132494 (n)	all AD 750
Pair	LA 129214 (s) (2x)	both AD 760
Pair	LA 129214 (s), LA 113042 (s)	both AD 770
Septuplet	LA 129214 (s) (5x), LA 129300 (s), LA 113046 (s)	all AD 790
Triplet	LA 129214 (s) (2x), LA 109294 (n)	all AD 800
Single	LA 129214 (s)	AD 810
Quadruplet	LA 129214 (s) (3x), LA 129216 (s)	all AD 830
Pair	LA 129214 (s) (2x)	both AD 840
Pair	LA 129214 (s), ENM 10418 (s)	both AD 850
Single	LA 129214 (s)	AD 860
Single	ENM 10418 (s)	AD 870
Triplet	LA 129214 (s), LA 129222 (s), LA 98820 (s)	all AD 880
Pair	LA 113042 (s), LA 129214 (s)	both AD 900
Pair	LA 129214 (s), LA 129218 (s)	both AD 910
Single	LA 129214 (s)	AD 920
Period 8		
Sextuplet	LA 113042 (s) (2x), LA 129214 (s) (4x)	all AD 940
Pair	LA 129214 (s) (2x)	both AD 950
Quadruplet	LA 129214 (s), LA 129216 (s), LA 129218 (s) (2x)	all AD 960
Pair	LA 129214 (s) (2x)	both AD 970
Quintuplet	LA 113042 (s) (3x), LA 129214 (s), LA 113045 (s)	all AD 980
Period 9		
Pair	LA 113042 (s), LA 129214 (s)	both AD 990
Single	LA 129214 (s)	AD 1010
Pair	LA 129218 (s), LA 113044 (s)	AD 1020
Triplet	LA 129214 (s) (2x), LA 113044 (s)	all AD 1030
Pair	LA 113042 (s), LA 129214 (s)	both AD 1040
Pair	LA 129214 (s), LA 113044 (s)	both AD 1050

(Table 16.15, continued)

STATUS	ACTIVITY/SITE	CALIBRATION DATE**
	Period 10	
Single	LA 129214 (s)	AD 1080
Single	LA 129214 (s)	AD 1090
Pair	LA 129214 (s) (2x)	both AD 1110
	Period 11	
Single	LA 113046 (s)	AD 1150
Pair	LA 130738 (n), ENM 10418 (s)	both AD 1190
Single	LA 129214 (s)	AD 1210
	Period 12	
Single	ENM 10230 (s)	AD 1310
Single	LA 129214 (s)	AD 1380
	Period 13	
Single	LA 98820 (s)	AD 1480
	Period 14	
Single	ENM 10418 (s)	AD 1610
	Period 15	
Single	ENM 10418 (s)	AD 1730

*sectors: (n) = north, (s) = south, (m) = middle
**uncalibrated, conventional C-14 date

features, artifacts, etc., were exposed on the surface or in deflation depressions among sand dunes—but were not expanded sufficiently in all directions.

The failure to expand excavations is often due to the presence of impediments such as sand dunes and mesquite clumps. Some archaeologists tend to fail to appreciate the fact that thermal features are only part of the total configuration of any occupation. Especially in sandy environments, they assume that cultural deposits are badly disturbed and features and artifact associations have been mixed or destroyed.

While this can be true, it is not always so, especially at larger sites; the nature and degree of destruction is often variable, with some areas showing little disturbance. My experience is that through the expansion of excavations over large areas one frequently encounters deposits and features that have remained sufficiently intact to permit the recovery of valuable information.

Relationships Among Dates and Depths to Features

Evaluation of the chronological and stratigraphic relationships among features in Blocks 1/2 of LA 113042 proved interesting. Features occur both as clusters and as isolates. Excavations noted stratigraphic associations and absolute, instrument-derived elevations. Comparison among these variables showed even for the clustered features, stratigraphy, elevations, and radiocarbon dates did not work out neatly in all cases.

The reasons for these discrepancies may include a lack of insufficient resolution in radiocarbon technique; difficulties in accurately defining orifices of the features and therefore their vertical and stratigraphic relationships; human, animal, and plant bioturbation; and physical climatic actions such as wind and water deposition and erosion. A similar study conducted on features in Block 7 of LA 129300, gave the same results.

Chapter End Notes

Note 1: Several OxCal runs were conducted as different sets of radiocarbon dates became available, mostly through the staccato appearance of other reports. As the number of dates increased, more "gaps" were filled, creating, for instance, the very long Period 7. While this process may highlight the intensity of occupations and lengthen periods—

as happened here—it also eliminates detail as to how close individual dates are to one another with regard to the question of statistical contemporaneity or the lack thereof. Thus, with the huge database of the final OxCal run (200 dates), results may appear more "grainy"; the finer the grain, the better the resolution for this analysis. Thus, the results presented here can only be considered a rough approximation.

17 ⊻ Projectile Point and Chipped Stone Analysis

James L. Moore

Chipped stone artifacts were recovered from all seven sites examined in this study, though individual assemblages vary widely in size. The number of specimens recovered per site ranged from a low of 52 at LA 129216 to a high of 7,291 at LA 129214, for a combined total of 10,204 artifacts. This analysis begins with a discussion of the methods used to examine these materials. Following that, we discuss the individual attributes that were monitored. Since chronometric data suggest that each of these sites had multiple occupations over a long period of time, individual temporal components cannot be separated out for comparison. Thus, most of this discussion will consist of an examination of complete site assemblages without taking potential dates of occupation into account. In the final section of this chapter, we examine individual sites by analytic groups to help determine whether characteristics of those sub-assemblages vary in ways indicative of temporal or functional differences. While we may be able to isolate differences attributable to these processes, because these sites represent palimpsests reflecting multiple occupations over long periods of time, it may not be possible to determine the actual meaning of those differences.

Analytic Methods

Chipped stone artifacts were analyzed using a standardized format developed by the Office of Archaeological Studies (OAS 1994) that includes both typological and attribute approaches. In typological approaches, "individual artifacts are classified into types that have some kind of technological or functional meaning" (Andrefsky 2001:6). A benefit of this type of analysis is that behavior can be immediately inferred from the identification of a single artifact (Andrefsky 2001:6). For instance, the presence of a single notching flake indicates that a notched tool was made at a location, even if no notched tools were found. However, this method can be criticized because there is often a lack of verification between artifact type and functional or technological interpretation (Andrefsky 2001:7). Attribute analysis examines the distribution of one or more characteristics through an entire population, usually of debitage (Andrefsky 2001:7).

Among other things, various attributes can be used to assess the prevalence of specific reduction methods in a debitage population. However, problems can also crop up when using this analytic strategy "for a variety of reasons related to the small size of attributes and the number of observations" (Andrefsky 2001:12). Typological and attribute analyses vary in scale; typological analysis is applied to individual artifacts, while attribute analysis is applied to entire assemblages (Andrefsky 2001:12). Andrefsky notes that there is no one "right" approach to debitage analysis, and that the approach used can vary according to the types of information desired.

The analysis methods employed by the OAS assign typological interpretations to individual artifacts, while at the same time gathering attribute data that can be used to test and augment typological data. For instance, a rigorous set of characteristics is used to define flakes struck from bifaces versus those struck from cores. Flakes that do not fulfill the set of characteristics used to define biface flakes are, by default, considered core-flakes. However, the definition used to assign debitage to the biface flake category models ideal examples, and all flakes struck from bifaces (especially those struck in the early stages of manufacture) do not fit that ideal. By combining attribute analysis with a typological approach, we are able to determine which flakes were definitely struck from bifaces (typological approach), as well as those that were probably struck from bifaces but do not fit the model (attribute analysis). In essence, the two approaches complement one another and help provide a deeper understanding of reduction technology and tool use.

Since these methods are routinely applied to assemblages studied by the OAS, their use provides comparability for assemblages from sites of varying date and cultural affiliation excavated across New Mexico. A series of mandatory attributes included in this format is used in all analyses. Mandatory attributes describe materials, artifact types and condition, cortex, striking platforms on flakes, and dimensions. Optional attributes are also available and are useful for examining specific questions; several were used in this analysis in addition to mandated attributes.

The main questions the OAS analytic scheme was designed to explore include what types of materials were selected, where those materials were obtained, what techniques were used for chipped stone reduction, and what types of chipped stone tools occur in an assemblage. These topics can provide information about ties to other regions, mobility patterns, and site function. Material-selection studies will not always reveal how materials were obtained, but they can usually provide information on where materials came from. The type of cortex present on artifacts can be used to determine whether materials were obtained at outcrops or came from secondary gravel deposits. Studies of reduction technologies can help show how different peoples solved the problem of producing the types of chipped stone tools they needed from resources at hand. Various approaches could have been used, depending upon the level of residential mobility, the types of stone available, and the range of other materials that could be used to make tools. Examination of the types of chipped stone tools recovered from a site can help define the range of activities that occurred there, and in many cases will also aid in defining site function. Chipped stone tools can sometimes be used to provide temporal data, but are usually less time sensitive than other artifact classes, like pottery. For this reason, the chipped stone assemblages from these sites are only used to provide relative temporal data.

Each chipped stone artifact was examined using a binocular microscope to define morphology and material type, examine flake platforms, and determine whether they were used as tools. The level of magnification used varied between 10x and 80x, with higher magnification used to identify wear patterns and platform modifications. Utilized and modified edge angles were measured with a goniometer; other dimensions were measured with a sliding caliper. Artifacts were weighed on a digital or balance-beam scale.

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

Sampling

Because of error, a sizeable portion of the assemblage from LA 129214 was not included in the first round of analysis. When this exclusion was realized, time constraints dictated that these materials could not all be fully analyzed, and sampling was necessary. Less than 40 percent of the artifacts accidentally excluded from the first round of analysis were fully analyzed in the second round, while just over 60 percent were subjected to an abbreviated analysis. The abbreviated format consisted of an examination of nine attributes including material type, material quality, artifact morphology, function, percentage of cortex present, cortex type, weight, evidence of thermal alteration, and evidence of informal-tool use. These attributes are fully discussed in the next section. Thus, while certain data from the entire assemblage are available for some examinations, data from only part of the assemblage are available for others.

Initial analysis of chipped stone artifacts from LA 129214 ended after the examination of 792 artifacts. Sampling was applied to the remaining 5,981 specimens. Nearly all artifacts from Blocks 1-5, 7-12, and 14 were included in the full analysis, though there were a few exceptions due to errors made while drawing the sample. For Block 6, all artifacts that underwent the full analysis were examined as part of the first round, while all artifacts from this block that were examined during the second round were subjected to abbreviated analysis. The full analysis sample from Block 13 included all artifacts from features and Stratum 3, and materials from all excavation units in Stratum 2 that yielded 11 or more artifacts. Materials from proveniences in Block 13 that did not fit these parameters were examined by the abbreviated analysis. For Block 16, materials included in the full analysis were those that came from features and from excavation units in Stratum 2 that contained 50 or more artifacts. As was the procedure for Block 13, materials from Block 16 that did not fit these parameters were examined by abbreviated analysis. Materials from Blocks 15, 17, 18, and 19 were mainly examined by abbreviated analysis, while those from Block 20 were all fully analyzed. These procedures resulted in the full analysis of 3,054 specimens (45.09 percent) and the abbreviated analysis of 3,719 specimens (54.91 percent) from LA 129214.

Analytic Attributes

Attributes recorded for all artifacts included material type and quality, artifact morphology and function, amount of surface covered by cortex, portion, evidence of thermal alteration, edge damage, and dimensions; platform and dorsal surface information was recorded for flakes only, as was termination type. Two attributes were used to record information on materials used in chipped stone reduction.

Material type was coded by gross category unless specific sources or distinct varieties were recognized. Codes were arranged so that major material groups fell into specific sequences of numbers, progressing from general groups to specific varieties. Because this project was initiated before recording the color of cherts was required during analysis for the southeastern section of New Mexico, color only rarely factored into material-type definitions. One exception to this was that gray cherts received separate codes during analysis in order to allow them to be easily broken out from the rest of the assemblage for examination under ultraviolet light. This was done to determine whether certain cherts imported from Texas could be identified in these assemblages. The only other exception involved the definition of rhyolites, which is discussed in more detail later in this chapter. When color was monitored, it was not a separate attribute; rather, color was included as part of the material-type description.

Material texture and quality provided information on the basic flaking characteristics of materials. Texture subjectively measured grain size within rather than across material types and was scaled from fine to coarse, with fine textures exhibiting the smallest grains and coarse the largest. Quality recorded the presence of flaws that could affect flaking including crystalline inclusions, fossils, visible cracks, and voids. Inclusions that did not affect flaking, such as specks of different colored material or dendrites, were not considered flaws. Material texture and quality were recorded together in a single code.

Two attributes were used to provide information about artifact form and use. The first was **artifact morphology** that classified artifacts by general form as well as more specific attributes, placing them in categories like flake or early stage biface. The second was **artifact function** that placed artifacts into typological categories by inferred use, such as utilized debitage or scraper. These attributes were coded separately.

Cortex is the chemically or mechanically weathered outer rind on nodules; it is often brittle and chalky and does not flake with the ease or predictability of unweathered material. The amount of cortical coverage was estimated and recorded in 10 percent increments for each artifact. The percentage of dorsal surface covered by cortex was estimated on flakes, while for all other artifact classes the percentage of the total surface area covered by cortex was estimated, since artifacts other than flakes lack definable dorsal and ventral surfaces.

Cortex type can be a clue to the origin of an artifact. Waterworn cortex indicates that a nodule was transported by water and that its source was a gravel bed. Non-waterworn cortex suggests that a material was obtained where it outcrops naturally. Cortex type was identified for artifacts on which it occurred; when identification was not possible it was coded as indeterminate. Dorsal cortex coverage and cortex type were recorded separately.

All artifacts were coded as whole or fragmentary; when broken, the **portion** was recorded if it could be identified. Artifact portions can provide important functional information for sites. For example, the occurrence of mostly whole formal tools on a site has a completely different meaning than if the tools were predominantly broken and worn out. Proportions of flake sections can also provide data on post-reduction impacts to an assemblage. If most flakes are broken and proximal and distal fragments are represented by similar percentages, the assemblage may have been exposed on the surface for a significant period of time and damaged by traffic across the site. In this case, any wear patterns observed on debitage edges could have been caused by noncultural impacts rather than cultural use. Thus, an examination of the condition and distribution of artifact portions can provide critical interpretive information.

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

Thermal alteration was recorded for all artifacts on which it occurred. Nearly all evidence for thermal alteration was found on artifacts made from chert. Cherts can be modified by heating at high temperatures to improve their flaking characteristics. This process can realign the crystalline structure of a material and sometimes heals minor flaws like microcracks. Heat treatment can be difficult to detect unless mistakes were made during processing. When present, the type and location of evidence for thermal alteration were recorded to determine whether an artifact was purposely altered or the alteration was incidental.

Two attributes were used to record edge damage caused by cultural use. The first described the types of **wear patterns** observed. Use of a piece of debitage or core as an informal tool can cause damage, producing patterns of scars that may be indicative of the way in which it was used. Cultural edge damage denoting use as an informal tool was recorded and described when present. A separate series of codes was used to describe formal-tool edges, and were much more general in nature. The utilized **edge angles** of all formal and informal tools were measured and recorded separately; edges lacking cultural damage were not measured.

Maximum length, **width**, and **thickness** were measured for all chipped stone artifacts in the full analysis. On angular debris and cores, length was the largest measurement, and width was the longest dimension perpendicular to length. Thickness was perpendicular to the width and was the smallest measurement. On flakes and formal tools, length was the distance between the platform (proximal end) and termination (distal end), width was the distance between edges paralleling the length, and thickness was the distance between dorsal and ventral surfaces. **Weights** were measured in grams, and were obtained for all chipped stone artifacts in both levels of analysis.

Flake Categories

Several types of flakes can occur in an assemblage, and one analytic goal was to distinguish between flakes removed from cores and bifaces. Flakes were divided into these categories using a polythetic set of variables (Fig. 17.1). A polythetic framework is one in which fulfilling a majority of conditions is both necessary and sufficient for inclusion in a class (Beckner 1959). The polythetic set contains an array of conditions that model an idealized biface flake, and includes data on platform morphology, flake shape, and earlier removals from the parent artifact. In order to be considered a biface flake, an artifact needed to fulfill at least 70 percent of these conditions in any combination. Those that did not match that percentage of conditions were classified as core-flakes by default. This percentage was considered high enough to isolate flakes produced during the later stages of biface production from those removed from cores, but at the same time it was also low enough to permit flakes removed from a biface that did not fulfill the entire set of conditions to be properly classified. While not all flakes removed from bifaces were identified in this way, those that were can be considered definite evidence of biface reduction. Instead of rigid definitions, the polythetic set provided a flexible means of categorizing flakes and helped account for some of the variation in flake form and attributes observed during flintknapping.

Other flake types were identified by certain distinguishing characteristics. Two sub-varieties of biface flakes were categorized separately. Notching flakes were produced when the hafting elements of bifaces were notched. This type of flake generally exhibits a recessed, U-shaped platform and a deep, semicircular scallop at the junction of the platform

Whole Flakes

1. Platform:
   a. has more than one facet.
   b. is modified (retouched and/or abraded).
2. Platform is lipped.
3. Platform angle is less than 45 degrees.
4. Dorsal scar orientation is:
   a. parallel.
   b. multidirectional.
   c. opposing.
5. Dorsal topography is regular.
6. Edge outline is even.
7. Flake is less than 5 mm thick.
8. Flake has a relatively even thickness from proximal to distal end.
9. Bulb of percussion is diffuse.
10. There is a pronounced ventral curvature.

Broken Flakes or Flakes with Collapsed Platforms

1. Dorsal scars orientation is:
   a. parallel.
   b. multidirectional.
   c. opposing.
2. Dorsal topography is regular.
3. Edge outline is even.
4. Flake is less than 5 mm thick.
5. Flake has a relatively even thickness from proximal to distal end.
6. Bulb of percussion is diffuse.
7. There is a pronounced ventral curvature.

Figure 17.1. Polythetic set of variables for defining biface flakes.

and dorsal-flake surface. Re-sharpening flakes were removed from formal-tool edges that became dull from use, and usually fit the polythetic set for biface flakes. This category is often impossible to separate from other types of biface flakes, but can sometimes be identified by an extraordinary amount of damage on the platform and dorsal surface adjacent to the platform. Bipolar flakes were the only sub-variety of core-flakes to be separately categorized, and were evidence of nodule smashing; they usually exhibit signs of having been struck at one end and crushed against an anvil at the other. Other flake categories are evidence of removals from tools or indicate inadvertent damage during thermal processing. Ground stone flakes are debitage struck from broken pieces of ground stone, hammerstone flakes are debitage that were detached from a hammerstone by use, and pot lids are debitage that were blown off the surface of an artifact during thermal alteration.

Core and Tool Categories

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

Cores were classified by the direction of removals, and in rare circumstances by shape. Unidirectional cores had a single platform from which flakes were removed in one direction or along one continuous surface. Blade cores are pyramidal in shape, with specially prepared platforms that allow the consistent removal of long, narrow flakes, or blades. This category tends to only occur in Clovis-era Paleoindian assemblages in the Southwest. Pyramidal cores are a subdivision of the unidirectional category, and resemble blade cores in shape but lack the specially prepared platforms of that type. Pyramidal cores represent an attempt to maximize the number of flakes removed by reducing a core systematically from one platform. Bidirectional cores have two opposing platforms or a single platform from which flakes were removed from two opposing surfaces. Multidirectional cores exhibit multiple platforms, with flakes being struck from any suitable edge. Bipolar cores tend to be rare, and result from the smashing of small nodules or exhausted cores between a hammerstone and an anvil. This is usually done when materials were rare or highly prized, or nodules of high-quality materials were small and difficult to flake in other ways.

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

Formal tools were divided into cobble tools, unifaces, and bifaces. Cobble tools were usually massive, and were generally shaped by unifacial or bifacial flaking along one or more edges while retaining enough un-flaked surface space that their original form was recognizable. Unifaces were pieces of debitage that had one or more edges intentionally modified by flaking across a single surface. Bifaces were pieces of debitage that were intentionally flaked across two opposing surfaces. In all three of these tool categories, flaking was used to alter edge shape or angle into a needed or desired form.

Both cores and formal tools are nuclei from which flakes were removed, but differ in the reason for those removals. Flakes were struck from cores for use as informal tools or to be modified into formal tools. Flakes were removed from formal tools to create desired shapes or edge angles. Thus, cores were classified with debitage as by-products of the reduction process. Formal tools were considered separately because, in their finished form, they are evidence for the performance of unrelated tasks. Since all chipped stone artifacts result from similar reductive processes, this division is in many ways artificial, and some formal tools can also be used to provide evidence of reduction strategy.

Reduction Strategies

An assessment of strategies used to reduce lithic materials at a site often provides evidence of residential mobility or stability. Two basic reduction strategies have been identified for the Southwest. Efficient (or curated) strategies entail the manufacture of bifaces that served as 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 were 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 needed to reduce the risk of being caught unprepared for a task by carrying tools with them. Such tools were transportable, multifunctional, and easily modified. Sedentary groups did not necessarily need to consolidate tools into multifunctional, lightweight configurations (Andrefsky 1998:38).

Of course there are exceptions 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). Conversely, efficient reduction may have been impossible in areas where materials suitable for chipping occurred only as small nodules, requiring the use of a different strategy (Andrefsky 1998; Camilli 1988; Moore 1990).

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 could be easily and efficiently reduced further to produce debitage for use as informal tools or they could be shaped into replacements for other types of formal tools. Efficient strategies allowed flintknappers to produce the maximum length of usable edge per biface. By maximizing the return from these 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 nor transport cost were important considerations in expedient strategies; flakes were simply struck from cores as needed. Thus, analysis of the reduction strategy used at a site allows us to estimate whether site occupants were residentially mobile or sedentary.

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

Material Selection

Fourteen general material categories and an unknown category were identified in the composite assemblage from these sites, several of which include multiple recognizable varieties. Among the latter are cherts with seven varieties, rhyolites with four, metaquartzites with two, and orthoquartzites with two. Multiple varieties were distinguished when materials from specific sources were visually identifiable or could be discerned through the use of ultraviolet light.

General Material Distributions and Sources

Overall, chert was the most abundant material category, comprising just over three-quarters of the total assemblage. Cherts are mostly of sedimentary origin, and are comprised of silica that precipitated out of sea water and formed as nodules or bubbles within other types of sedimentary rocks, especially limestone (Andrefsky 1998:52). This material can also occur as massive beds or layers in shale and volcanic deposits (Andrefsky 1998:52). The varieties of chert identified in these assemblages all derive from sedimentary deposits. The formation of cherts

Table 17.1. Material categories, by site; counts and column percentages.

MATERIAL CATEGORY		LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300	TOTAL	% OF TOTAL
Unknown	Count	–	5	–	–	–	–	–	**5**	
	Col. %	–	0.1%	–	–	–	–	–		**0.0%**
Chert	Count	1,152	5,497	41	281	119	327	297	**7,714**	
	Col. %	74.9%	75.4%	78.9%	81.0%	85.6%	80.3%	69.1%		**75.6%**
Obsidian	Count	–	2	–	–	–	–	–	**2**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Igneous undifferentiated	Count	–	3	–	–	–	–	–	**3**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Basalt	Count	–	28	–	–	–	–	–	**28**	
	Col. %	–	0.4%	–	–	–	–	–		**0.3%**
Granite	Count	1	–	–	–	–	–	–	**1**	
	Col. %	0.1%	–	–	–	–	–	–		**0.0%**
Rhyolite	Count	10	20	–	–	–	–	2	**32**	
	Col. %	0.7%	0.3%	–	–	–	–	0.5%		**0.3%**
Aphanitic rhyolite	Count	–	12	–	–	–	–	–	**12**	
	Col. %	–	0.2%	–	–	–	–	–		**0.1%**
Andesite	Count	–	4	–	–	–	–	–	**4**	
	Col. %	–	0.1%	–	–	–	–	–		**0.0%**
Limestone	Count	53	192	2	–	–	5	32	**284**	
	Col. %	3.5%	2.6%	3.9%	–	–	1.2%	7.4%		**2.8%**
Sandstone	Count	5	6	–	2	2	5	3	**23**	
	Col. %	0.3%	0.1%	–	0.6%	1.4%	1.2%	0.7%		**0.2%**
Siltstone	Count	–	3	–	–	–	–	–	**3**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Mudstone	Count	–	–	–	–	–	–	1	**1**	
	Col. %	–	–	–	–	–	–	0.2%		**0.0%**
Metaquartzite	Count	265	1,416	9	54	14	52	87	**1,897**	
	Col. %	17.2%	19.4%	17.3%	15.6%	10.1%	12.8%	20.2%		**18.6%**
Orthoquartzite	Count	50	62	–	10	4	18	8	**152**	
	Col. %	3.3%	0.9%	–	2.9%	2.9%	4.4%	1.9%		**1.5%**
Quartz	Count	2	41	–	–	–	–	–	**43**	
	Col. %	0.1%	0.6%	–	–	–	–	–		**0.4%**
Total	**Count**	**1,538**	**7,291**	**52**	**347**	**139**	**407**	**430**	**10,204**	
	Row %	**15.1%**	**71.5%**	**0.5%**	**3.4%**	**1.4%**	**4.0%**	**4.2%**	**100.0%**	**100.0%**

in marine sediments can be an extremely complex process, and requires multiple steps through a variety of siliceous minerals before chert is actually formed (Luedtke 1992). Seven chert categories were recognized, including unsourced cherts, Alibates chert, Tecovas chert, San Andres chert, Pedernal chert, Edwards Plateau chert, and possible Edwards Plateau chert. Silicified wood can also be considered a chert, because it is essentially the same material (Luedtke 1992:32-33). Like cherts, silicified woods are cryptocrystalline silicates, but were formed when silica replaced wood fiber, often preserving the structure of the wood down to the cellular level. The preserved wood structure is what helps separate silicified woods from cherts, but is not always visible. Thus, when discussing general material categories, silicified woods are combined with the cherts. While individual categories are discussed in more detail later, unsourced chert was most common, comprising over 98 percent of this category.

As shown in Table 17.1, cherts dominated the chipped stone assemblages from all seven sites, comprising 74 percent or more of individual assemblages except for LA 129300, where they still made up 69 percent of the total. This dominance indicates that chert was the main focus of the material acquisition process, and was supplemented to some extent by the use of other, apparently less suitable, materials. Cherts tended to be heavily selected for reduction because their flaking characteristics made them eminently suited to the manufacture of formal tools, and because they tend to produce very sharp edges that can be used for cutting or scraping.

Crystal size was an important factor in assigning specimens to igneous materials. Andrefsky (1998:46) provides useful definitions for crystal size grades in igneous materials, and his definitions are used in this discussion. Phaneritic materials have large individual crystals that are macroscopically visible. Intrusive igneous rocks that cooled slowly, like granite, usually have this type of crystalline structure, with the constituent minerals forming crystals of variable sizes. Aphanitic rocks have a microscopic crystalline structure, with crystals too small to be seen by the naked eye. Extrusive rocks like basalt and rhyolite fall into this category. No crystals can be seen in glassy materials like obsidian, even under high magnification. Igneous rocks are porphyritic when phenocrysts (occasional large crystals) occur in materials with phaneritic, aphanitic, or glassy structures. The types of phenocrysts present are usually a clue to the type of rock represented.

Six general categories of igneous rocks were identified, including obsidian, basalt, andesite, granite, rhyolite, and igneous undifferentiated (Table 17.1). Obsidian is a volcanic glass that is isotrophic and flakes easily with a conchoidal fracture, producing extremely sharp edges. The two specimens of this material both came from LA 129214. Basalt and andesite are aphanitic volcanic rocks that, when very fine-grained and lacking vesicules, can break with a conchoidal fracture and are highly suitable for tool manufacture. Like obsidian, the only examples of basalt and andesite were identified at LA 129214. Granite is a phaneritic plutonic rock that does not break conchoidally and is not well suited to chipped stone reduction. The only example of granite was identified at LA 113042. Four varieties of rhyolite were distinguished by color and texture. Two colors were differentiated—red and gray—though we are uncertain whether they represent different sources or are simply an indication of variation within flows. Though all rhyolites are aphanitic volcanic rocks, two texture categories based on grain size were recognized. Rhyolites with a dull, sugary appearance were simply classified as red or gray rhyolite, while those with a waxy luster and smooth, almost glassy appearance were classified as red or gray aphanitic rhyolites to distinguish them from the other varieties. The aphanitic rhyolite categories often visually resemble cherts, but can usually be distinguished because they tend to be porphrytic. While rhyolites were more common than were other types of igneous rocks, they still comprised less than half a percent of the overall assemblage, and were found on only three sites (Table 17.1). Red rhyolite was the most common variety, followed by gray rhyolite, gray aphanitic rhyolite, and red aphanitic rhyolite. The igneous undifferentiated category was a catch-all for materials that were visibly igneous in nature, but could not be more accurately identified by analysts. This category was uncommon, with only five specimens from LA 129214 being assigned to it. The general rarity of igneous materials in these assemblages suggests they were not widely available for use.

Several sedimentary rocks other than chert also occurred including limestone, sandstone, siltstone, and mudstone, but they were comparatively rare and together comprise less than 4 percent of the overall assemblage. Limestone was the most common of these materials, but made up only 2.78 percent of the composite assemblage. Sandstone debitage was rare, but was found in all but one assemblage, and the only site that lacked material contained the fewest chipped stone artifacts. Sandstone does not break conchoidally, nor does it hold a sharp edge; thus, this material is usually considered unsuitable for reduction. However, the manufacture of ground stone tools from sandstone may include some flaking to remove excess material, and that may be where these specimens originated. In contrast, limestone can break conchoidally and produce a sharp edge suitable for use as a cutting tool. Indeed, formal tools made of limestone have occasionally been found. Limestone artifacts were moderately common in the five assemblages in which they occurred. Mudstone and siltstone are generally very soft and of limited suitability for reduction, however, when silicified, clastic sedimentary rocks of these types are suitable for stone-tool manufacture (Andrefsky 1998:50). The specimens assigned to these categories appeared to be silicified, making them very difficult to accurately distinguish from cherts. Indeed, very few specimens were assigned to these categories (Table 17.1). Though sedimentary rocks other than chert tend to be abundant and easily accessed in much of southeastern New Mexico, their relative rarity in these assemblages suggests that they usually were not considered suitable for reduction.

Two categories of quartzite were distinguished, both of which were represented by two varieties. Metaquartzites were metamorphosed from sandstone, and are mostly composed of quartz with traces of other minerals imparting various colors to specimens from different sources. The quartz crystals in metaquartzites were fused together so they break conchoidally, with fractures traveling through quartz grains rather than around them as is the case with un-metamorphosed sandstone (Andrefsky 1998:55). The second category of quartzite is a sedimentary rock called orthoquartzite, which is sandstone in which individual quartz crystals (usually rounded) were cemented together by silica. Like metaquartzites, orthoquartzites tend to break across particles, permitting conchoidal fracture (Andrefsky 1998:51). Metaquartzite was the second most common material for every site, comprising between about 10 and 20 percent of individual assemblages. Two varieties were distinguished: generic quartzite, which comprised 10.16 percent of the overall assemblage, and purple quartzite, which made up 8.43 percent. Orthoquartzite was usually the third or fourth most common material at the sites where it was found, and comprised between about 0.9 and 4.5 percent of those assemblages.

Quartz is a phaneritic mineral originating in plutonic deposits. While quartz does not break with a conchoidal fracture and is unsuitable for many tasks in which chipped stone tools were used, it is very durable and is often found in small percentages in prehistoric assemblages. Examples of this material were recovered in small numbers only from LA 113042 and LA 129214, suggesting that, like other igneous materials, quartz was not widely available.

The last category is comprised of materials that were unrecognizable and could not be classified. These materials were categorized as unknown, and include a few specimens of variable composition recovered from LA 129214.

Material Sources

Materials were collected for reduction from two basic types of sources. Perhaps the most common was gravel deposits that contain rocks transported great distances away from where they originated. The locations at which materials naturally outcrop are the second type of source. Determining the type of source materials were obtained from can be very difficult when dealing with individual specimens. However, some attributes can be used to suggest which type of source was predominantly used for obtaining the materials in an assemblage as a whole, as well as for some individual materials. This can be an important factor in evaluating ties between regions. For example, the occurrence of Jemez obsidian has often been used to suggest links between various regions, assuming that it was obtained directly from sources in the Jemez Mountains of north-central New Mexico. However, this assumption is often incorrect because streams also transported Jemez obsidian away from where it outcropped, depositing it in associated gravel beds as well as in gravel beds along the rivers to which those streams are tributary. Thus, Jemez obsidian is commonly found in gravel beds along the Rio Grande below its confluence with the Rio Jemez, and is known to occur at least as far south as the Las Cruces area.

The type of cortex present on artifacts can be used to help distinguish between procurement from outcrops versus gravel beds. Mechanical transport by streams causes the outer surface of nodules to become battered and rounded, providing a distinct appearance that can usually be differentiated from cortex not subjected to water transport. Waterworn cortex indicates that a nodule originated in gravel deposits and was transported anywhere from a few miles to hundreds of miles from where it originated. In contrast, the presence of non-waterworn cortex indicates that a material was obtained at or very near an outcrop. Thus, while geological formations in which several materials in these assemblages originated can be identified we still must consider the possibility of mechanical transport away from those sources.

Materials that can be assigned to specific geological sources include Alibates chert, Tecovas chert, Edwards Plateau chert, Pedernal chert, San Andres chert, and obsidian. Alibates chert is a silicified or agatized dolomite that formed when silica-rich groundwater slowly replaced the original material, preserving the structure of the dolomite (Patten 1999:21). This material is from the Texas Panhandle near Amarillo, just south of the Canadian River. The area in which Alibates chert outcrops is geologically localized, though it has been transported eastward by the Canadian River (Banks 1990). Since the area in which Alibates chert outcrops drain toward the east, mechanical transport in a westerly direction toward the project area is unlikely. Thus, all Alibates chert artifacts represent materials obtained from a distant location, including those that exhibit waterworn cortex.

Tecovas chert (or jasper) mainly occurs in west Texas, outcropping in the Tecovas formation. This material is more geologically widespread than Alibates chert, but nodules tend to be much smaller than those of Alibates (Banks 1990:92-93). The best known quarries for this material are along the east edge of the Llano Estacado. Banks (1990:93) notes that the Chinle and Baldy Hill formations are lateral equivalents of the Tecovas formation. Among other areas in New Mexico and Arizona, the Chinle formation outcrops in southeastern New Mexico near Jal. This suggests that Tecovas chert might be available much closer to the project area than are the quarries along the eastern flank of the Llano Estacado, but in a location that is distant enough that it still must be considered an import, even when it exhibits waterworn cortex.

The San Andres formation produces visually distinctive cherts that display a "fingerprint" pattern, outcropping along the eastern flank of the Zuni Mountains in west-central New Mexico and in various parts of southern New Mexico including the Sacramento and Guadalupe mountains (Banks 1990:70, 80). Indeed, a large part of southeastern New Mexico between Vaughan and the Texas border is underlain by the San Andres formation (Banks 1990:71). San Andres chert is visually similar to Kay County chert from Oklahoma and Kansas, but certain characteristics of the latter, absent in San Andres chert, may help distinguish the two. This material can be considered local, even if non-waterworn cortex is present.

Edwards Plateau chert is widespread in central and west Texas, where it outcrops as nodules or in beds in various locations (Banks 1990). This material is considered an import even when waterworn cortex is present because mechanical transport from the region in which it outcrops to the study area is highly unlikely. Banks (1990) indicates that there are multiple chert-bearing formations from various geological periods on the Edwards Plateau, not all of which would technically be considered Edwards Plateau chert. Wiseman et al. (2000:78-79) noted that there is a visual resemblance between some varieties of chert originating in the San Andres formation in southeastern New Mexico and Edwards Plateau chert. For this reason, gray cherts were separated out during analysis and subjected to fluorescence analysis using ultraviolet light (UVFL). Since UVFL experiments reported by Wiseman and others (2000) suggest that materials from the New Mexico sources do not fluoresce to the same color as Edwards Plateau chert, only those specimens that fluoresced to the correct color were considered actual examples of Edwards Plateau chert, while specimens that fluoresced to a similar color were classified as possible Edwards Plateau chert.

Pedernal chert originates in north-central New Mexico in the Rio Chama Valley, and occurs as float in gravel deposits along the Rio Chama and Rio Grande below the confluence of those rivers. This material outcrops in limestone and is quite variable in appearance, though it is usually visually distinguishable by analysts who are familiar with the range of variation. Pedernal chert is very unlikely to occur naturally in gravel beds along the Pecos River, and is considered an exotic material even when waterworn cortex is present. The nearest source for this material is in gravel beds along the Rio Grande, a considerable distance to the west of the study area.

Because of the Madera formation, which contains large deposits of chert, outcrops along the eastern flank of the Sangre de Cristo Mountains, large quantities of Madera chert have been mechanically transported southward and occur in Pecos River gravels (Banks 1990:89). While numerous pieces of probable Madera chert were noted during analysis, they were not consistently identified and are therefore not considered separately. However, Madera chert most likely comprises a significant percentage of the unsourced cherts.

Obsidian does not occur naturally in southeastern New Mexico, and there are no known sources along the Pecos River from which nodules could have been mechanically transported south toward the study area. The lack of naturally occurring obsidian in the study area indicates that any specimens found there are exotic materials, even when waterworn cortex is present. The nearest source for this material is in gravel beds along the Rio Grande, a considerable distance to the west.

The actual source of purple quartzite is currently unknown, but during an earlier study near

Roswell, purple quartzite was available locally as cobbles (Moore 2003a), so it is a likely component of gravel beds along the Pecos River. Banks (1990:89) notes that quartzites and igneous rocks that outcrop to the north are found on the terraces and upland surfaces along the Pecos River, and that these materials were used throughout eastern New Mexico. Because of its distinctive appearance, purple quartzite was classified separately from other metaquartzites.

From this short overview, we can expect many if not most of the materials used in the project area to have originated in Pecos River gravels, with the remainder coming from local or more distant sources. Examination of cortex type indicates that most of the materials used at these sites did, indeed, originate in gravel beds. Cortex was noted on 29.37 percent of the assemblage, and was waterworn on 98.92 percent of the specimens on which it occurred, an overwhelmingly large percentage. Only 18 specimens (0.59 percent) exhibit non-waterworn cortex, and cortex type was indeterminate in another 15 cases (0.49 percent). Of the specimens that exhibit non-waterworn cortex, 10 are various cherts, four are limestone, and single examples of unknown, igneous undifferentiated, metaquartzite, and orthoquartzite also occur. Nine of the chert specimens could not be assigned to a definite source, and probably represent locally available materials. A single example of possible Edwards Plateau chert exhibits non-waterworn cortex and probably represents indirect acquisition from a Texas source.

The small number of exotic materials that exhibit waterworn cortex included Pedernal chert, Alibates chert, and both definite and possible Edwards Plateau chert. Thus, few of the exotic materials in the composite assemblage were obtained directly from outcrops; rather, they probably came from gravel deposits some distance away from their sources. The nodules from which the Pedernal chert debitage were struck were probably obtained from Rio Grande gravels, somewhere below the confluence of the Rio Chama and Rio Grande. The Alibates and Tecovas specimens would have been obtained from gravel deposits located to the east of where they outcrop in Texas.

Other materials with unknown sources also appear to have come from Pecos River gravels. This includes all of the igneous materials (basalt, granite, quartz, and rhyolite), the metamorphic materials (metaquartzites and orthoquartzites), and most of the sedimentary rocks (unsourced cherts, limestone, sandstone, and mudstone). Clearly, little use was made of material outcrops by the residents of these sites, and they depended heavily on the types of rocks available in gravel beds, primarily those deposited by the Pecos River as well as those that occur along local tributary streams.

The term "Pecos River gravels" needs further explanation. While this term is used throughout the following discussion, it does not necessarily imply that only gravel beds along the geologically modern course of the Pecos River were used as sources for lithic materials. Since the course of the Pecos River has changed over time, related gravel beds also occur a distance away from its modern course. Hall (2009) examined a deposit of Quaternary Older Alluvium (QOA) at LA 154359 about 17 to 18 km (10 to 11 mi) south of our project area. These materials represent eroded terrace deposits formed by the Pecos River during the Pleistocene that are mostly comprised of gravels (Hall 2009:4–5). In examining samples of these gravels, Hall (2009:4–5) determined that they were mainly quartzites, including the purple metaquartzite found on the sites examined by the present study. Also occurring were pink and white cherts, granite, and other igneous rocks that were not further identified in Hall's report. While these gravel deposits are now buried by a layer of eolian sand, Hall (2009:5) notes that they represent a "rich lithic resource," and speculates that LA 154359 may have been occupied in order to exploit that resource.

Though the QOA does not underlie our study area, an exposure does occur just beyond the western end of the project area, as shown by the *Geologic Map of New Mexico* (New Mexico Bureau of Geology and Mineral Resources 2003). Exposures of QOA gravels in erosional channels and deflated areas could have been the source for many or all of the materials considered representative of Pecos River gravels by this study, and would constitute a source that was 4 to 6 km (2 to 4 mi) nearer our sites than were gravel deposits along the geologically modern Pecos River channel. While this does not represent a considerable distance, it does indicate that the occupants of our sites could have obtained suitable materials for chipped stone reduction from Pecos River gravels without ever having to actually access the modern Pecos Valley. In actuality, both source areas probably contributed to the archaeo-

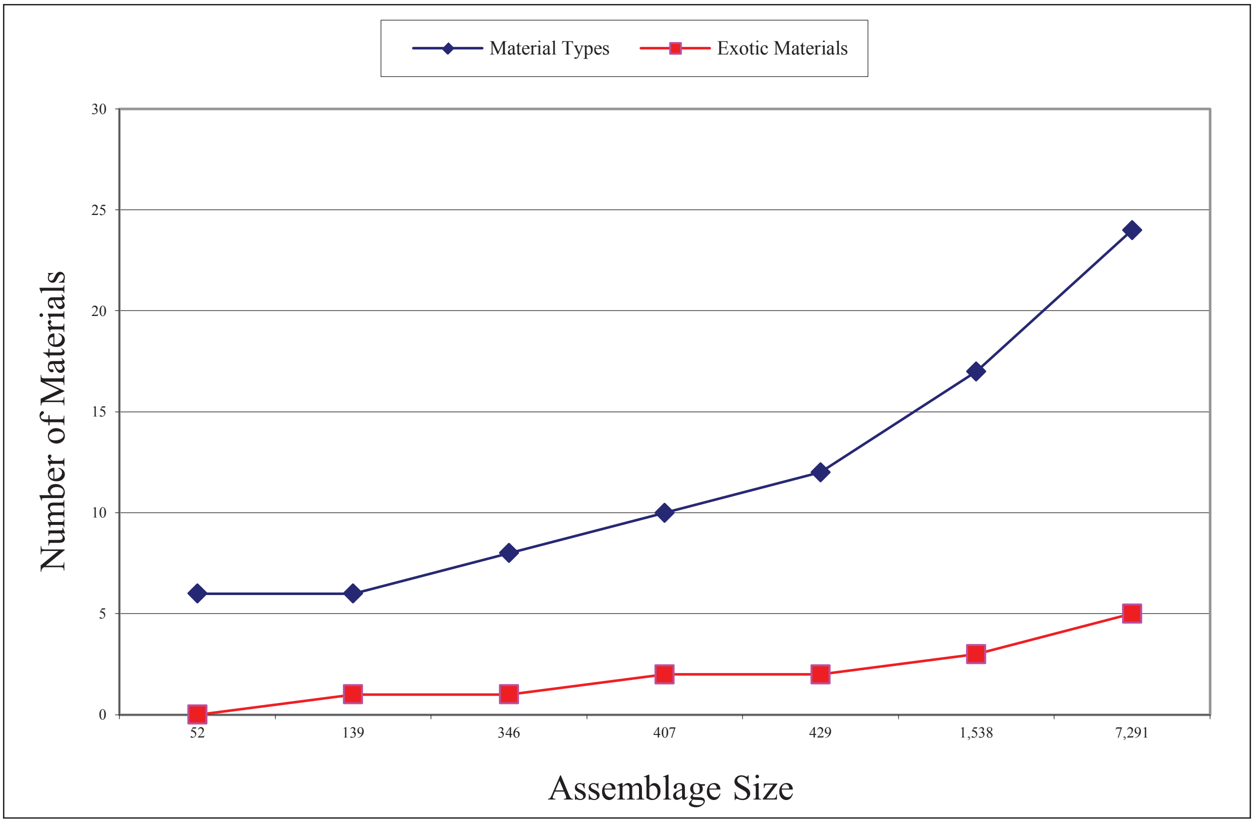

Figure 17.2. Number of material and exotic materials, by assemblage size.

logical materials recovered from these sites, though both were not necessarily used during the same occupations. Unfortunately, there is currently no way to distinguish between rocks obtained from the QOA and those that came from gravel beds along the more modern course of the Pecos River, so we cannot determine which source contributed materials to individual occupations.

Material Selection by Site

Table 17.2 shows the distribution of identified material types for each site. Over 72 percent of the assemblage consisted of various unsourced cherts, and since cortex was waterworn on 99.14 percent of the 26.91 percent of these specimens that retained part of their cortical surfaces, these cherts were overwhelmingly obtained from gravel beds. As discussed earlier, among the other material types exhibiting cortex, only unsourced chert, limestone, a few materials of unknown type, and a piece of possible Edwards Plateau chert exhibited cortex that was non-waterworn and therefore evidence of procurement at or near an outcrop.

Thus, nearly all of the materials that can be considered locally available were obtained from gravel beds, including San Andres chert. Knowing that materials were obtained from fluvial gravels renders their original source irrelevant, in archaeological terms, so further attempts to determine where most of these materials outcropped are considered unnecessary.

The material types per site ranged from six to 25 and were graphed against overall chipped stone assemblage size in Figure 17.2, with definite and possible examples of Edwards Plateau chert combined. The number of materials tends to vary with assemblage size, with larger assemblages containing the most materials, and smaller assemblages the least. This suggests that number of materials is related to the number of artifacts recovered from these sites rather than cultural factors. Figure 17.2 also graphs the number of exotic materials by assemblage size, again with definite and possible Edwards Plateau cherts combined as a single type. The covariation between number of materials and assemblage size is nearly as clear cut for the exotics. As expected, the smaller assemblages contain the fewest varieties

Table 17.2. Material categories, by site; counts and column percentages.

MATERIAL TYPE		LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300	TOTAL	% OF TOTAL
Unknown	Count	–	5	–	–	–	–	–	**5**	
	Col. %	–	0.1%	–	–	–	–	–		**0.0%**
Chert	Count	1,078	5,308	37	264	108	306	271	**7,372**	
	Col. %	70.1%	72.8%	71.2%	76.1%	77.7%	75.2%	63.0%		**72.2%**
Pedernal chert	Count	2	6	–	–	–	1	2	**11**	
	Col. %	0.1%	0.1%	–	–	–	0.3%	0.5%		**0.1%**
Alibates chert	Count	–	2	–	–	–	–	–	**2**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Tecovas chert	Count	2	2	–	–	–	–	–	**4**	
	Col. %	0.1%	0.0%	–	–	–	–	–		**0.0%**
San Andres chert	Count	11	22	2	–	–	2	5	**42**	
	Col. %	0.7%	0.3%	3.9%	–	–	0.5%	1.2%		**0.4%**
Edwards Plateau chert	Count	13	18	–	8	7	–	2	**48**	
	Col. %	0.9%	0.3%	–	2.3%	5.0%	–	0.5%		**0.5%**
Possible Edwards Plateau chert	Count	5	14	–	8	4	6	2	**39**	
	Col. %	0.3%	0.2%	–	2.3%	2.9%	1.5%	0.5%		**0.4%**
Silicified wood	Count	41	125	2	1	–	12	15	**196**	
	Col. %	2.7%	1.7%	3.9%	0.3%	–	3.0%	3.5%		**1.9%**
Obsidian	Count	–	2	–	–	–	–	–	**2**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Igneous	Count	–	3	–	–	–	–	–	**3**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Basalt	Count	–	28	–	–	–	–	–	**28**	
	Col. %	–	0.4%	–	–	–	–	–		**0.3%**
Granite	Count	1	–	–	–	–	–	–	**1**	
	Col. %	0.1%	–	–	–	–	–	–		**0.0%**
Red rhyolite	Count	3	13	–	–	–	–	2	**18**	
	Col. %	0.2%	0.2%	–	–	–	–	0.5%		**0.2%**
Gray rhyolite	Count	6	6	–	–	–	–	–	**12**	
	Col. %	0.4%	0.1%	–	–	–	–	–		**0.1%**
Red aphanitic rhyolite	Count	1	10	–	–	–	–	–	**11**	
	Col. %	0.1%	0.1%	–	–	–	–	–		**0.1%**
Gray aphanitic rhyolite	Count	–	3	–	–	–	–	–	**3**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Andesite	Count	–	4	–	–	–	–	–	**4**	
	Col. %	–	0.1%	–	–	–	–	–		**0.0%**
Limestone	Count	53	192	2	–	–	5	32	**284**	
	Col. %	3.5%	2.6%	3.9%	–	–	1.2%	7.4%		**2.8%**
Sandstone	Count	5	6	–	2	2	5	3	**23**	
	Col. %	0.3%	0.1%	–	0.6%	1.4%	1.2%	0.7%		**0.2%**
Siltstone	Count	–	3	–	–	–	–	–	**3**	
	Col. %	–	0.0%	–	–	–	–	–		**0.0%**
Mudstone	Count	–	–	–	–	–	–	1	**1**	
	Col. %	–	–	–	–	–	–	0.2%		**0.0%**
Metaquartzite	Count	114	858	3	17	4	15	26	**1,037**	
	Col. %	7.4%	11.8%	5.8%	4.9%	2.9%	3.7%	6.1%		**10.2%**
Purple quartzite	Count	151	558	6	37	10	37	61	**860**	
	Col. %	9.8%	7.7%	11.5%	10.7%	7.2%	9.1%	14.2%		**8.4%**
Orthoquartzite	Count	39	51	–	10	4	18	8	**130**	
	Col. %	2.5%	0.7%	–	2.9%	2.9%	4.4%	1.9%		**1.3%**

(Table 17.2, continued)

MATERIAL TYPE		LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300	**TOTAL**	**% OF TOTAL**
Orthoquartzite Variety 1	Count	11	11	–	–	–	–	–	**22**	
	Col. %	0.7%	0.2%	–	–	–	–	–		**0.2%**
Quartz	Count	2	41	–	–	–	–	–	**43**	
	Col. %	0.1%	0.6%	–	–	–	–	–		**0.4%**
Total	**Count**	**1,538**	**7,291**	**52**	**347**	**139**	**407**	**430**	**10,204**	
	Row %	**15.1%**	**71.5%**	**0.5%**	**3.4%**	**1.4%**	**4.0%**	**4.2%**	**100.0%**	**100.0%**

and the largest assemblages the most. This suggests that the number of exotic materials is also related to assemblage size rather than cultural or temporal factors.

Material selection was primarily based on the types of suitable materials available in the gravel deposits that were mined for tool stone by the occupants of these sites. We assume that those gravel beds were mainly deposited by the Pecos River, considering the types of materials identified in the composite assemblage. While a few cherts and limestones were obtained at outcrops, and some probably came from gravels along local tributaries of the Pecos River, these were exceptions to the primary acquisition system. This array of materials was augmented by the use of a few others acquired, probably through exchange, from groups located to the east in Texas. Three exotics fall into this category including Alibates chert, Tecovas chert, and Edwards Plateau chert (including possible examples). The small amounts of Pedernal chert that occurs in four assemblages and the obsidian found in one suggest that exchange links also existed to the west, ultimately with groups in the lower Rio Grande Valley. Whether exotics were obtained by trading directly with the peoples who quarried them or through down-the-line exchange is impossible to determine, though the latter is most likely.

Material Texture and Quality

The actual selection of materials for reduction was undoubtedly based on the purposes to which debitage from those materials would be put. Different parameters are required for materials that will be used for cutting versus those slated for chopping or pounding use, as well as those from which formal tools will be manufactured. Material-type factors into these parameters because different rocks possess variable characteristics of fracture and strength. However, the texture and quality of materials were also very important factors in the selection process, because they help determine the suitability of tools made from those materials for use in specific tasks. By examining some of the characteristics of material fracture and strength, we can better understand the uses to which those materials may have been put.

Material texture was a subjective measure of grain size within material types, and is difficult to compare across materials. For example, cherts lack a visible crystalline structure at the level of magnification used in this analysis, with surfaces that often have a smooth appearance, unbroken except by occasional flaws even when classified as coarse-grained. The difference in chert textures is based on appearance: smooth, glossy cherts were fine grained while cherts with a dull, sugary luster were classified as medium- or coarse-grained. In contrast, even when fine grained, materials like quartzite and quartz have a crystalline structure visible to the naked eye. Thus, while fine-grained materials tend to be more easily and reliably flaked within their material categories, all fine-grained materials are not suited to the same tasks.

Artifacts were also examined for the presence of obvious flaws that could have interfered with flake propagation including voids, cracks, fossils, and crystals in an otherwise homogenous material. Dendritic inclusions, spots of different colors, and minor variations in grain were not considered flaws. The distribution of material types by quality is shown in Table 17.3. Fine-grained textures dominated the assemblage, comprising over four-fifths of the total. Medium- and coarse-grained materials occurred in comparatively minor percentages, with the former comprising less than 15 percent and the latter just over 3 percent of the composite assemblage. Only

Table 17.3. Material texture, by material category; counts and row percentages.

MATERIAL CATEGORY		GLASSY	FINE-GRAINED	FINE-GRAINED, FLAWED	MEDIUM-GRAINED	MEDIUM-GRAINED, FLAWED	COARSE-GRAINED	COARSE-GRAINED, FLAWED	TOTAL	% OF TOTAL
Unknown	Count	–	1	3	1	–	–	–	**5**	
	Row %	–	20.0%	60.0%	20.0%	–	–	–	**100.0%**	**0.0%**
Chert	Count	–	4,597	2,053	675	301	60	27	**7,714**	
	Row %	–	59.6%	26.6%	8.8%	3.9%	0.8%	0.4%	**100.0%**	**75.6%**
Obsidian	Count	2	–	–	–	–	–	–	**2**	
	Row %	100.0%	–	–	–	–	–	–	**100.0%**	**0.0%**
Igneous	Count	–	2	–	1	–	–	–	**3**	
	Row %	–	66.7%	–	33.3%	–	–	–	**100.0%**	**0.0%**
Basalt	Count	–	25	–	3	–	–	–	**28**	
	Row %	–	89.3%	–	10.7%	–	–	–	**100.0%**	**0.3%**
Granite	Count	–	–	–	1	–	–	–	**1**	
	Row %	–	–	–	100.0%	–	–	–	**100.0%**	**0.0%**
Rhyolite	Count	–	19	7	7	2	8	1	**44**	
	Row %	–	43.2%	15.9%	15.9%	4.5%	18.2%	2.3%	**100.0%**	**0.4%**
Andesite	Count	–	4	–	–	–	–	–	**4**	
	Row %	–	100.0%	–	–	–	–	–	**100.0%**	**0.0%**
Limestone	Count	–	185	42	40	10	6	1	**284**	
	Row %	–	65.1%	14.8%	14.1%	3.5%	2.1%	0.4%	**100.0%**	**2.8%**
Sandstone	Count	–	8	–	7	–	8	–	**23**	
	Row %	–	34.8%	–	30.4%	–	34.8%	–	**100.0%**	**0.2%**
Siltstone	Count	–	2	–	1	–	–	–	**3**	
	Row %	–	66.7%	–	33.3%	–	–	–	**100.0%**	**0.0%**
Mudstone	Count	–	–	–	1	–	–	–	**1**	
	Row %	–	–	–	100.0%	–	–	–	**100.0%**	**0.0%**
Meta-quartzite	Count	–	1,205	143	317	67	151	14	**1,897**	
	Row %	–	63.5%	7.5%	16.7%	3.5%	8.0%	0.7%	**100.0%**	**18.6%**
Ortho-quartzite	Count	–	45	4	69	–	30	4	**152**	
	Row %	–	29.6%	2.6%	45.4%	–	19.7%	2.6%	**100.0%**	**1.5%**
Quartz	Count	–	12	8	12	10	1	–	**43**	
	Row %	–	27.9%	18.6%	27.9%	23.3%	2.3%	–	**100.0%**	**0.4%**
Total	**Count**	**2**	**6,105**	**2,260**	**1,135**	**390**	**264**	**47**	**10,204**	
	Row %	**0.0%**	**59.8%**	**22.1%**	**11.1%**	**3.8%**	**2.6%**	**0.5%**	**100.0%**	**100.0%**

two artifacts with a glassy texture were identified. The heavy selection for fine-grained textures suggests a need for materials that were easily and accurately flaked and that produced sharp edges for use.

Flaws were quite common, occurring in 26.43 percent of the assemblage. Considering only materials represented by at least 15 specimens, flaws were very common in the cherts, fairly common in the rhyolites and limestones, and much less common in the quartzites and sandstones. Clearly, the presence of at least some flaws was not an impediment to the use of a material. This was especially true for chert, which was the most heavily used material, despite the presence of numerous flaws. Over a quarter of the cherts were flawed, and this level of flawing is probably indicative of general material condition before acquisition and use. Flaws were apparently common in chert deposits or were caused by mechanical transport as nodules struck against one another. Indeed, in examining nodules of water-transported chert in northern New Mexico, the author has often noted a zone of microcracks just below the cortical surface that are evidence of this process. Since cherts were often used for making formal tools, this potential problem could be corrected for by selecting unflawed debitage for further reduction.

However, this was not the case, as 30.77 percent of the unsourced cherts used in formal-tool manufacture were flawed versus 30.87 percent for this material category overall. These percentages are nearly identical, indicating that the presence of

Table 17.4. Material quality, by artifact category, for tools, with pounding tools eliminated from consideration; counts and column percentages.

MATERIAL QUALITY		PROJECTILE POINTS/ PREFORMS	OTHER FORMAL TOOLS	INFORMAL TOOLS	DEBITAGE AND CORES
Glassy	Glassy	–	–	–	2
	Col. %	–	–	–	0.0%
Fine-grained	Count	27	30	101	5,946
	Col. %	73.0%	63.8%	69.7%	59.7%
Fine-grained and flawed	Count	8	14	37	2,201
	Col. %	21.6%	29.8%	25.5%	22.1%
Medium-grained	Count	2	2	4	1,124
	Col. %	5.4%	4.3%	2.8%	11.3%
Medium-grained and flawed	Count	–	–	1	388
	Col. %	–	–	0.7%	3.9%
Coarse-grained	Count	–	1	2	261
	Col. %	–	2.1%	1.4%	2.6%
Coarse-grained and flawed	Count	–	–	–	47
	Col. %	–	–	–	0.5%
Total	**Count**	**37**	**47**	**145**	**9,969**
	Row %	**0.4%**	**0.5%**	**1.5%**	**100.0%**

visible flaws was not an important factor in the selection of unsourced chert debitage for reduction into formal tools.

Table 17.4 contrasts the distribution of material quality for various tool categories with the distribution for the unutilized debitage and cores. There was a very obvious selection for fine-grained materials in the manufacture of projectile points and preforms, with over 94 percent of these tools being made from fine-grained materials, and only two specimens that were not. Unflawed materials were also preferred for projectile point manufacture, though some flawed materials were also used. The distribution for other formal tools, with pounding tools dropped from consideration, is similar to that of the projectile points and preforms, though with a slightly higher use of flawed materials, and one example of a coarse-grained material. These distributions contrast with those for the unmodified debitage/core assemblage. While around 94 percent of the projectile points and other formal tools were made from fine-grained materials, just 81.73 percent of the debitage/core assemblage fell into that category. This suggests a conscious selection for the better grades of materials for formal-tool manufacture, as might be expected. Medium-grained materials were much more common in the debitage/core assemblage, and coarse-grained materials were slightly more common.

Interestingly, the distribution of textures selected for informal-tool use also contrasts with that of the unmodified debitage/core assemblage. Just over 95 percent of the informal tools were made from fine-grained materials, with very few specimens occurring in the medium- and coarse-grained categories. However, this distribution may be due to the analysts' ability to see more evidence for use on fine-grained materials rather than conscious selection. Use-wear scars tend to be easier to define on glassy and fine-grained materials than on coarse-grained rocks. Foix and Bradley (1985) conducted use-wear experiments on rhyolite and found that evidence of wear was almost invisible, with coarse-grained varieties exhibiting more resistance to wear than fine-grained types. Thus, a much higher percentage of fine-grained materials should evidence use as informal tools, as we see in this assemblage.

Durability is also thought to have played a role in the selection of materials for specific tasks, and is closely related to both material type and texture. Durable materials are resistant to fracture damage and are better able to withstand impacts from pounding or chopping without splintering and coming apart. Cotterell and Kaminga (1990:129–130) refer to this quality as *toughness*, and present a comparison for several materials. Though materials from different sources vary in toughness, Cotterell and Kaminga's (1990:129) comparison generally indicates that obsidian, quartz, and chert are less tough than andesitic basalt, tuff, and rhyodacitic volcanic rock. Toughness is not equated with hardness, because hard materials also tend to be brittle and fracture easily (Cotterell and Kaminga 1990:129). Thus, the materials categorized in this analysis as nondurable are mostly hard and brittle. Fine-grained nondurable materials produce sharp cutting edges (Cotterell and Kaminga 1990:127) and are less tough (and therefore less durable) than those that are softer and less brittle. While the former are well-suited to the production of cutting and scraping tools, the latter are best for pounding tools and ground stone. Nondurable materials are not well suited to pounding or chopping because the same characteristics that allow them to produce sharp edges causes them to splinter and crack when force is applied to their edges. Grain size may also be associated with durability. When tough materials with larger grains are used for pounding or chopping, their edges tend to crush rather than splinter (though some splintering can occur), allowing them to be used longer and more efficiently for these purposes. This may be because the force applied to the edges of tough, grainy materials dislodges or crushes individual grains rather than propagating the cracks that lead to flake removal as can happen in finer-grained material.

This system of classification is similar to one presented by Callahan (1979:16) and modified somewhat by Whittaker (1994:66) that ranks materials by degree of toughness and the effective limits of tools used for reduction. While Callahan's (1979:16) rankings are a subjective rather than a quantitative test of toughness, they are based on many years of knapping experience and appear to be accurate. In this scheme, obsidians and heat-treated fine-grained cherts and chalcedonies are classified as brittle and can be efficiently thinned using soft hammer percussion and pressure flaking. The finest-grained basalts and rhyolites, unheated fine-grained cherts, and other chertic materials are categorized as strong, and can be efficiently thinned using both soft hammerstone and soft hammer percussion, as well as pressure flaking. Cherts classified as strong by Callahan's scheme can be transformed into brittle materials by purposeful thermal alteration. Thus, a chert that is hard and very difficult to pressure flake in its natural state becomes brittle and much easier to flake when properly heat-treated. The coarser cherts, quartzites, quartz crystal, agate, jasper, siltstone, siliceous limestone, coarser-grained rhyolites, and most basalt are classified as tough and are best thinned by soft hammer reduction.

Luedtke (1992:80) notes that material strength (also referred to as toughness or tenacity) "is a measure of how much force must be applied to produce a fracture." Thus, strength also equates to the degree of resistance to knapping that is demonstrated by a material. Strong materials that require the use of hard blows to remove flakes cannot be hit as accurately as materials that require less force to initiate a fracture (Luedtke 1992:80). Some reduction techniques, like pressure flaking, are not applicable to very strong materials (Luedtke 1992:80). In discussing Callahan's (1979) material scale, Luedtke (1992:80–81) notes,

> Strength peaks in the middle of the range rather than at either end. The most workable materials, at the low end of his scale, are relatively weak. They should be worked with softer billets or flakers, and they require special procedures to keep platforms from collapsing. Materials at the high end of Callahan's scale, the least workable, are also somewhat less strong and prone to hinge and step fractures. Presumably, fractures start easily in materials at this end of the scale but do not propagate all the way through the stone, as desired.
>
> Materials categorized as brittle in Callahan's scale are the most amenable to reduction. Materials classified as strong can be worked, but require more force to remove flakes than do brittle materials. Tough materials at the upper end of Callahan's scale generally cannot be efficiently worked because flakes struck from them often terminate in hinges or steps that make further flaking difficult to accomplish.

By combining classification systems, we can categorize materials defined as brittle and strong by Callahan (1979:16) as nondurable, and those defined as tough as durable materials. Nondurable materials

Table 17.5. Durability classifications for material categories.

MATERIAL CATEGORY	NONDURABLE		DURABLE
	BRITTLE	STRONG	TOUGH
Obsidian	all	–	–
Chert	heat-treated	not heat-treated, fine- and medium-grained	not heat-treated, coarse-grained
Basalt	–	–	all
Granite	–	–	all
Rhyolite	–	–	all
Aphanitic rhyolite	–	all	–
Limestone	–	–	all
Siltstone and mudstone	–	–	all
Sandstone	–	–	all
Quartzite	–	–	all
Quartz	–	–	all

are best suited to reduction because they can be efficiently flaked using a variety of methods. Durable materials are less well-suited to reduction because the techniques used to work them are more limited, and they cannot be flaked as efficiently. Table 17.5 illustrates the classification of material categories encountered in this analysis, with unknown materials dropped from consideration. We expect nondurable materials to have been used to make formal tools like projectile points and knives, where sharp edges and accurate, reliable flaking were needed to produce desired shapes and edge angles. Brittle materials were best suited to this purpose, while strong materials were less well-suited. Similarly, informal tools used for cutting and scraping should have been predominantly manufactured from nondurable materials because they produce the sharpest edges.

Few, if any, formal tools used for cutting or scraping are expected to have been made from durable materials. Most formal and informal tools used for pounding or chopping should have been made from durable materials because of their toughness. However, these are tendencies and not hard-and-fast rules. Depending on material availability and the task for which a tool was designed (rather than the task for which an archaeologist thinks a tool was designed), there will undoubtedly be some selection of durable materials when nondurable materials would logically be more desirable and vice versa.

Table 17.6 shows durability and toughness ratings for each site. Nearly 75 percent of the materials in the overall assemblage were classified as brittle or strong, and would have been suitable for formal-tool manufacture or use as informal cutting/scraping tools. Strong materials comprise nearly 69 percent of the overall assemblage, while brittle materials make up just under 6 percent. Tough materials are the second most common category, both overall and in every assemblage, and make up over a quarter of the composite assemblage, though they would have mostly been unsuited to the manufacture of formal tools that required careful shaping. The main parameter in material selection may have been suitability for tool manufacture and use, but this was obviously not the only factor taken into account.

Toughness ratings for each tool category are shown in Table 17.7. The distribution of the various classes of toughness is quite different from what it was in the composite assemblage. In considering the array of formal tools used for cutting, scraping, or piercing, 81.48 percent were made from brittle and strong materials, while only 18.52 percent were tough materials. This is a significant contrast with the distribution of these rating classes in the composite assemblage, and suggests a conscious selection of materials best suited to this purpose. Indeed, 24.69 percent of these tools were made from brittle materials, a percentage that is over four times higher than occurs for brittle materials in the composite assemblage. Not surprisingly, the only formal tools used for pounding were made from tough materials, which are best suited to that purpose. Brittle

Table 17.6. Durability and toughness ratings, by site; counts and row percentages.

SITE		NONDURABLE		DURABLE	TOTAL
		BRITTLE	STRONG	TOUGH	
LA 113042	Count	27	1119	392	**1538**
	Row %	1.8%	72.8%	25.5%	**15.1%**
LA 129214	Count	513	4925	1853	**7291**
	Row %	7.0%	67.6%	25.4%	**71.5%**
LA 129216	Count	5	34	13	**52**
	Row %	9.6%	65.4%	25.0%	**0.5%**
LA 129217	Count	28	253	66	**347**
	Row %	8.1%	72.9%	19.0%	**3.4%**
LA 129218	Count	2	116	21	**139**
	Row %	1.4%	83.5%	15.1%	**1.4%**
LA 129222	Count	22	304	81	**407**
	Row %	5.4%	74.7%	19.9%	**4.0%**
LA 129300	Count	12	283	135	**430**
	Row %	2.8%	65.8%	31.4%	**4.2%**
Total	**Count**	**609**	**7034**	**2561**	**10,204**
	Row %	**6.0%**	**68.9%**	**25.1%**	**100.0%**

and strong materials were also dominantly selected for informal-tool use, comprising 88.65 percent of those tools. Unfortunately, little dependence can be placed on these percentages because, as discussed earlier, most informal tools made from tough materials were probably not recognized during analysis.

The textural and durability analyses complement one another, and both point to a dominant selection of materials for reduction that were best suited to cutting, scraping, and piercing. A smaller, though still significant, percentage of the composite assemblage was comprised of tough materials best suited to pounding and chopping. LA129216 and LA 129217 contained much higher percentages of brittle materials—nearly 10 percent apiece—than were found in any of the other assemblages. While these higher percentages could be evidence for a greater focus on formal-tool manufacture, both of these assemblages are rather small. Thus, sample error was probably a factor in producing these comparatively high percentages.

Material Selection Viewed Through Core Assemblages

Further information on material selection parameters is available from the core assemblage. How cores were treated during reduction and the types of cortex remaining on them can provide information about material selection locations. Three core attributes are examined including cortex type, core morphology, and remaining size. As discussed earlier, cortex type is a clue to where materials were obtained. Core morphology can provide data on the intensity of reduction, especially when combined with information on cortical coverage. The remaining size of cores, particularly those that were intensively reduced and retain little or no cortex, can be used to augment other attributes and provide a fuller understanding of reduction in relation to material source.

The core morphologies used in this analysis represent a modeled sequence from least to greatest amount of material removed. Tested cobbles had a few flakes struck from them to assess their suitability for further reduction, and therefore should retain much of their cortical surfaces and have the largest average size. These are very early stage cores that were rejected for further reduction, and their presence at a site suggests that they were obtained nearby and their transport was inexpensive in terms of time and energy. Unidirectional cores are nodules that were considered suitable for further reduction, with flakes being struck from a single platform. When unidirectional cores are systematically reduced they eventually become pyramidal cores that resemble blade cores in form but not in how platforms were prepared and flakes were struck from them. Unidirectional cores should retain lesser cortex than tested cobbles and should be smaller,

Table 17.7. Toughness rating, by tool type; counts and row percentages.

TOOL TYPE		BRITTLE	STRONG	TOUGH	**TOTAL**	**% OF TOTAL**
Utilized debitage	Count	16	109	16	**141**	
	Row %	11.3%	77.3%	11.3%	**100.0%**	**60.3%**
Core tools	Count	–	4	5	**9**	
	Row %	–	44.4%	55.6%	**100.0%**	**3.8%**
Pounding tools	Count	–	–	3	**3**	
	Row %	–	–	100.0%	**100.0%**	**1.3%**
Drill	Count	–	2	–	**2**	
	Row %	–	100.0%	–	**100.0%**	**0.9%**
Graver	Count	–	–	1	**1**	
	Row %	–	–	100.0%	**100.0%**	**0.4%**
Combination tool	Count	–	1	–	**1**	
	Row %	–	100.0%	–	**100.0%**	**0.4%**
Spokeshave	Count	–	1	1	**2**	
	Row %	–	50.0%	50.0%	**100.0%**	**0.9%**
Scrapers	Count	1	4	–	**5**	
	Row %	20.0%	80.0%	–	**100.0%**	**2.1%**
Scraper-graver	Count	–	2	–	**2**	
	Row %	–	100.0%	–	**100.0%**	**0.9%**
Uniface	Count	2	5	2	**9**	
	Row %	22.2%	55.6%	22.2%	**100.0%**	**3.8%**
Biface	Count	3	10	4	**17**	
	Row %	17.6%	58.8%	23.5%	**100.0%**	**7.3%**
Tabular knives	Count	–	–	5	**5**	
	Row %	–	–	100.0%	**100.0%**	**2.1%**
Projectile point preform	Count	2	8	1	**11**	
	Row %	18.2%	72.7%	9.1%	**100.0%**	**4.7%**
Dart points	Count	6	6	1	**13**	
	Row %	46.2%	46.2%	7.7%	**100.0%**	**5.6%**
Arrow points	Count	6	7	–	**13**	
	Row %	46.2%	53.8%	–	**100.0%**	**5.6%**
Total	**Count**	**36**	**159**	**39**	**234**	
	Row %	**15.4%**	**67.9%**	**16.7%**	**100.0%**	**100.0%**

on the average. Bidirectional cores logically follow unidirectional cores in the sequence; they represent acceptable nodules that were reduced from two opposing platforms or along two surfaces from the same platform, and should retain lesser cortex and be smaller than unidirectional cores. Multidirectional cores were reduced from multiple platforms or from two non-opposed platforms, and should retain lesser cortex and have a smaller mean size than bidirectional cores. Bipolar cores are nodules/cores that were deliberately smashed in order to obtain usable debitage. High-quality materials available only in small nodules might be treated in this manner as the most effective way to obtain usable debitage. Exhausted cores of high-quality materials might be similarly smashed to produce debitage. The former might be represented by large amounts of cortex on a bipolar core, and the latter by its absence. Since this type of reduction rarely leaves a recognizable core behind, bipolar cores are uncommon. Andrefsky (1998:137) only recognizes two types of cores—unidirectional and multidirectional. Using Andrefsky's scheme, bidirectional cores would be reclassified as multidirectional and tested cobbles would be classified according to the number of platforms present. Presumably, bipolar cores would also be reclassified as multidirectional cores. While we will not follow Andrefsky's classificatory method in this discussion, the possibility that bidirectional cores might be more accurately subsumed under the multidirectional core category will be explored.

Cores were identified on six sites, and were absent from the parts of LA 129218 that were inves-

Table 17.8. Core morphology, by material type and site; counts and column percentages.

MATERIAL TYPE	CORE MORPHOLOGY		LA 113042	LA 129214	LA 129216	LA 129217	LA 129222	LA 129300	TOTAL
Chert	tested cobble	Count	3	9	–	–	1	1	**14**
		Col. %	21.4%	64.3%	–	–	7.1%	7.1%	**7.5%**
	unidirectional core	Count	13	32	1	1	3	5	**55**
		Col. %	23.6%	58.2%	1.8%	1.8%	5.5%	9.1%	**29.4%**
	bidirectional core	Count	1	2	–	–	1	–	**4**
		Col. %	25.0%	50.0%	–	–	25.0%	–	**2.1%**
	multidirectional core	Count	11	38	1	–	3	2	**55**
		Col. %	20.0%	69.1%	1.8%	–	5.5%	3.6%	**29.4%**
	bipolar core	Count	–	1	–	–	–	–	**1**
		Col. %	–	100.0%	–	–	–	–	**0.5%**
Rhyolite	tested cobble	Count	–	1	–	–	–	–	**1**
		Col. %	–	100.0%	–	–	–	–	**0.5%**
	unidirectional core	Count	1	–	–	–	–	–	**1**
		Col. %	100.0%	–	–	–	–	–	**0.5%**
Limestone	unidirectional core	Count	–	2	–	–	–	–	**2**
		Col. %	–	100.0%	–	–	–	–	**1.1%**
	bidirectional core	Count	–	1	–	–	–	–	**1**
		Col. %	–	100.0%	–	–	–	–	**0.5%**
	multidirectional core	Count	1	4	–	–	–	–	**5**
		Col. %	20.0%	80.0%	–	–	–	–	**2.7%**
Meta-quartzite	tested cobble	Count	–	6	–	–	–	–	**6**
		Col. %	–	100.0%	–	–	–	–	**3.2%**
	unidirectional core	Count	4	7	–	–	2	–	**13**
		Col. %	30.8%	53.9%	–	–	15.4%	–	**7.0%**
	bidirectional core	Count	1	4	–	–	–	–	**5**
		Col. %	20.0%	80.0%	–	–	–	–	**2.7%**
	multidirectional core	Count	2	14	–	–	1	–	**17**
		Col. %	11.8%	82.4%	–	–	5.9%	–	**9.1%**
	bipolar core	Count	–	1	–	–	–	–	**1**
		Col. %	–	100.0%	–	–	–	–	**0.5%**
Ortho-quartzite	bidirectional core	Count	1	1	–	–	–	–	**2**
		Col. %	50.0%	50.0%	–	–	–	–	**1.1%**
	multidirectional core	Count	2	1	–	–	1	–	**4**
		Col. %	50.0%	25.0%	–	–	25.0%	–	**2.1%**
Total		**Count**	**40**	**124**	**2**	**1**	**12**	**8**	**187**
		Row %	**21.4%**	**66.3%**	**1.1%**	**0.5%**	**6.4%**	**4.3%**	**100.0%**

tigated. Table 17.8 shows the distribution of core morphologies by material category for the sites on which they occurred. Five general material categories are represented, as are five basic core morphologies, with no pyramidal cores being found. Overall, multidirectional cores were most common (43.32 percent), followed by unidirectional cores (37.97 percent), tested cobbles (11.23 percent), bidirectional cores (6.42 percent), and bipolar cores (1.07 percent). Unidirectional reduction is usually the most efficient way in which to remove flakes from cores (Whittaker 1994:113). This accounts for why unidirectional cores were common, dominating in three assemblages and tied for the most common type in two others. However, flaws are often encountered as flakes are removed, or errors are made in reduction. As a result, cores often become more amorphous, or multidirectional, in shape (Whittaker 1994:113). Overall, multidirectional cores were the most common type, but dominated in only one assemblage, while tying for the most common type in two others. Tested cobbles seem more common than they should be, and bidirectional cores are less common than might be expected. Since the ability to reduce cores from two opposing platforms rather than two non-opposing platforms is probably determined by nodule shape rather than the flintknapper's preference, it may be that cores

Table 17.9. Information on core size and cortical coverage.

CORE MORPHOLOGY	NO. OF SPECIMENS	MEAN DORSAL CORTEX	MEAN WEIGHT (G)	ADJUSTED MEAN WEIGHT (G)
Tested cobble	21	67.6%	118.75	47.62
Unidirectional core	71	39.6%	54.87	46.27
Bidirectional core	12	31.7%	82.29	65.94
Multidirectional core	81	26.2%	65.61	58.03
Bipolar core	2	55.0%	16.90	n/a

were only reduced in this manner when the shape of the original nodule permitted. As expected, bipolar cores were very rare, since this type of reduction only occasionally produces a recognizable core rather than shatter.

Whittaker's (1994:113,115) discussion of the difficulties involved with reducing rounded cobbles is relevant to this analysis, considering that the likely source for most of these materials was gravel beds rather than outcrops. Since the removal of flakes from a nodule requires a platform measuring 90 degrees or less, striking the first flake from a rounded core presents a problem. Whittaker (1994:115) discusses two techniques for accomplishing this: bipolar reduction and the split-cone technique. Without going into detail, the paucity of bipolar cores and associated debitage suggests that rounded cores were mostly reduced using the split-cone technique to remove an initial flake and produce a usable platform. When flakes are struck from rounded nodules in this way, the core is first reduced unidirectionally. As reduction continues, later flakes are removed opportunistically as suitable platforms are created elsewhere on the core by prior removals. This tends to result in multidirectional rather than bidirectional cores. Bidirectional reduction is probably more likely when a nodule is blocky or parabolic in shape. The predominance of rounded nodules obtained from gravel beds tends to predict the higher percentages of unidirectional and multidirectional cores in the composite assemblage. If bidirectional cores are subsumed into the multidirectional category, as is done by both Whittaker (1994) and Andrefsky (1998), multidirectional cores dominate in three assemblages while unidirectional cores dominate in two, and these categories are tied in the last assemblage.

Information on mean core size and cortical coverage is shown in Table 17.9. The distribution of remaining cortical coverage fits the expectations for the reduction model. As might be expected, tested cobbles retain the largest percentage of cortical coverage, with less than a third of the cortex removed from them, on average. Again as expected, the smallest average amount of cortex occurs on the multidirectional cores. The unidirectional and bidirectional categories fall between these two extremes, just where expected. However, when mean weight is taken into consideration, only the tested cobbles fit the reduction model. Examination of individual core weights for each category shows that there are one or two specimens in each group except for the bipolar cores with apparently anomalously high weights. These specimens were dropped from consideration, and the resulting adjusted mean weights are shown in Table 17.9. The greatest difference that results from this exercise is a sizeable reduction in the mean weight of tested cobbles. The general relationship of the other three categories to one another was not affected. Mean weights should decline throughout reduction, with tested cobbles weighing the most and multidirectional cores the least if the model is correct and bipolar cores are not considered. Since this is not the case, the distribution of mean weights does not support the proposed reduction sequence model, as mean cortex percentages did. This suggests that the core reduction sequence is not quite as simple as the model proposes and is also affected by other factors.

The distribution of mean cortex percentages suggests that the model is correct insofar as it proposes that tested cobbles underwent the least amount of reduction, followed in order by unidirectional, bidirectional, and multidirectional cores. However, rather than simply being determined by a set sequence of forms resulting from amount of reduction, core morphology was also influenced by original nodule size and perhaps shape. With the

Table 17.10. Mean cortical coverage and weight, by material type, for all core classes.

MATERIAL TYPE		TESTED COBBLE	UNIDIRECTIONAL	BIDIRECTIONAL	MULTI-DIRECTIONAL	BIPOLAR	ALL CORES
Chert	n	14	55	4	55	1	129
	cortex	66.43%	39.64%	27.50%	28.18%	70.00%	37.52%
	weight (g)	94.65	49.90	74.28	54.58	18.30	57.26
Rhyolite	n	1	1	–	–	–	2
	cortex	90.00%	10.00%	–	–	–	50.00%
	weight (g)	903.00	52.00	–	–	–	477.50
Limestone	n	–	2	1	5	–	8
	cortex	–	20.00%	0.00%	20.00%	–	17.50%
	weight (g)	–	–	32.00	216.46	–	147.29
Metaquartzite	n	6	13	5	17	1	42
	cortex	66.67%	44.62%	48.00%	25.29%	40.00%	40.24%
	weight (g)	44.28	68.83	92.68	60.61	15.50	63.57
Orthoquartzite	n	–	–	2	4	–	6
	cortex	–	–	15.00%	10.00%	–	11.67%
	weight (g)	–	–	97.50	50.05	–	65.87

two largest specimens removed from consideration, the tested cobbles appear to have mostly been fairly small nodules that had a few flakes removed from them and were then discarded because they were too small for further reduction or flaws were encountered. Most unidirectional cores appear to represent fairly small nodules that were reduced from a single platform until too small for further efficient reduction. Bidirectional cores, in contrast, represent comparatively large nodules that were reduced to a somewhat greater extent than were the unidirectional cores. Most of the multidirectional cores also appear to have originally been fairly sizeable nodules that were ultimately abandoned while they were still larger than the average unidirectional core. Thus, while core morphology is related to the extent of reduction as measured by the amount of remaining cortex, original nodule size was also an important factor in determining core morphology. However, other characteristics might also be determining factors in core morphology and original nodule size. In particular, material type could be an important determinant.

Table 17.10 shows average cortical coverage and weights by material category for all core classes. More than two-thirds of the cores were made from cherts (68.98 percent), with metaquartzite comprising another 22.46 percent. For both of these material categories, the bidirectional cores do not fit the proposed reduction sequence model. Bidirectional chert cores retain slightly less cortical surface than do the multidirectional chert cores, and are the second heaviest, on average. For the metaquartzites, the bidirectional cores retain more cortex than the unidirectional cores, and they have the largest mean weight. This suggests that the apparently anomalous positioning of the bidirectional core category in the composite assemblage vis-a-vis the proposed reduction sequence model is not the result of material choice. Instead, and once again, original nodule size and perhaps shape appear to have been the most important factors in determining final core morphology.

When the bidirectional and multidirectional core categories are combined, better sense can be made of these data without needing to eliminate apparently anomalous specimens. Data for the tested cobbles and unidirectional cobbles remain the same, with average cortical coverage of 67.61 percent and 39.57 percent, respectivelyand average weights of 118.76 g and 54.87 g, respectively. Multidirectional cores now retain an average of 26.88 percent cortical coverage and have a mean weight of 67.76 g. This suggests that, as expected (and discussed earlier), tested cobbles were discarded after the least amount of reduction and while retaining the highest average weight. While unidirectional cores exhibited, on the average, greater cortical coverage than the multidirectional cores, they are also smaller, on average, than the multidirectional cores. This suggests that nodules that were reduced unidirectionally were initially smaller than were those that were reduced in a multidirectional fashion. Because of that smaller initial size, fewer suitable alternate platforms appear to have been created during the reduction, so unidirectional cores were discarded while they still retained more cortex, on average, than did the multidirectional cores. Since the multidirectional cores began their use-life as larger nodules than the unidirectional cores, alternate surfaces suitable for use as striking platforms were created and exploited during reduction. Specimens that were initially recorded as bidirectional cores during analysis essentially represent early stage multidirectional cores that were discarded before more than two platforms were used for flake removal. The reason for discard can only be speculated on, but might have occurred when flaws were encountered or when available platforms were ruined through stepping or hinging.

Considering remaining cortical coverage and mean weight by material category in Table 17.10, it appears that material type may have been related to original nodule size in many cases. Overall, rhyolite and limestone nodules were much larger than were those of chert and the quartzites. Orthoquartzite cores have larger mean weights than do the metaquartzites and cherts, yet were reduced to a much greater extent. This suggests that orthoquartzite nodules also tended to be larger than those of chert or metaquartzite. Nodules of the latter two materials may have been similar in size, perhaps with metaquartzite nodules being a bit larger.

All of the materials from which these cores were made were available in gravel beds, especially related to the modern and Pleistocene courses of the Pecos River. Cortex was noted on 87.70 percent of the core assemblage, and was waterworn in every case except two, confirming that most of the materials used at these sites were obtained from gravel beds. The exceptions were two limestone cores, one with non-waterworn cortex and one with indeterminate cortex. The occurrence of non-waterworn cortex on one core indicates that at least some limestone was obtained as nodules from local outcrops. Only one core made from a potentially exotic material was identified. This was a unidirectional core made from probable Pedernal chert that was found at LA 129214. In general, though, debitage of exotic materials were probably struck from curated bifaces or cores that were carried to and away from these sites. Because a number of tested cobbles occur, the source area for most of the materials used on these sites may not have been considered too great a distance over which to transport nodules that might have to be rejected soon after reduction began. The presence of fairly substantial retained cortical coverage on many of the other cores supports this possibility—the flintknappers did not feel it necessary to remove all waste material from core surfaces before transporting them to these sites.

The presence of still usable cores in most assemblages also suggests that site occupants did not anticipate a lack of suitable materials for reduction at the next location to which they planned to move. Had this been the case, we would have expected to recover only exhausted cores—those with no further potential for flake removal. While this was probably the case for some of the cores in the composite assemblage, the potential of many others was certainly not exhausted.

Analysis of the cores corroborates some of the conclusions made when examining material selection parameters for the entire assemblage. Gravel beds represent the main source for materials used at these sites, with rounded cobbles mainly being reduced. Several flakes were often removed from nodules to test them, and since several tested cobbles were found, the transport of nodules that might not be suitable for continued reduction was apparently not a problem. Reduction initially produced unidirectional cores—the most efficient form. As reduction proceeded, many cores assumed a multidirectional morphology as flaws were encountered or better platforms were created as part of the flake removal process. Bidirectional cores might be better viewed as simply a sub-variety of the multidirectional form, abandoned before more than two opposing platforms could be used for flake removal. Neither material acquisition nor core reduction was as efficient as possible, and quite a bit of waste was tolerated. This tentatively suggests that these sites were occupied by people who were either mostly sedentary or who did not move their residential sites very often during the year.

Reduction Strategies

Two basic reduction strategies have been defined for the post-Paleoindian occupation of the Southwest: curated and expedient. Curated reduction can also be termed efficient, because it entailed the manufacture of tools in anticipation of use. In contrast, expedient reduction involved the production of tools as needed. An efficient strategy was usually associated with the manufacture of large bifaces that could be used to fulfill a variety of needs. Kelly (1988:731) defines three types of bifaces: those used as cores as well as tools, long use-life tools that could be re-sharpened, and those that were made to replace parts of existing composite tools. The last category can also be referred to as specialized bifaces, and are tools that were made for a very limited set of purposes. Bifaces with multiple functions and those with long use-lives were mostly associated with mobile lifestyles where efficiency was critical, though these associations were certainly not exclusive. Mobile peoples also used specialized bifaces while sedentary peoples made some general purpose bifaces. The difference is more a matter of degree—there was less focus on specialized bifaces by mobile peoples and less focus on general purpose bifaces by sedentary peoples. Thus, the number of bifaces or amount of evidence for biface manufacture in an assemblage are not necessarily indicative of reduction strategy and lifestyle; rather, it is the types of bifaces that were made and used and the types of debris discarded during their manufacture that provide clues to these aspects of prehistoric life.

The first two categories of bifaces defined by Kelly (1988) were necessarily large in size. Bifaces that functioned as cores, general purpose tools, and blanks for the replacement of broken or lost tools had to be large to be useful. Similarly, bifaces made with long use lives in mind had to be large enough to allow them to be re-sharpened when necessary. In contrast, specialized bifaces needed to be no larger than required by the task at hand. Projectile points provide a good comparison between these categories. In an efficient tool kit, broken projectile points can be replaced using blanks that also served as cores and general purpose tools. Large projectile points could be used as knives, since they possess fairly long edges and were usually set into detachable foreshafts. These points could often be reworked into a new form when broken, so they also served as tools with long use-lives.

Small projectile points are evidence of a different focus. They were not as useful as cutting tools because their edges are short and would be awkward and inefficient to use, even when set into foreshafts. The thinness of these tools and the point of weakness formed by notching often caused them to break during use, and because of their small size and the location of most breaks they usually could not be re-sharpened. Small projectile points were mostly limited to a single function, and often could only be used once before being broken and discarded. Other small bifaces, like drills, also tended to serve a single purpose. These are specialized tool types that often had short use-lives. Thus, we differentiate between the manufacture of large and small bifaces in this analysis, because they may be indicative of different lifestyle focuses.

Efficient and Expedient Debitage Assemblages Modeled

Several attributes can be used to assess assemblages and determine whether they reflect an efficient or expedient reduction strategy, or a combination of both. Unfortunately, no single indicator can provide this information, so a range of attributes that examine such characteristics as cortical coverage, platform shape and modifications, and flake breakage patterns is needed. Assemblages that reflect a predominantly expedient reduction strategy should contain much lower percentages of non-cortical debitage than those in which a predominantly efficient strategy was employed.

Cortex is usually brittle and chalky and does not flake with the ease or predictability of un-weathered material. This can cause problems during tool manufacture, so cortex was usually removed early in the reduction process. The manufacture of large bifaces is rather wasteful, and quite a few flakes must be removed before a tool of the proper size and shape is created. These flakes are carefully struck, and are generally smaller and thinner than most flakes removed from cores. As large bifaces are manufactured, many flakes lacking cortical surfaces are removed and the proportion of non-cortical debitage increases. The removal of cortex is not as high a priority in expedient reduction, and this strategy tends to produce more debitage with cortical surfaces.

The presence of flakes struck from bifaces is usually good evidence that tools were made at a site, though it is rarely possible to define the absolute number or types of bifaces made there based on characteristics of biface flakes alone. A polythetic set of attributes was used to distinguish biface flakes from core-flakes in this analysis, as discussed earlier. Flakes fulfilling at least 70 percent of

Table 17.11. Comparison of biface flake length data from several New Mexican sites.

SITE OR PROJECT DESIGNATION	OCCUPATIONAL PERIOD	MEAN LENGTH (MM)	RANGE (MM)	PERCENT <15 MM LONG	PERCENT >15 MM LONG
LA 65006	Archaic	17.86	3–52	43.62%	56.38%
LA 111333	Archaic	12.52	3–43	72.77%	27.23%
Luna Project	Archaic	15.81	2–65	50.68%	49.32%
Pojoaque Corridor	Late Developmental	8.76	3–33	95.06%	4.94%
LA 1051	Coalition - Classic	6.97	3–19	98.39%	1.61%
LA 76138	Early Spanish Colonial	7.88	3–51	90.00%	10.00%

the attributes in the polythetic set were classified as biface flakes, while those that did not were considered core-flakes. This method permitted recognition of definite biface flakes, though it may have missed flakes struck early in the tool-manufacturing process. Large percentages of biface flakes in an assemblage suggest that tool production was an important activity. When those flakes are long, large bifaces were probably made or used, and this suggests an efficient reduction strategy. Though a lack of these characteristics is not definite proof of an expedient strategy, it does suggest that reduction was not focused on tool making.

Biface flake length can be indicative of the size of the tool being made, and lengths of 15 mm or more suggest that large bifaces were being manufactured. However, when only small biface flakes occur, the reverse is not necessarily true. While the presence of small biface flakes may indicate that small specialized bifaces were made, the possibility that they represent debris produced by flaking and retouching large biface edges must also be considered. This tendency can be demonstrated using data from several sites in New Mexico, as shown in Table 17.11. The data used in this analysis were collected from Archaic components near San Ildefonso (LA 65006), near Santa Fe (LA 111333), and in the Luna/Reserve area of southwestern New Mexico. Pueblo components include several from late Developmental period sites near Santa Fe, a large Pueblo in Santa Fe (LA 1051), and a farmstead near Pecos Pueblo (LA 76138). As Table 17.11 shows, biface flakes from Archaic components have significantly longer mean lengths than do those from Pueblo sites. Overall, the range of biface flake lengths is greater for Archaic sites than for Pueblo sites, though large bifaces were obviously also manufactured at the latter. Perhaps most telling is the percentage of biface flakes that are shorter or longer than 15 mm. The Pueblo components contained comparatively few biface flakes that were longer than 15 mm, while the Archaic components contained a much larger percentage of longer biface flakes, and a much small smaller percentage of biface flakes shorter than 15 mm. This analysis confirms that it is not the length of individual bifaces that is indicative of reduction strategy, but the overall focus of biface manufacture as demonstrated for an assemblage as a whole. That focus was on the manufacture of comparatively large bifaces in the Archaic components shown in Table 17.11, while the focus for the Pueblo sites was on the manufacture of small bifaces.

While platform modification is used by the polythetic set to help assign flakes to core or biface categories, it can also be used as an independent indicator of reduction strategy. This is because the polythetic set only identifies ideal examples of biface flakes. Many flakes produced during initial tool shaping and thinning are difficult to distinguish from core-flakes. However, even at this stage of manufacture, platforms were often modified to facilitate removal. While core platforms were also modified on occasion, this was not commonly done because the same degree of control over flake size and shape were unnecessary unless cores were being systematically reduced. Since this rarely occurred in the Southwest, a large percentage of modified platforms in an assemblage is indicative of tool manufacture, while the opposite is evidence for core reduction. Damage associated with platform preparation also tends to occur in different locations in core reduction versus tool manufacture. Most core platform preparation involves the removal of overhangs and other weak points from the surface being reduced. This can leave scars on the dorsal surface of a core-flake below its juncture with the platform. A different type of modification is usually used in tool manufacture that involves grinding and can leave scars across the platform itself. Though grinding could be used to modify platforms during both reduction stages, it was more often used during tool manufacture. When there are a high percentage of modified platforms but few definite biface flakes, an early stage of tool manufacture may be indicated.

Since tool manufacture is usually more controlled than core reduction, fewer pieces of recoverable angular debris are produced. This suggests that a high ratio of flakes to angular debris indicates tool manufacture, while a low ratio implies core reduction. Unfortunately, this is rather simplistic, because the production of angular debris also depends on the type of material being worked, the reduction technique used, and the amount of force applied. Brittle materials shatter more easily than do elastic materials, and hard hammer percussion tends to produce more recoverable pieces of angular debris than does soft hammer percussion. The use of excessive force can also cause materials to shatter. In general, though, as reduction proceeds, the ratio of flakes to angular debris should increase, and late stage core reduction as well as tool manufacture should produce high ratios of flakes to angular debris.

Flake breakage patterns are also indicative of reduction strategy. Experimental data suggest there are differences in fracture patterns between flakes struck from cores and tools (Moore 2003b). Though reduction techniques are more controlled during tool manufacture, flake breakage increases because debitage gets thinner as reduction proceeds. Thus, there should be more broken flakes in an assemblage in which tools were made than in one that simply reflects core reduction. However, trampling, erosional movement, and other post-reduction impacts can also cause breakage and must be taken into account.

Flake breakage can also be caused by secondary compression, in which outward bending can cause flakes to snap (Sollberger 1986). Characteristics of the broken ends of flake fragments can be used to determine whether breakage was caused by this sort of bending. When a step or hinge fracture occurs at the proximal end of distal or medial fragments, they are classified as manufacturing breaks. Characteristics diagnostic of manufacturing breaks on proximal fragments include "pieces à languette" (Sollberger 1986:102), negative hinge scars, positive hinges curving up into small negative step fractures on the ventral surface, and step fractures on dorsal rather than ventral surfaces. Breakage by processes other than secondary compression results in snap fractures. This pattern is common on flakes broken by trampling or erosion, but can also occur during reduction. Core reduction tends to create a high percentage of snap fractures, while biface reduction creates a high percentage of manufacturing breaks. Since snap fractures can also indicate post-reduction damage, this may be the weakest of the attributes used to examine reduction strategy.

The presence of platform lipping is indicative of reduction technology, and is marginally related to strategy. Platform lipping usually occurs during pressure flaking or soft hammer percussion, though it can sometimes occur on flakes removed by hard hammers (Crabtree 1972). The former techniques were usually employed during tool manufacture, so a high percentage of lipped platforms can often suggest a focus on tool making rather than core reduction. While soft hammer percussion can also be used in core reduction, most of the materials in our assemblages are very tough and were probably more efficiently reduced using hard hammers.

The pattern of scars left on the dorsal surface of a flake by earlier removals can also help define reduction strategy. Since biface reduction removes flakes from opposite edges, some scars originate beyond the distal end of a flake and run toward its proximal end. These are opposing scars and indicate reduction from opposite edges. Opposing dorsal scars are indicative of biface manufacture, but can also occur when cores were reduced bi-directionally (Laumbach 1980:858). Thus, this attribute is not directly indicative of tool production, but can help in defining the reduction strategy used.

The ratio of flakes to cores is another potential indicator of reduction strategy. As the amount of tool manufacture increases, so does the ratio between flakes and cores. The opposite should be true of assemblages in which expedient core reduction dominated; in that case the ratio between flakes and cores should be relatively low. A potential problem, of course, is that cores were often carried to another location if still usable, while debris from their reduction was left behind. This would inflate the ratio and suggest that tool manufacture rather than core reduction occurred. The systematic reduction of cores can also produce high flake to core ratios.

While none of these attributes are accurate independent indicators of reduction strategy, when they are combined they should allow us to fairly accurately determine how materials were reduced at a site. A primarily efficient debitage assemblage should contain high percentages of non-cortical debitage, biface flakes, modified platforms, manufacturing breaks, lipped platforms, and flakes with opposing dorsal scars, and should have high flake to angular debris and flake to core ratios. Primarily expedient debitage assemblages should contain lower percentages of non-cortical debitage and low percentages of biface flakes, modified platforms, manufacturing breaks, lipped platforms, and flakes with opposing dorsal scars. They should also have low flake to angular debris and flake to core ratios.

Dorsal Cortex

While cortex type has been used to examine material procurement patterns, the distribution of cortical surfaces in assemblages can also be used to examine reduction strategy. Several approaches can be used to examine cortical ratios, each providing a slightly different piece of the puzzle. In this discussion we only consider debitage that is divided into two categories: flakes and angular debris. These ratios are shown in Table 17.12. Two assemblages have ratios that seem anomalously high or low. At 5.71:1, the non-cortical to cortical debitage ratio for LA 129217 is somewhat higher than it is for any of the other assemblages, and suggests the reduction of cores that had already had much of their cortical surfaces removed. Conversely, at 1.08:1, the ratio for LA 129216 seems much smaller, and suggests that mainly early stage core reduction occurred. However, in the latter case, the anomaly could also be due to sample error, since LA 129216 yielded the smallest assemblage of the sites in our sample. While the size of the assemblage from LA 129217 is also at the lower end of the distribution, it is still fairly sizeable. Thus, the larger ratio of non-cortical to cortical debitage for at least LA 129217 may indicate that materials were treated differently there than at the other sites.

When cortical coverage on flakes is compared with that on angular debris, the ratio is lower for the flakes in one case and higher in six. The greatest disparity occurs in the LA 129216 and LA 129217 assemblages and proportionally is much greater for the former, adding credence to the probability that this attribute was affected by sample error at that site. The case in which the non-cortical to cortical ratio is higher for angular debris (LA 113042) indicates that more unidentifiable shatter of recoverable size was produced at that site during the later stages of core reduction after the cortical surface was mostly removed from nodules. In the other five cases (LA 129216 excluded), these ratios suggest that more angular debris was produced during initial core reduction as nodule exteriors were being removed. In part, this may be because more cracks caused by mechanical transport occur near the outer surface of nodules, and are therefore more likely to be encountered during decortication. The higher ratio for flakes in these assemblages could be indicative of later stage core reduction, in which most of the cortical surface was previously removed. However, they might also simply indicate that less shattering occurred after the exterior zone containing mechanically caused cracks was removed.

Table 17.12. Noncortical-to-cortical rations, by debitage type, for each site.

SITE	NONCORTICAL:CORTICAL		
	ALL DEBITAGE	FLAKES	ANGULAR DEBRIS
LA 113042	2.23:1	2.13:1	2.51:1
LA 129214	3.27:1	3.29:1	3.23:1
LA 129216	1.08:1	1.47:1	0.44:1
LA 129217	5.71:1	6.12:1	4.94:1
LA 129218	3.48:1	4.28:1	2.38:1
LA 129222	2.79:1	3.05:1	2.45:1
LA 129300	1.65:1	1.68:1	1.61:1

Flakes can be divided into groups that are determined by percentages of cortex remaining on their dorsal surfaces. Traditionally, these classes are termed primary, secondary, and tertiary. Primary flakes have 50 percent or more of their dorsal surfaces covered by cortex, secondary flakes are those with less than 50 percent dorsal cortex, and tertiary flakes exhibit no dorsal cortex. Primary flakes mostly result from removal of the cortical surface during initial core reduction, secondary flakes were removed as the core was further reduced, and tertiary flakes are often considered debris from tool manufacture.

Unfortunately, these classifications are overly simplistic and erroneous in some assumptions. For instance, a lack of dorsal cortex is not necessarily indicative of tool manufacture, since flakes removed from a core that has been significantly reduced will usually lack cortex. Similarly, this scheme assumes that cores are decorticated before flakes are struck for use or shaping into formal tools and this is also an incorrect assumption. However, stripped of their traditional meanings, these classes remain a useful way to examine flake assemblages. Varying percentages for these classes can be used to examine the condition of objective pieces when they arrived at a site and can provide information on reduction strategies.

Table 17.13 shows the distribution of dorsal cortex percentage classes for all seven sites. Comparatively large percentages of primary flakes occur in three assemblages including LA 113042, LA 129216, and LA 129300. Indeed, the largest percentage of primary flakes occurs in the small assemblage from LA 129216, which also had the lowest non-cortical to cortical debitage ratio as well as the greatest disparity in this ratio between flakes and angular debris. All three of these attributes could suggest that more initial core reduction occurred at LA 129216 than at the other sites, provided sample error is not responsible for this distribution. In contrast, LA 129217 had the smallest percentage of primary flakes and the highest non-cortical to cortical debitage ratio.

These attributes suggest that the later stages of core reduction dominated there, with cores arriving at LA 129217 in an already reduced condition. The remaining assemblages have moderate percentages of primary flakes that fall between these extremes. The later stages of core reduction also appear to have prevailed at LA 129218 and, to a lesser extent, at LA 129214 and LA 129222. Early stage core reduction was more common at LA 113042 and LA 129300.

Table 17.14 contrasts non-cortical to cortical debitage ratios for debitage from exotic and local materials by site. Unfortunately, no ratios could be derived for three sites because one lacked exotic materials (LA 129216) and two had no cortical exotic debitage (LA 129218 and LA 129222). Noncritical to cortical debitage ratios for local materials were a bit smaller than the overall ratios for each site that contained exotic materials except for LA 129214, when the exotics are considered separately.

However, these declines were not significant and change none of our original conclusions. For the sites that contained both cortical and non-cortical exotic debitage, the ratios for those materials are larger to considerably larger than are those for local materials.

When values for the composite assemblage are examined, the non-cortical to cortical ratio for exotic materials is well over twice as large as that for local materials. This indicates that the objective pieces from which the exotic debitage were removed were different from those used to produce debitage from local materials, probably arriving on site as heavily reduced cores or finished tools.

Table 17.15 contrasts reduction-stage distributions for flakes of local versus exotic materials. Reduction-stage distributions for local materials are very similar to those of the overall assemblages. This is not surprising, given that exotics comprise only very small percentages of most assemblages. The biggest change was in the distributions for LA 129218, and does not alter our original conclusions about reduction for that site.

For the assemblages that contain exotic mate-

Table 17.13. Dorsal cortex coverage on flakes, by site.

SITE	TERTIARY	SECONDARY	PRIMARY
	0%	1–49%	50–100%
LA 113042	68.1%	15.4%	16.6%
LA 129214	76.7%	11.7%	11.7%
LA 129216	59.5%	18.9%	21.6%
LA 129217	86.0%	7.7%	6.4%
LA 129218	81.1%	9.5%	9.5%
LA 129222	75.3%	13.6%	11.1%
LA 129300	62.6%	20.3%	17.1%

Table 17.14. Noncortical-to-cortical ratios for debitage, by site.

SITE	EXOTIC MATERIALS		LOCAL MATERIALS	
	NO. OF SPECIMENS	RATIO	NO. OF SPECIMENS	RATIO
LA 113042	20	19.00:1	1468	2.20:1
LA 129214	38	3.75:1	7078	3.27:1
LA 129216	0	n/a	50	1.08:1
LA 129217	16	15.00:1	326	5.52:1
LA 129218	11	n/a	128	3.13:1
LA 129222	7	n/a	380	2.73:1
LA 129300	6	5.00:1	408	1.63:1
Total	**98**	**7.91:1**	**9838**	**2.97:1**

Table 17.15. Percentages of flakes in each reductions stage, by site.

SITE	LOCAL MATERIALS			EXOTIC MATERIALS		
	TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%	TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%
LA 113042	67.55%	15.69%	16.76%	94.74%	–	5.26%
LA 129214	76.60%	11.70%	11.70%	90.32%	6.45%	3.23%
LA 129216	59.46%	18.92%	21.62%	–	–	–
LA 129217	85.45%	7.73%	6.82%	93.33%	6.67%	–
LA 129218	79.07%	10.47%	10.47%	100.00%	–	–
LA 129222	74.67%	13.97%	11.35%	100.00%	–	–
LA 129300	62.32%	20.29%	17.39%	80.00%	20.00%	–
Total	**74.85%**	**12.60%**	**12.55%**	**92.94%**	**4.71%**	**2.35%**

rials, the contrast between reduction-stage distributions for local versus exotic materials is striking. Primary flakes of exotic materials occur in small percentages in only three assemblages. All six exotic assemblages are dominated by tertiary flakes that comprise over 90 percent of five of these assemblages and 80 percent of the last. When values for the composite assemblages are compared, the contrast is even more striking. Well over 92 percent of the exotic flakes were struck from completely decorticated surfaces, compared with only about 75 percent for the local materials. Very few exotic flakes—just over 7 percent—were struck from surfaces that retained some cortex, contrasting with about 25 percent of flakes of local materials. This supports the contention made earlier that exotic debitage were removed from objective pieces that were much more heavily reduced than were the objective pieces from which local flakes were struck.

Are these differences indicative of the degree of decortication before transport to a site or are they evidence of the intensity of reduction? The answer to this is probably both—nonlocal materials are often obtained because they are more desirable for reduction than most local materials, thus they tend to be reduced to a higher degree. Much of the cortical surface was probably removed before transport because cortex is waste material and rocks are heavy to carry. This can be partly tested by examining mean weights for cortical classes by material source for the local and nonlocal material categories, which is shown in Table 17.16.

For all flakes in these categories, primary flakes had the highest average weight, secondary flakes the second highest and tertiary flakes the lowest. This is the distribution that would logically be expected. However, there were large differences in weights for flakes of nonlocal materials versus local materials. Nonlocal secondary and tertiary flakes were 46 to 66 percent the size of their local counterparts, while primary nonlocal flakes were over twice the size of local primary flakes. The disparity in mean primary flake sizes was probably due to the small number of specimens for which weight was available in this category for the nonlocal materials (n = 2), and for that reason may not be an important distinction. For secondary and tertiary flakes, the disparity is probably indicative of less cortex remaining on nonlocal objective pieces when they arrived at these sites, and smaller objective pieces in comparison with those that were reduced from local materials.

Table 17.16. Mean flake weights for dorsal cortex categories, by probable material source, for the composite assemblage; weight in grams.

MATERIAL SOURCE	TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%
Local	1.10	4.40	4.66
Nonlocal	0.72	2.00	9.50

Flake Type as an Indication of Reduction Strategy

Flakes were typologically categorized during analysis, with type designation based on a series of analytic observations using the polythetic set discussed earlier to distinguish between biface and core-flakes. This was not a perfect system, because many flakes removed during the early stages of tool manufacture might not fit the polythetic set and would therefore be erroneously classified as core-

Table 17.17. Flake types for each site; counts and row percentages.

SITE		CORE FLAKE	BIFACE FLAKE	RESHARPENING FLAKE	NOTCHING FLAKE	BIPOLAR FLAKE	**TOTAL**	**% OF TOTAL**
LA 113042	Count	1031	4	–	3	–	**1038**	**14.9%**
	Row %	99.3%	0.4%	–	0.3%	–	**100.0%**	**0.0%**
LA 129214	Count	4703	326	1	21	7	**5058**	**72.5%**
	Row %	93.0%	6.4%	0.0%	0.4%	0.1%	**100.0%**	**0.0%**
LA 129216	Count	35	1	–	–	–	**36**	**0.5%**
	Row %	97.2%	2.8%	–	–	–	**100.0%**	**0.0%**
LA 129217	Count	221	14	–	–	–	**235**	**3.4%**
	Row %	94.0%	6.0%	–	–	–	**100.0%**	**0.0%**
LA 129218	Count	93		–	–	–	**93**	**1.3%**
	Row %	100.0%	0.0%	–	–	–	**100.0%**	**0.0%**
LA 129222	Count	233	2	–	–	–	**235**	**3.4%**
	Row %	99.1%	0.9%	–	–	–	**100.0%**	**0.0%**
LA 129300	Count	276	3	–	–	–	**279**	**4.0%**
	Row %	98.9%	1.1%	–	–	–	**100.0%**	**0.0%**
Total	**Count**	**6592**	**350**	**1**	**24**	**7**	**6974**	**100.0%**
	Row %	**94.5%**	**5.0%**	**0.0%**	**0.3%**	**0.1%**	**100.0%**	

flakes. This can be partly rectified by examining flake platforms for evidence of alteration through grinding that is usually (but not always) associated with tool manufacture. However, this can only be done for the full analysis sample.w

Besides core and biface flakes, several other flake types were identified including bipolar flakes, notching flakes, hammerstone flakes, and pot lids, definitions for which were presented earlier. Bipolar flakes are evidence for the smashing of small nodules or exhausted cores to derive the maximum amount of usable edge. This technique produces quite a bit of angular debris, and bipolar flakes display considerable morphological variability (Andrefsky 1998:119).

Notching flakes have a characteristic shape and can be considered evidence for the later stages of notched formal-tool manufacture. Pot lids are pieces of debris that were detached by improper thermal treatment and, as such, are difficult to classify. In this analysis, they are categorized as flakes by default. Because of their origin, pot lids are not considered in this discussion of reduction strategy.

Table 17.17 shows the distribution of flake types for all sites, with pot lids and hammerstone flakes dropped from consideration because neither represents debitage deliberately struck from cores or tools. Core-flakes dominated all assemblages, and constituted the only type recovered from LA 129218. Biface flakes were far less common, but they occurred at all sites except LA 129218. LA 129214 and LA 129217 yielded comparatively higher percentages of biface flakes than did the other sites, which may indicate that more formal tool manufacture or maintenance occurred at those locations.

Notching flakes were quite rare, and occurred only in the assemblages from LA 113042 and LA 129214, which by no coincidence are also the largest in the group. Bipolar flakes were only identified at LA 129214 and were the rarest type of flake identified. However, since debitage from bipolar reduction is often very difficult to identify, these few examples are probably only the tip of the iceberg, indicating that bipolar reduction occurred at this site, but providing no accurate idea of how common it might have been.

Platforms were often modified on biface flakes, though this was not always the case. A total of 168 flakes that were definitely struck from bifaces were identified in the full analysis sample, including biface flakes, notching flakes, and re-sharpening flakes. Platforms on only 38.69 percent of these specimens were modified, with most exhibiting no consistent evidence of retouch or abrasion. Even so, platform modification is expected to have been much more common in biface manufacture than in core reduction. Tentatively, we can consider debitage with modified platforms that were originally classified as core-flakes to be probable biface flakes. By adding these specimens to the array of definite biface flakes, it should be possible to better

Table 17.18. *Revised flake types for each site; counts and row percentages.*

SITE		CORE FLAKE	BIFACE FLAKE	RESHARPENING FLAKE	NOTCHING FLAKE	BIPOLAR FLAKE	**TOTAL**	**% OF TOTAL**
LA 113042	Count	1019	16	–	3	–	**1038**	**14.9%**
	Row %	98.2%	1.5%	–	0.3%	–	**100.0%**	**0.0%**
LA 129214	Count	4679	350	1	21	7	**5058**	**72.5%**
	Row %	92.5%	6.9%	0.0%	0.4%	0.1%	**100.0%**	**0.0%**
LA 129216	Count	35	1	–	–	–	**36**	**0.5%**
	Row %	97.2%	2.8%	–	–	–	**100.0%**	**0.0%**
LA 129217	Count	206	29	–	–	–	**235**	**3.4%**
	Row %	87.7%	12.3%	–	–	–	**100.0%**	**0.0%**
LA 129218	Count	92	1	–	–	–	**93**	**1.3%**
	Row %	98.9%	1.1%	–	–	–	**100.0%**	**0.0%**
LA 129222	Count	225	10	–	–	–	**235**	**3.4%**
	Row %	95.7%	4.3%	–	–	–	**100.0%**	**0.0%**
LA 129300	Count	274	5	–	–	–	**279**	**4.0%**
	Row %	98.2%	1.8%	–	–	–	**100.0%**	**0.0%**
Total	**Count**	**6530**	**412**	**1**	**24**	**7**	**6974**	**100.0%**
	Row %	**93.6%**	**5.9%**	**0.0%**	**0.3%**	**0.1%**	**100.0%**	

estimate the amount of tool manufacture indicated in these assemblages.

This procedure provided a total of 412 probable biface flakes for the complete assemblage, and includes examples from all seven sites, adding specimens to all assemblages except for LA 129216. These revisions are shown in Table 17.18. With these additions, three assemblages now appear to contain atypically high percentages of biface flakes, with LA 129222 being added to LA 129214 and LA 129217. Indeed, the revision more than doubled the percentage of biface flakes in the latter assemblage.

With probable biface flakes added to the array of definite biface flakes, some evidence for biface manufacture or refurbishing is visible in every assemblage. Biface reduction was probably a more important activity at the three sites with atypically high percentages of flakes related to this process than at the sites that yielded lower percentages. However, despite the comparatively high percentage of biface flakes from LA 129217, these data still suggest that an expedient reduction strategy prevailed at all seven sites.

Flake Platforms

What are referred to as flake platforms in this discussion represent small sections of the original platforms present on the edge of an objective piece that remained attached to flakes after those flakes were removed. Another term for platform is "platform remnant." Platforms on objective pieces can be modified to facilitate removal, but the type of modification used will generally vary between cores and formal tools, as discussed earlier. Platforms identified as being modified to facilitate reduction are considered to represent removals from formal tools rather than cores, because of the differences in striking platform preparation between cores and formal tools discussed earlier in this chapter.

Much of the flake platform discussion will not include most of the LA 129214 assemblage because of the sampling procedure used to examine materials from that site. Because missing and obscured platforms tend to mask patterns in the data, they were eliminated from consideration. With these caveats in mind, Table 17.19 shows the distribution of remaining platforms on flakes for each site. Overall, three types of platforms comprised over 95 percent of this assemblage. They were, in declining order, the single-facet, multifacet, and cortical types. Single-facet platforms were by far the most common type, comprising nearly half of the platform assemblage and dominating in most site assemblages except for LA 129216 and LA 129218. Multifacet platforms were the second most common type in two cases and were most common in one, while cortical platforms were the second most common type in three cases and dominated in one.

Single-facet platforms comprise at least 44 percent of all assemblages except for LA 129216, which is dominated by cortical platforms. Cortical

Table 17.19. Flake platform type, by site; counts and row percentages.

SITE		CORTICAL	SINGLE-FACETED	SINGLE- FACETED AND ABRADED	MULTIFACETED	MULTIFACETED AND ABRADED	RETOUCHED	RETOUCHED AND ABRADED	ABRADED	**TOTAL**	**% OF TOTAL**
LA 113042	Count	190	347	5	166	1	3	1	3	**716**	**25.9%**
	Row %	26.5%	48.5%	0.7%	23.2%	0.1%	0.4%	0.1%	0.4%	**100.0%**	**0.0%**
LA 129214	Count	319	661	24	434	23	27	5	1	**1494**	**54.1%**
	Row %	21.4%	44.2%	1.6%	29.0%	1.5%	1.8%	0.3%	0.1%	**100.0%**	**0.0%**
LA 129216	Count	13	7	–	5	–	–	–	1	**26**	**0.9%**
	Row %	50.0%	26.9%	–	19.2%	–	–	–	3.8%	**100.0%**	**0.0%**
LA 129217	Count	19	62	9	34	11	1	1	–	**137**	**5.0%**
	Row %	13.9%	45.3%	6.6%	24.8%	8.0%	0.7%	0.7%	–	**100.0%**	**0.0%**
LA 129218	Count	4	23	–	24	1	–	–	–	**52**	**1.9%**
	Row %	7.7%	44.2%	–	46.2%	1.9%	–	–	–	**100.0%**	**0.0%**
LA 129222	Count	38	61	2	30	5	2	–	–	**138**	**5.0%**
	Row %	27.5%	44.2%	1.4%	21.7%	3.6%	1.4%	–	–	**100.0%**	**0.0%**
LA 129300	Count	51	113	2	30	1	–	–	–	**197**	**7.1%**
	Row %	25.9%	57.4%	1.0%	15.2%	0.5%	–	–	–	**100.0%**	**0.0%**
Total	**Count**	**634**	**1274**	**42**	**723**	**42**	**33**	**7**	**5**	**2760**	**100.0%**
	Row %	**23.0%**	**46.2%**	**1.5%**	**26.2%**	**1.5%**	**1.2%**	**0.3%**	**0.2%**	**100.0%**	

Table 17.20. Modified and unmodified platforms, by site; counts and row percentages.

SITE		UNMODIFIED	MODIFIED	TOTAL	% OF TOTAL
LA 113042	Count	703	13	**716**	**25.9%**
	Row %	98.2%	1.8%	**100.0%**	**0.0%**
LA 129214	Count	1414	80	**1494**	**54.1%**
	Row %	94.6%	5.4%	**100.0%**	**0.0%**
LA 129216	Count	25	1	**26**	**0.9%**
	Row %	96.2%	3.8%	**100.0%**	**0.0%**
LA 129217	Count	115	22	**137**	**5.0%**
	Row %	83.9%	16.1%	**100.0%**	**0.0%**
LA 129218	Count	51	1	**52**	**1.9%**
	Row %	98.1%	1.9%	**100.0%**	**0.0%**
LA 129222	Count	129	9	**138**	**5.0%**
	Row %	93.5%	6.5%	**100.0%**	**0.0%**
LA 129300	Count	194	3	**197**	**7.1%**
	Row %	98.5%	1.5%	**100.0%**	**0.0%**
Total	**Count**	**2631**	**129**	**2760**	**100.0%**
	Row %	**95.3%**	**4.7%**	**100.0%**	

platforms comprise at least 21 percent of five assemblages, with much smaller percentages for LA 129217 and LA 129218. Multifacet platforms comprise at least 19 percent of all assemblages except for LA 129300, and are the dominant type on LA 129218. These three platform types tend to reflect core reduction, though they can also occur during formal-tool manufacture. These data suggest that core reduction dominated at each of these sites, with formal-tool manufacture accounting for only a small percentage of the flakes in each case. The domination of cortical platforms at LA 129216 supports data presented earlier that suggest that early stage reduction dominated in that assemblage. Conversely, the very low percentage of cortical platforms for LA 129217 supports the idea that later-stage reduction was more common here than at any of the other sites.

Platforms modified to facilitate flake removal were identified in all seven assemblages, but were most abundant in the largest assemblages, as might be expected. Overall, single-facet/abraded and multifacet/abraded platforms were the most common of the modified platform categories. The other three varieties—retouched, retouched/abraded, and abraded—are much less common. Data on modified and unmodified platforms is shown in Table 17.20. The highest percentage of modified platforms, by far, occurred in the LA 129217 assemblage. LA 129222 contained the second highest percentage of modified platforms, followed by LA 129214. Platform data suggest that at least some formal tool manufacture or maintenance occurred at every site, but was most common at LA 129217, LA 129222, and LA 129214. While tool manufacture and maintenance does not dominate at any of these sites, LA 129217 in particular stands out from the rest in the amount of evidence for tool manufacture. These data essentially replicate the distribution of flake types seen in Table 17.18. In both cases, LA 129217 is atypical in comparison with the other assemblages. LA 129214 and LA 129222 switch positions between Tables 17.18 and 17.20, but otherwise contain higher percentages than the remaining assemblages in which biface flakes and modified platforms are represented.

Flake Breakage Patterns

Flake breakage patterns can be used to examine two questions: how intact and undamaged are these assemblages; and how prevalent was core versus biface reduction. Flakes can break during removal, during use, and after discard. Various factors can cause flakes to fracture during removal. They can break when the force applied to remove them exceeds the tensile strength of the material, probably resulting in nondiagnostic snap fractures. Breaks can also occur when flaws are encountered during flake propagation. While this type of break can sometimes be correctly categorized, generally they are simply defined as nondiagnostic snap frac-

Table 17.21. Flake breakage patterns and flake portions, by site; row percentages.

SITE	BREAK CATEGORY		FLAKE PORTION		WHOLE FLAKES
	SNAP FRACTURE	MANU-FACTURING BREAK	PROXIMAL	DISTAL	
LA 113042	73.5%	26.5%	50.9%	49.1%	51.3%
LA 129214	60.0%	40.0%	57.0%	43.0%	41.9%
LA 129216	100.0%	–	30.0%	70.0%	41.7%
LA 129217	62.0%	38.0%	39.2%	60.8%	44.7%
LA 129218	100.0%	–	40.0%	60.0%	40.9%
LA 129222	61.5%	38.5%	55.1%	44.9%	40.4%
LA 129300	63.9%	36.1%	52.5%	47.5%	49.5%

tures. Flakes can also snap because of secondary compression, in which outward bending during removal causes them to buckle (Sollberger 1986).

Characteristics of the broken ends of flake fragments that can be used to determine whether breakage was caused by manufacture-related bending were discussed earlier. While bending fractures can often be correctly identified because of characteristics of the break, snap fractures caused by exceeding a material's tensile strength or encountering a flaw are much more difficult to distinguish. This is because snap fractures can also be caused by forces unassociated with flake removal. Flakes can snap while being used as informal tools, because they were stepped on, or when unequal pressures were applied by natural processes. These breaks produce similar patterns that are all classified as snap fractures. Because snap fractures can be caused by several different and unrelated processes, they are considered nondiagnostic.

Table 17.21 presents several data sets related to flake breakage patterns. How intact an assemblage is can be evaluated using the percentage of whole flakes and proportions of distal versus proximal ends. Atypically high or low percentages of whole flakes can be meaningful. The former may indicate that many partial flakes are missing, which could mean that most reduction occurred elsewhere and that whole flakes were intentionally moved to the location where they were found. Lower-than-expected percentages of whole flakes can suggest that an assemblage was affected by surface traffic, or that biface manufacture predominated. The presence of roughly equivalent percentages of proximal and distal ends in conjunction with a low percentage of manufacturing breaks might suggest that trampling was the cause, while a high proportion of distal to proximal ends combined with high percentages of manufacturing breaks is indicative of tool manufacture. This is because, as shown by observations made while flintknapping, when biface flakes snap during removal, the proximal end often shatters into many small unrecoverable fragments, thereby increasing the proportion of distal to proximal fragments. In core reduction, the distal ends of flakes that snap during removal often shatter into unrecoverable or nondiagnostic fragments as well.

Percentages of whole specimens in flake assemblages range between 40 and 51 percent in Table 17.21. The mean percentage of whole flakes in these assemblages is 44.62, with a standard deviation of 4.37. Five assemblages cluster within the first standard deviation, with only the assemblages from LA 113042 and LA 129300 falling a bit above this range. Thus, the two latter sites can be viewed as atypical for this attribute. Interestingly, both of these assemblages also had relatively even splits between proximal and distal fragments that might indicate that they suffered more post-depositional impact. However, if this was the case, whole flake percentages should fall below the first standard deviation rather than above it. Thus, the nearly even distribution of proximal and distal fragments for these sites may simply be coincidental and is probably not indicative of a higher degree of post-depositional impact than occurred in any of the other assemblages. All-in-all, none of these assemblages appear to have been heavily affected by post-depositional impacts, though a certain degree of that type of damage is expected considering the relative shallowness of deposits.

Breaks at the proximal or distal ends of flake fragments were categorized as simple snap fractures or manufacturing breaks. Medial and lateral fragments were categorized as broken during manufacture if one end displayed a manufacturing break. Limited experiments have shown that both types of breaks can occur during core reduction and tool manufacture, but there are differences in distributions (Moore 2001:109). Those experiments suggest that large percentages of snap fractures (two-thirds or more) may indicate core reduction, while high percentages of manufacturing breaks (three-quarters or more) may indicate formal-tool manufacture. Of course, if both reduction trajectories are used at a site, our interpretations may need to be tempered to account for both. Break type distributions in Table 17.21 suggest that core reduction dominated in all seven assemblages, and that biface reduction was a very minor component in each case. In turn, this indicates that little evidence for a curated reduction strategy should be present.

Table 17.22. Platform lipping, by site; counts and row percentages.

SITE		PRESENT	NOT PRESENT	**TOTAL**
LA 113042	Count	38	752	**1038**
	Row %	4.8%	95.2%	**23.7%**
LA 129214	Count	136	1543	**2469**
	Row %	8.1%	91.9%	**56.3%**
LA 129216	Count	1	26	**36**
	Row %	3.7%	96.3%	**0.8%**
LA 129217	Count	8	145	**235**
	Row %	5.2%	94.8%	**5.4%**
LA 129218	Count	5	60	**93**
	Row %	7.7%	92.3%	**2.1%**
LA 129222	Count	2	162	**235**
	Row %	1.2%	98.8%	**5.4%**
LA 129300	Count	4	223	**279**
	Row %	1.8%	98.2%	**6.4%**
Total	**Count**	**194**	**2911**	**4385**
	Row %	**6.3%**	**93.8%**	**100.0%**

Platform Lipping

Platform lipping refers to the presence of a slight overhang at the intersection of the platform and ventral surface of a flake. Lipped platforms are generally indicative of soft hammer percussion or pressure flaking. Thus, platform lipping is more indicative of tool manufacture than it is of core reduction, though it can occur with either technique. As Table 17.22 shows, lipped platforms are most common in the LA 129214 and LA 129218 assemblages, and are fairly uncommon in all other assemblages. However, despite the more common occurrence of lipped platforms at LA 129214 and LA 129218, those percentages are still rather low.

Platform lipping can be used as an indicator of reduction technique, but it is not absolute and is most accurate when combined with other attributes, most of which were not independently recorded in this analysis. As Andrefsky (1998:115) notes: "Even though soft hammer and hard hammer flaking techniques produce detached pieces that overlap in their range of bulb morphology and amount of lipping, these characteristics may be effective discriminators in most cases." Bulb size was not independently recorded in this analysis, but was one of the attributes used in the polythetic set to discriminate between core-flakes and biface flakes, where the presence of a diffuse bulb was considered evidence of removal from a biface. Platform lipping was independently recorded when present and, though this attribute cannot be considered absolute evidence of soft hammer percussion or pressure flaking, it is safe to assume that the occurrence of large percentages of lipped platforms suggests that these reduction techniques were used, while small percentages of lipped platforms suggests that mostly hard hammer reduction was used.

In general, soft hammer percussion and pressure flaking are associated with tool manufacture, while hard hammer percussion is mostly used for core reduction. However, this separation is not hard and fast; cores can be reduced using soft hammers, while hard hammers are sometimes used in tool manufacture. In general, however, soft hammers are better suited to tool manufacture and hard hammers to core reduction (Whittaker 1994:187). Core reduction using a soft hammer requires more powerful blows to detach flakes than are necessary with a hard hammer, and tough materials are more difficult to reduce with this type of hammer (Whittaker 1994:187). Biface manufacture completed with a hard hammer tends to result in tools that are thick in cross section, with a wavier edge caused by the more pronounced bulbs of percussion produced by hard hammer blows.

Thus, when there is evidence for quite a bit of soft hammer percussion or pressure flaking in an assemblage, we assume that bifacial tool manufacture

Table 17.23. Opposing dorsal scars, by site; counts and row percentages.

SITE		NO OPPOSING SCARS	OPPOSING SCARS	**TOTAL**
LA 113042	Count	1031	6	**1037**
	Row %	99.4%	0.6%	**23.8%**
LA 129214	Count	2295	154	**2449**
	Row %	93.7%	6.3%	**56.3%**
LA 129216	Count	31	–	**31**
	Row %	100.0%	–	**0.7%**
LA 129217	Count	232	2	**234**
	Row %	99.2%	0.9%	**5.4%**
LA 129218	Count	90	1	**91**
	Row %	98.9%	1.1%	**2.1%**
LA 129222	Count	231	3	**234**
	Row %	98.7%	1.3%	**5.4%**
LA 129300	Count	273	1	**274**
	Row %	99.6%	0.4%	**6.3%**
Total	**Count**	**4183**	**167**	**4350**
	Row %	**96.2%**	**3.8%**	**100.0%**

was an important component of the reduction strategy. When most evidence is for hard hammer percussion, we assume that core reduction dominated. Along with the other attributes discussed in this section, we can use platform lipping to help distinguish between assemblages in which core reduction or biface manufacture dominated.

The comparatively low percentages of lipped platforms in Table 17.22 suggest that core reduction dominated in all seven assemblages. However, different levels of biface reduction as a secondary activity are indicated. As other data make clear, some biface reduction occurred in all seven assemblages. Analysis of platform lipping suggests three levels of biface reduction for these sites. Three assemblages—LA 113042, LA 129216, and LA 129217—fall within the first standard deviation for this attribute (mean = 4.64; sd = 2.66). Two assemblages—LA 129214 and LA 129218—fall above the first standard deviation, while the assemblages from LA 129222 and LA 129300 fall below it. This suggests that, while biface reduction was a comparatively minor activity on all seven sites, it was somewhat more common than normal at LA 129214 and LA 129218, and somewhat less important at LA 129222 and LA 129300.

Opposing Dorsal Scars

When flakes removed from the surface of a biface extend past the midpoint of the tool, they leave telltale evidence behind. That evidence consists of opposing dorsal scars at the distal end of a flake that originated at a platform on the opposite edge of the biface from the platform used to strike the flake being examined. However, opposing dorsal scars also occur when cores were reduced bi-directionally (Laumbach 1980:858). Thus, like the other attributes discussed in this section, opposing dorsal scars cannot be used by themselves to define reduction strategy; they are only meaningful when combined with other characteristics.

Table 17.23 shows the distribution of flakes with and without opposing dorsal scars. Six assemblages cluster within the first standard deviation for percentages of flakes lacking opposing dorsal scars (mean = 98.51; sd = 2.16) as well as those with opposing dorsal scars (mean = 1.49; sd = 2.16), with only LA 129214 falling outside those ranges. Thus, even though percentages of flakes with opposing dorsal scars are low for all seven sites, they are significantly higher than the norm for LA 129214. This either suggests that more biface reduction or bidirectional core reduction occurred at LA 129214 than was the case for the other sites.

Debitage Ratios

Three ratios can be used to examine relationships between various classes of debitage and cores: flake to angular debris, flake to core, and core-flake to biface flake. The flake to core ratio is probably the weakest of the three, because cores can disappear from assemblages in several ways. When exhausted, cores can be further reduced using the bipolar technique, turning them into multiple pieces of debitage without leaving a core behind. Cores can also be carried to another location or transformed into a tool such as a hammerstone or chopper when no longer suitable for the production of debitage, again with the potential of being moved elsewhere. Depending on whether or not any of these factors are in play, there could be considerable variation in the ratio between assemblages with attributes that otherwise suggest similar reduction strategies were used.

When objective pieces are struck, the detached pieces do not always break into recognizable flakes (Andrefsky 1998:82). These pieces of shattered material are termed angular debris in this analysis, and are distinguished from intentionally struck flakes by the lack of a striking platform and definable dorsal and ventral surfaces. Flake removal is also accompanied by a shower of small pieces of shatter that are only sometimes recoverable by standard excavation techniques. This is especially true of hard hammer percussion, because the blow used to remove a flake will often cause the formation of numerous partial Hertzian crack cones; one crack will dominate and propagate to form the flake, while the others will result in the removal of small flakes that often terminate in a step or hinge (Cotterell and Kaminga 1987:687). These small flakes or pieces of shatter are most common in core reduction, which is usually accomplished using hard hammers. Soft hammer percussion results in comparatively few secondary detachments of this type (Cotterell and Kaminga 1987:690).

Core reduction and tool manufacture result in the production of nondiagnostic, shattered material. The main difference is in size—core reduction produces much more angular debris that is recoverable by standard archaeological techniques than does tool manufacture. Thus, logic suggests that the flake to angular debris ratio should increase with the amount of tool manufacture conducted at a site. Other analyses suggest that this is indeed the case (Moore 1999b, 2001, 2003b). Thus, high ratios of flake to angular debris can indicate tool manufacture, while low ratios can indicate core reduction. However, since flake to angular debris ratios can also be indicative of reduction technique, which is related to but not determined by reduction strategy, this ratio is not an accurate indicator of reduction strategy unless used in combination with other indicators. Flake to angular debris ratios are shown for all components in Table 17.24. All of these ratios are low, and all indicate expedient core reduction. Because comparatively few flakes are represented per piece of angular debris, hard hammer reduction also seems indicated. This possibility is supported, in part, by percentages of unlipped platforms in assemblages, as shown in Table 17.22.

Table 17.24. Debitage ratios for each site.

SITE	FLAKE: ANGULAR DEBRIS	FLAKE: CORE	CORE FLAKE: BIFACE FLAKE
LA 113042	2.31:1	25.98:1	53.63:1
LA 129214	2.50:1	40.98:1	12.60:1
LA 129216	2.85:1	18.50:1	35.00:1
LA 129217	2.20:1	235.00:1	7.10:1
LA 129218	2.16:1	no cores	92.00:1
LA 129222	1.55:1	19.58:1	22.50:1
LA 129300	2.11:1	35.13:1	54.80:1
Composite	2.39:1	37.45:1	14.96:1

The flake to core ratio is also shown in Table 17.24. As the amount of tool manufacture increases, so should the ratio between flakes and cores. Tool manufacture is a reductive process in which debitage are removed from a nucleus to create a tool. During this process, multiple flakes are removed from a piece of debitage originally struck from a core, thereby inflating the number of flakes in an assemblage. However, the size of the tool being made must be kept in mind when considering this attribute. The manufacture of any chipped stone tool results in the production of large numbers of flakes, but those struck when making large tools are more easily recovered by standard archaeological techniques than are those that were struck while making small tools. Bifaces indicative of an efficient reduction strategy were large in order to allow them to be used as cores or blanks for making formal tools. Thus, their manufacture created large amounts of recoverable debitage indicative of this focus. Hunter-gatherers using an efficient reduction strategy tended to produce large numbers of flakes per core, especially when large biface manufacture was an important task. More sedentary peoples focused on expedient reduction produced flakes at need for use as informal tools or formal-tool blanks, but the number of recoverable flakes per core should be far fewer than in an efficient reduction strategy. Formal tools produced in an expedient strategy tend to be specialized and, after the introduction of the bow and arrow, are generally small in comparison with Archaic bifaces. Thus, while the manufacture of small specialized bifaces in an expedient reduction strategy probably produced as many flakes as did the manufacture of large generalized bifaces in an efficient strategy, the debitage resulting from this process in the former case are mostly too small for recovery. Under these circumstances, the ratio of flakes-to-cores is artificially reduced because of recovery methods.

There is a large range in the flake to core ratios shown in Table 17.24. No ratio could be produced for LA 129218 because no cores were identified in that assemblage. Ratios are fairly low for all other sites except LA 129217, where only one core was recovered. In general, flake to core ratios are indicative of expedient core reduction. The sole exception is LA 129217, where the flake to core ratio suggests that biface reduction may have been an important task, as did several other indicators discussed earlier. However, the possibility that most of the cores reduced at this site were altered or otherwise removed must also be considered. The complete lack of cores at LA 129218 may also be evidence of this process, or could indicate that the debitage recovered there were struck elsewhere and transported to that site.

The meaning of flake to core ratios is best examined in relation to the ratio of core-flakes to biface flakes in an assemblage. A high ratio of core-flakes to biface flakes suggests a focus on expedient reduction, while a low ratio suggests more of a focus on efficient reduction. The third column in Table 17.24 shows this ratio, and allows us to reassess the meaning of the flake to core ratios. A very high flake to core ratio coupled with a very low core-flake to biface flake ratio would be indicative of an efficient reduction strategy. Consequently, the converse of this relationship would suggest a focus on expedient reduction. The LA 129217 assemblage fits the expected pattern for efficient reduction in that it exhibits a very high flake to core ratio and a very low core-flake to-biface flake ratio. Flake to core ratios can be considered low for the other five assemblages that contained cores, two of which—LA 129214 and LA 129222—had fairly low core-flake to biface flake ratios. While expedient reduction appears to have dominated in these five assemblages, biface manufacture was also apparently fairly important at the latter two sites. Despite the lack of cores in the LA 129218 assemblage, the high core-flake to biface flake ratio demonstrates the dominance of expedient core reduction. Since LA 129218 yielded the second smallest assemblage at fewer than 150 artifacts, sample error could very well be responsible for the lack of cores.

Comparison of Reduction Strategy Indicators

This discussion has repeatedly stressed the notion that no single indicator discussed here can accurately identify the reduction strategy used at a site. Only when the indicators are compared and contrasted is it possible to address the question of what reduction strategy might have dominated in an assemblage, and how prevalent it was. The use of a variety of indicators makes it possible to account for some of the biases introduced into assemblages by prehistoric activities as well as archaeological recovery methods. Many of these indicators overlap, but were used in somewhat different ways and are not as redundant as it may seem, but rather should be considered interrelated. The site characteristics discussed as indicators of reduction strategy are summarized in Table 17.25, with the addition of dominant material durability as discussed earlier. Most indicators tend to agree that expedient reduction was the dominant strategy used at these sites. However, in several cases indicators suggest the use of a mixed strategy mainly focused on core reduction, but that may have been significantly augmented by bifacial tool manufacture.

These results are rather surprising, because all seven sites are believed to have been occupied on multiple occasions by hunter-gatherers during the Archaic or Neoarchaic periods, and perhaps as early as the Paleoindian period for LA 129300. In each case, the level of mobility generally exhibited by Southwestern hunter-gatherers tends to predict that an efficient reduction strategy stressing the curation of formal tools made in anticipation of need would be the reduction focus. However, it should be noted that reduction strategies can be situational as well as linked to lifestyle. While Kelly (1988) associates curated strategies with mobility, Bamforth

Table 17.25. Comparison of reductions strategy indicators for each site.

SITE	DURABILITY	NONCORTICAL: CORTICAL DEBITAGE	REDUCTION STAGE	FLAKE TYPE	PLATFORM MODIFICATION	FLAKE BREAKAGE	PLATFORM LIPPING	DORSAL SCARS	FLAKES: ANGULAR DEBRIS	FLAKES: CORES	CORE FLAKES: BIFACE FLAKES
LA 113042	strong/tough	low	middle	expedient	expedient	expedient	expedient	expedient	expedient	expedient	expedient
LA 129214	strong/tough	low	middle	mixed	mixed	expedient	expedient	expedient	expedient	expedient	mixed
LA 129216	strong/tough	low	early	expedient	expedient	expedient	expedient	expedient	expedient	expedient	expedient
LA 129217	strong	moderate	late	mixed	mixed	expedient	expedient	expedient	expedient	mixed	mixed
LA 129218	strong	low	middle	expedient	expedient	expedient	expedient	expedient	expedient	n/a	expedient
LA 129222	strong/tough	low	middle	mixed	mixed	expedient	expedient	expedient	expedient	expedient	expedient
LA 129300	strong/tough	low	middle	expedient	expedient	expedient	expedient	expedient	expedient	expedient	expedient

(1986) argues that they are more closely related to the availability of desirable materials. Parry and Kelly (1987) suggest such efficient strategies might not be used by mobile groups living in areas with abundant and widely distributed raw materials or suitable substitutes for stone tools. To these possibilities should be added the probability that little evidence of a curated strategy will be found in areas where desirable materials occur in nodules that are too small to allow the manufacture of large bifacial tools. Indeed, this factor may be at work in a variety of circumstances where efficient reduction would be expected. A similar situation has been observed in the Mesilla Bolson of south-central New Mexico (Moore 1996). Naturally occurring nodules of materials suitable for tool manufacture were uncommon in that area as well as being small in size. While there was limited evidence for the use of large generalized bifaces on the Archaic site investigated during that study, the main focus was on the expedient reduction of small nodules. Since most of the materials used on the sites in the present study appear to have been obtained from gravel beds associated with the Pecos River, nodule size is not expected to have been very large. Indeed, since most of the cherts and quartzites available in those gravel beds outcrop far to the north of the study area, mechanical transport is expected to have severely reduced them in size by the time they reached southern New Mexico.

Two groups of sites can be defined based on this analysis. The largest group consists of sites for which an expedient reduction strategy is strongly indicated, including LA 113042, LA 129216, LA 129218, and LA 129300. The second group consists of those for which several indicators suggest a mixed expedient/efficient reduction focus. Efficient and expedient strategies are not exclusive categories, but overlap to varying degrees depending upon the level of residential mobility displayed by a group and the quality and nodule size of available materials, as discussed above. Thus, even when evidence for the manufacture of efficient tools is overwhelming in a Late Archaic assemblage, as it was at LA 65006 near San Ildefonso (Moore 2001), there is also evidence for expedient reduction. The most extensive component at LA 65006 was a workshop where imported obsidian augmented by some local materials was made into large generalized bifaces. However, local materials were mostly expediently reduced because they were abundant and easily obtained, so there was no need to conserve them. Thus, there may be differences in the treatment of local versus exotic materials, especially when local materials are abundant but not as high quality as exotics, and therefore are less suitable for the manufacture of large bifacial tools.

The group of assemblages for which a mixed reduction strategy is indicated includes LA 129214, LA 129217, and LA 129222. Several factors need to be taken into account in considering these sites. First is potential date: Is there any indication that there was a Paleoindian or Archaic occupation at these sites that would generally be more expected to reflect an efficient reduction strategy? Since later occupations are also expected to reflect a mobile hunter-gatherer lifestyle, can we see any difference in reduction strategy that might reflect temporal differentiation? This question might be better addressed on an intersite basis rather than by using general site summary data. Second is sample size: Could any of the indicators that suggest a mixed strategy be affected by sample error because of small assemblage size? Third is potential nodule size: Can the size of the objective pieces being reduced at these sites be estimated? Lastly, were the bifaces made at these three sites large or small, and how does this determination affect the initial conclusions based on examination of Table 17.25?

General dates were tentatively assigned to blocks from each site when temporally diagnostic materials were available. Three types of dateable materials were used for these assignments: radiocarbon dates, projectile point styles, and pottery. The general periods used for this analysis include Paleoindian, Archaic, and Neoarchaic. Only one Paleoindian period date was assigned, based on the subsurface presence of a Paleoindian projectile point and the absence of other dateable materials. Archaic affinity was assigned when radiocarbon dates earlier than AD 200 were derived. Neoarchaic dates were assigned to blocks that produced radiocarbon dates later than AD 200 and/or contained pottery.

Table 17.26 shows the temporal affinity assigned to blocks from each site, where possible. The only potential Paleoindian date was assigned to Block 6 on LA 129300 that, as noted above, was based on the subsurface recovery of a Paleoindian point unsupported by other temporal data. Since a second point of the same type was recovered from surface contexts at LA 129300, this date assignment seems

Table 17.26. Dates for excavational blocks by site, based on radiocarbon dates, projectile point typology, and presence of pottery.

BLOCK	LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300
1	Archaic - Neoarchaic	Archaic - Neoarchaic	unknown	unknown	Neoarchaic	Archaic	Neoarchaic
2	Neoarchaic	Neoarchaic	unknown	unknown	unknown	Neoarchaic	unknown
3	unknown	Neoarchaic	Neoarchaic	unknown	Neoarchaic	unknown	unknown
4	unknown	Neoarchaic	Neoarchaic	unknown	unknown	Neoarchaic	Archaic
5	Neoarchaic	Neoarchaic	Neoarchaic	unknown	unknown	unknown	unknown
6	Neoarchaic	Neoarchaic	Neoarchaic	unknown	Neoarchaic	Neoarchaic	Paleoindian
7	Neoarchaic	Neoarchaic	Neoarchaic	–	unknown	–	Neoarchaic
8	unknown	Archaic - Neoarchaic	–	–	Archaic	–	unknown
9	unknown	Neoarchaic	–	–	Archaic - Neoarchaic	–	unknown
10	Neoarchaic	Neoarchaic	–	–	Neoarchaic	–	Archaic
11	Neoarchaic	Neoarchaic	–	–	Archaic	–	unknown
12	Neoarchaic	Neoarchaic	–	–	–	–	Neoarchaic
13	unknown	Neoarchaic	–	–	–	–	Neoarchaic
14	Archaic	Archaic - Neoarchaic	–	–	–	–	Neoarchaic
15	Neoarchaic	Neoarchaic	–	–	–	–	–
16	Archaic	Neoarchaic	–	–	–	–	–
17	Neoarchaic	Neoarchaic	–	–	–	–	–
18	Neoarchaic	Neoarchaic	–	–	–	–	–
19	Neoarchaic	Neoarchaic	–	–	–	–	–
20	unknown	Neoarchaic	–	–	–	–	–
21	unknown	–	–	–	–	–	–
22	Neoarchaic	–	–	–	–	–	–

plausible. Most Archaic dates suggest occupations from AD 1 to 200, though there are a few exceptions. These include a date in the 900s BC from Block 1 on LA 113042, dates at 4300 to 4500 BC from Blocks 8–9 and 11 on LA 129218, and dates at around 4500 BC from Blocks 4 and 10 at LA 129300. Unfortunately, in two cases dates or materials from the Neoarchaic period were also recovered, including Block 1 on LA 113042 and Block 9 on LA 129218. This suggests that materials from multiple periods are mixed in these analytic units. Even though multiple periods are not represented for analytic blocks containing the probable Paleoindian and many of the other Archaic components, this does not necessarily mean that those components are uncontaminated. Indeed, some level of mixing is likely and could skew analytic results in ways that might be difficult to detect or to account for.

Potential dates exist for blocks from all sites except LA 129217. The lack of pottery at this site coupled with the recovery of a late Paleoindian projectile point fragment from its surface could tentatively suggest a very early date. Since this was one of the sites for which a mixed reduction strategy was defined, this possibility may be significant. However, since other sites that exhibited evidence of a mixed reduction strategy (LA 129214 and LA 129222) yielded only Late Archaic and Neoarchaic dates, this is not in itself an indication of Paleoindian affinity. Otherwise, each site produced evidence of both Archaic and Neoarchaic occupations except for LA 129216 that only yielded dates and materials indicative of Neoarchaic occupation. The three sites containing Early Archaic components were all solidly assigned to the expedient reduction category.

The distribution of artifacts by site is shown in Table 17.1. Only two assemblages contained fewer than 347 artifacts (LA 129216 and LA 129218), and both were solidly classified as exhibiting a focus on expedient reduction. The three atypical assemblages were variable in size, ranging from a low of 347 artifacts at LA 129217 and a high of 7291 artifacts at LA 129214. Error related to small sample size does not seem responsible for the appearance of mixed

Table 17.27. Length data for flakes with cortical platforms and axial, or plunging, terminations.

MATERIAL CATEGORY	COUNT	MEAN LENGTH (MM)	MAXIMUM LENGTH (MM)	MINIMUM LENGTH (MM)
Chert	31	27.25	49.00	8.00
Silicified wood	1	10.00	10.00	10.00
Limestone	1	56.00	56.00	56.00
Rhyolite	3	26.33	30.00	22.00
Metaquartzite	13	36.38	61.00	23.00
Orthoquartzite	4	22.75	36.00	14.00
Total	**53**	**29.64**	**61.00**	**8.00**

reduction strategies in these assemblages. However, sample error could still be responsible if Archaic materials deposited during discrete occupations are overly represented in composite assemblages.

Two potential methods exist for estimating original nodule size. The first is to examine lengths of core-flakes with cortical platforms and axial or plunging distal terminations. The second is to look at the size of tested cobbles that retain most (80 percent or more) of their cortical cover. A total of 53 specimens from five sites fit the parameters of the first method and include 18 specimens from LA 113042, 25 from LA 129214, one from LA 129217, two from LA 129222, and seven from LA 129300. The distribution of these specimens by material type is shown in Table 17.27. Chert and quartzite flakes comprise most of this assemblage, and their overall mean length is just under 3 cm. The longest flake in this category is only 6.1 cm long. Even doubled in size, these flakes were probably struck from fairly small nodules that were not sizeable enough to produce debitage that could be made into large bifaces.

Only nine tested cobbles that retained 80 percent or more of their cortical surface were identified, all but two coming from LA 129214. The exceptions included a specimen from LA 113042 and one from LA 129222. Four specimens were chert, one was silicified wood, one was rhyolite, and three were metaquartzite. The largest of these specimens was 11.8 cm long, and the next largest was 6.9 cm long. The mean length of these nine tested cobbles was 5.744 cm. None of these specimens would have been large enough to produce debitage for the manufacture of large bifaces. Overall, the 11.8 cm long cobble was the largest core recovered, and the mean length of all cores was only 4.617 cm. Indeed, the largest core-flake recovered was 11.3 cm long, and would hardly be large enough to serve as a blank for the production of a large biface. Though rather crude, these measurements suggest that the nodules used to produce debitage on these sites were rather small, and probably would not have been of sufficient size to allow the striking of flakes large enough to be made into large bifaces.

Since all the data thus far examined suggest that little or no large generalized biface manufacture occurred at these sites, we should now examine the types of biface flakes recovered during this study and see whether those data support this general conclusion. A total of 230 biface flakes, 1 re-sharpening flake, and 13 notching flakes were examined by the full analysis and provide enough data for this study. Though biface flakes were recovered from all seven sites, by far the most specimens (168 biface flakes, 1 re-sharpening flake, and 10 notching flakes) came from LA 129214. Of the array of biface flakes available for study, 119 (66.48 percent) were unbroken and can provide complete dimensions. The mean length of whole biface flakes was 11.10 cm, and they ranged from 3 to 38 mm long. Lengths of 15 to 20 mm are considered representative of removals from larger bifaces. However, when only small biface flakes occur, the reverse is not necessarily true. While the presence of small biface flakes may indicate that small specialized bifaces were made, the possibility that they are debris produced by retouching large biface edges must also be considered. Only 25 biface flakes were longer than 15 mm, 16 of which were found at LA 129214, 5 at LA 113042, and two each from LA 129217 and LA 129222.

This examination of biface flake length can be expanded by considering the broken specimens. In most cases, this will provide no further reliable information, but in cases where the fragment exceeds 15 mm in length, the sample of flakes that were probably struck from large bifaces can be augmented. This addition resulted in an increase in the sample of flakes that were probably struck from large bifaces to 46—32 from LA 129214, 6 from LA 113042, 5 from LA 129217, 2 from LA 129222, and 1 from LA 129300.

At least five material types are represented among the large biface flakes from LA 129214, 21 of which are generic chert and therefore probably represent several different bifaces. Large biface flakes were recovered from seven different excavational blocks at LA 129214, mainly Blocks 12 (n = 15), 13 (n = 5), and 16 (n = 6). In contrast, the four large biface flakes recovered from LA 129217 came from three excavational blocks, as did the six specimens from LA 113042. Large biface flakes were recovered from single excavational blocks at LA 129222 and LA 129300. The small numbers of large biface flakes recovered at both the site and excavational block levels suggests that very little reduction of large generalized bifaces probably occurred at any of these sites.

Considering all the points discussed here, large generalized biface manufacture probably did not occur on these sites. Large generalized bifaces may have been transported to at least four sites and had flakes struck from them, but any biface manufacture occurring at those sites probably focused on the production of small specialized bifaces.

This possibility will be revisited in the discussion of formal tools. Since a focus on the manufacture and use of curated bifaces does not seem indicated for any of the sites in our sample, there must be some other reason for the appearance of mixed efficient and expedient reduction strategies in three cases.

Since large biface manufacture does not appear to be responsible for these inconsistencies, there was probably a heavier focus on small biface manufacture in one or more components on LA 129214, LA 129217, and LA 129222.

Formal and Informal Tools

Two very general categories of tools can be defined. First are formal tools, artifacts whose shapes or edge angles were significantly altered to fit the needs of a specific task. To these can be added debitage or cores whose shapes or edge angles were slightly altered to conform to the needs of a specific task; in essence, these are expedient tools whose probable functions can be defined by edge shape and wear patterns. The second general category is informal tools that consist of debitage or cores used expediently, and whose edges were visibly damaged by that use. Table 17.27 shows the distribution of tools by site. Formal tools were identified in every site assemblage, while informal tools were found in six. Nearly two-thirds of the tools came from LA 129214, which is actually proportionately less than the over 71 percent of the composite assemblage represented by that site. The number of tools from these sites tends to covary with assemblage size, as shown in Figure 17.3. This indicates that the number of tools found on each site is related to assemblage size rather than site function or cultural variation.

Most of the tools in Table 17.28 were assigned functions based on overall shape, or by the shape and angles of their utilized edges. The most abundant formal-tool categories—projectile points, projectile point preforms, and unclassified unifaces and bifaces—are discussed in detail, while other tool types are summarized by site. Spokeshaves were mainly used in woodworking. Drills were used as perforators in a variety of manufacturing activities including woodworking, leatherworking, boneworking, and ornament manufacture. Some tools were used for multiple activities, probably sequentially. These include the core-hammerstones that first served as a source for debitage and were then used to remove debitage from other cores, and the core-choppers first used as sources for debitage and then for chopping. The few gravers identified were probably used to carve moderately hard materials like wood or bone. Scrapers were mainly used for processing hides, and often exhibit edges that are rounded and polished from use. Most other tools types were used in general manufacture and maintenance activities including the utilized debitage, utilized cores, maul, choppers, and composite tools, the latter of which combined more than one function into a single tool. Tabular knives were fairly rare, and were used for a specialized purpose that is currently not known.

Table 17.7 showed toughness ratings for formal and informal tools, and can be compared to Table 17.6, which illustrates durability and toughness ratings for the entire assemblage. Brittle materials were disproportionately selected for tool use, and comprised 24.09 percent of the formal tools, com-

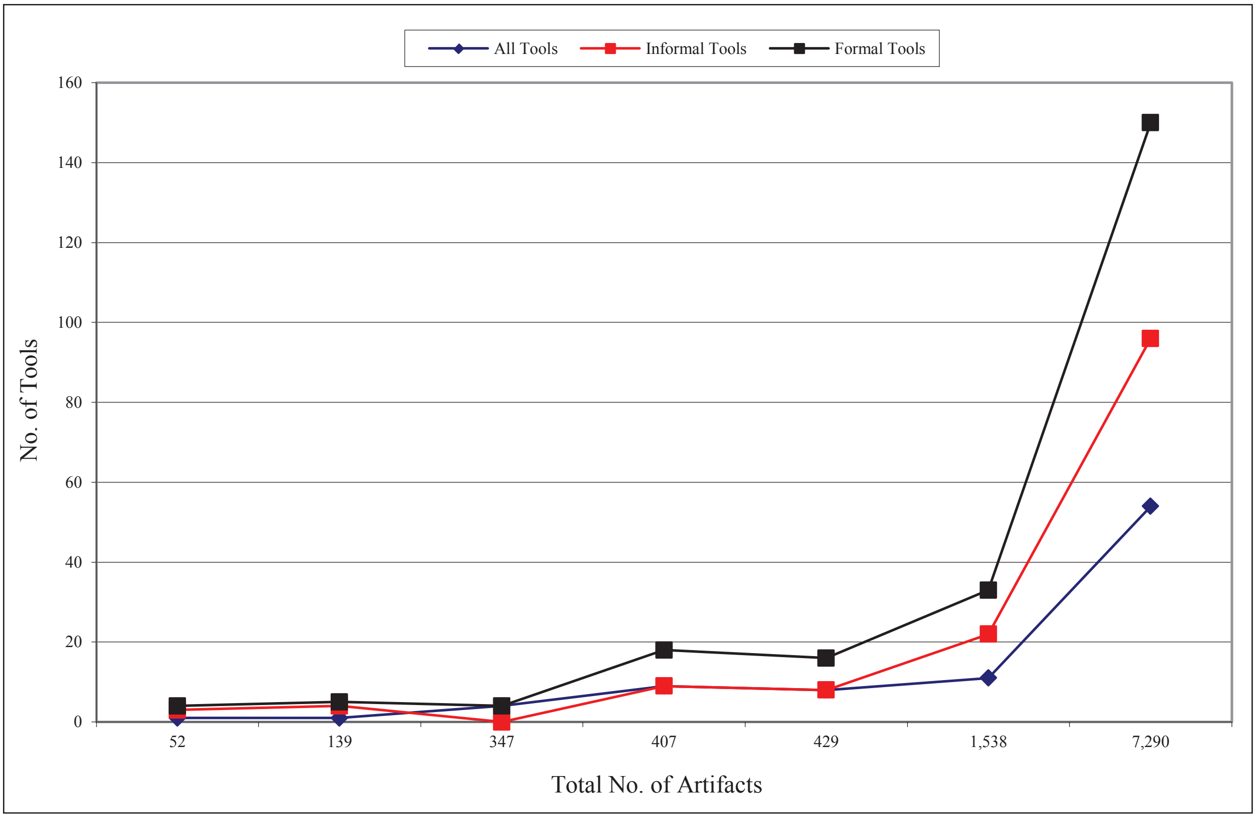

Figure 17.3. Number of tool types by assemblage size.

pared with 5.96 percent of the composite assemblage. This selection was mainly at the expense of the strong material category that made up only 48.19 percent of the formal tools, compared to 59.57 percent of the composite assemblage. Tough materials were also less common in the formal-tool assemblage (24.10 percent) than in the overall assemblage (34.47 percent), indicating that the increase in brittle materials also came at the expense of this category. These percentages indicate that brittle and strong materials were dominantly selected for formal-tool manufacture, as would be expected, with a significant percentage of strong materials being transformed to a brittle state through thermal alteration. While a similar contrast is also visible in the distribution of toughness categories for the informal tools, less meaning can be ascribed to this characteristic because of the tendency for tough materials to display little evidence of wear at the level of magnification used during this analysis, suggesting that brittle and strong materials are probably over-represented in the informal tool assemblage.

Table 17.29 shows the distribution of material types for all formal-tool classes. Nearly 74 percent of the formal tools were made from varieties of chert, the most common of which was the unsourced category. Five formal tools were made from exotic cherts, including Pedernal, Alibates, and Edwards Plateau. These specimens probably represent tools made elsewhere and transported to the locations where they were recovered.

The projectile point preforms were mostly made from either unsourced cherts or silicified wood, and all of these materials were either available locally or from Pecos River gravels. Only one dart point and one preform were made from durable (tough) materials, otherwise these tools were all made from nondurable (brittle or strong) materials. In general, tough, durable materials were selected for tools used for pounding or chopping, while brittle or strong materials that were nondurable were chosen for tools used for cutting, piercing, or scraping. However, there were exceptions to this statement that included five tabular knives, four bifaces, two unifaces, one spokeshave, and one graver all were made from tough materials.

In general, brittle/strong materials were selected for formal tools because they were amenable

Table 17.28. Tool type by site; counts and column percentages.

TOOL TYPE		LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300	**TOTAL**
Utilized debitage	Count	21	96	3	–	4	9	8	**141**
	Col. %	63.6%	62.3%	75.0%	–	80.0%	50.0%	50.0%	**60.3%**
Utilized core	Count	1	3	–	–	–	–	–	**4**
	Col. %	3.0%	2.0%	–	–	–	–	–	**1.71%**
Chopper	Count	–	2	–	–	–	–	–	**2**
	Col. %	–	1.3%	–	–	–	–	–	**0.9%**
Maul	Count	1	–	–	–	–	–	–	**1**
	Col. %	3.0%	–	–	–	–	–	–	**0.4%**
Drill	Count	–	1	–	–	–	–	1	**2**
	Col. %	–	0.7%	–	–	–	–	6.3%	**0.9%**
Graver	Count	1	–	–	–	–	–	–	**1**
	Col. %	3.0%	–	–	–	–	–	–	**0.4%**
Spokeshave	Count	–	1	–	–	–	1	–	**2**
	Col. %	–	0.7%	–	–	–	5.6%	–	**0.9%**
Combination tool	Count	1	–	–	–	–	–	–	**1**
	Col. %	3.0%	–	–	–	–	–	–	**0.4%**
Core-chopper	Count	–	1	–	–	–	–	–	**1**
	Col. %	–	0.7%	–	–	–	–	–	**0.4%**
Scraper-graver	Count	–	–	1	–	1	–	–	**2**
	Col. %	–	–	25.0%	–	20.0%	–	–	**0.9%**
Core-hammerstone	Count	–	4	–	–	–	–	–	**4**
	Col. %	–	2.6%	–	–	–	–	–	**1.7%**
Uniface	Count	1	7	–	–	–	–	1	**9**
	Col. %	3.0%	4.6%	–	–	–	–	6.3%	**3.9%**
Scraper	Count	–	500.0%	–	–	–	–	–	**5**
	Col. %	–	3.25%	–	–	–	–	–	**2.1%**
Biface	Count	–	15	–	–	–	1	1	**17**
	Col. %	–	9.7%	–	–	–	5.6%	6.3%	**7.3%**
Projectile point preform	Count	3	4	–	1	–	2	1	**11**
	Col. %	9.1%	2.6%	–	25.0%	–	11.1%	6.3%	**4.7%**
Tabular knife	Count	–	5	–	–	–	–	–	**5**
	Col. %	–	3.3%	–	–	–	–	–	**2.1%**
Dart point	Count	2	3	–	3	–	2	3	**13**
	Col. %	6.1%	2.0%	–	75.0%	–	11.1%	18.8%	**5.6%**
Arrow point	Count	2	7	–	–	–	3	1	**13**
	Col. %	6.1%	4.6%	–	–	–	16.7%	6.3%	**5.6%**
Total	**Count**	**33**	**154**	**4**	**4**	**5**	**18**	**16**	**234**
	Row %	**14.1%**	**65.8%**	**1.7%**	**1.7%**	**2.1%**	**7.7%**	**6.8%**	**100.0%**

to careful shaping using soft hammers and pressure flaking. This was especially true for projectile points that tend to be made to a certain template with temporal and possibly cultural connotations.

Tough materials were more difficult or impossible to successfully shape and notch using pressure flaking, and were therefore less often selected for this purpose.

Since the tabular knives were all made from tough materials, we can only assume that brittle or strong materials were not suitable for the purpose to which they were put, or that only tough materials came in large enough nodules for manufacture into this type of tool.

Projectile Points and Preforms

More than 41 percent of the formal tools were projectile point preforms or finished projectile points. These tool classes were identified at five sites, and were the most abundant formal tools found in those assemblages. Most formal-tool manufacture by the occupants of these sites was apparently invested in projectile tips, though of course we cannot account for tools that might have been used at those locations and transported elsewhere when people moved on. Other bifacial and unifacial tools were also commonly made, but their formal (and sometimes informal) shaping does not seem to have had the same level of importance attached to it as did the manufacture of projectile points.

All of the projectile points and most of the preforms identified in the composite assemblage were subjected to detailed analysis that included typing, examination for evidence of use, and analysis of manufacturing stage. Since projectile point types are temporally sensitive and data on breakage patterns can provide information related to site function, these tools are discussed at length.

Leslie (1978) provides a framework for typing and evaluating projectile points from southeastern New Mexico, and his typology is used in structuring this discussion. However, it should be noted that this framework is very general in nature and subsumes multiple named types under more general classifications. Thus, specimens are also assigned to named types, when possible, in order to provide a clearer temporal context. Specimens that do not fit Leslie's (1978) typology are discussed last. Only types defined by Leslie that were actually recovered during this study are discussed. Figs. 17.4 through 17.6 illustrate most of the preforms and projectile points recovered during this study.

Type 1 projectile points. Small un-notched points are categorized by Leslie (1978:89) as Type 1, who suggests that this type primarily represents small arrow-point preforms. While this may be true in some cases, in others it is not, because un-notched points were commonly used in some areas. In an analysis of projectile points from the Mogollon Highlands, Moore (1999a:67) categorized un-notched points as preforms only when evidence of rejection during manufacture was defined. Points that were not obviously discarded because of problems encountered during production were considered finished tools, and many showed evidence of use—40 percent of medium-sized un-notched points (1.5 to 2.5 cm wide) and 50 percent of small un-notched points (less than 1.5 cm wide) in that study exhibited impact fractures, indicating that they were damaged during use. Small triangular un-notched bifaces with concave bases are classified as Cottonwood Triangular Points in the Great Basin, where they mostly date after AD 1300 (Holmer 1986:108).

Kearns (1996:132–133) indicates that this point style is common on Protohistoric and Early Historic sites in northwestern New Mexico, and was used by Navajos and Utes. Similar un-notched, concave-base arrow points are also common at Mission period sites in Texas, reflecting use by diverse groups (Hester 1977b). Thus, the use of small un-notched points was widespread across much of the Southwest, and it would be wrong to assume that specimens from southeastern New Mexico only represent arrow-point preforms by default. Evidence of rejection during manufacture or discard after use-related breakage can help assign specimens to preform and finished tool categories. Classification of those that do not exhibit such evidence is more difficult.

Leslie (1978:89) divides small un-notched points into four varieties based on the shape of the base: convex (Type 1-A), straight (Type 1-B), concave (Type 1-C), and indented with a deep V-shaped notch (Type 1-D). Our assemblage contained eight bifaces assigned to the Type 1 category, but only one retained an identifiable hafting element, so most could not be assigned to subtypes. Since none of these specimens exhibit evidence of use-related breakage, they are all considered to represent preforms for small to medium arrow points. Two specimens were recovered from LA 113042 (Fig. 17.4[b, c]), three specimens from LA 129214 (Fig. 17.4[d, e, f], two came from LA 129222 (Fig. 17.4[h, i]), and one was found at LA 129300 (Fig. 17.4[j]). Several specimens were analyzed in detail along with the projectile point assemblage.

The preforms from LA 113042 included a Type 1-A that appears to have been abandoned because of hinging on both surfaces that prevented it from being properly thinned (Fig. 17.4[b]). The second specimen from LA 113042 was a distal fragment exhibiting a nondiagnostic snap fracture. Of the three specimens from LA 129214, two were discarded because of manufacturing-related breaks, and the third was intentionally smashed following abandonment because step-fracturing created a plateau on one surface that could not be removed by thinning.

One specimen from LA 129222 seemed to have been broken by end shock during manufacture, while the break on the second specimen was complex and undefinable. About a quarter of the

Table 17.29. Material types for all formal tool types; counts and row percentages.

TOOL TYPE		NON-DURABLE CHERT	PEDERNAL CHERT	ALIBATES CHERT	SAN ANDRES CHERT	EDWARDS PLATEAU CHERT	SILICIFIED CHERT	DURABLE RHYOLITE	LIMESTONE	SANDSTONE	METAQUARTZITE	PURPLE QUARTZITE	ORTHO - QUARTZITE	**TOTAL**	**% OF TOTAL**
Chopper	Count	–	–	–	–	–	–	–	–	1	1	–	–	**2**	**2.2%**
	Row %	–	–	–	–	–	–	–	–	50.0%	50.0%	–	–	**100.0%**	**1.1%**
Maul	Count	–	–	–	–	–	–	–	1	–	–	–	–	**1**	**1.1%**
	Row %	–	–	–	–	–	–	–	100.0%	–	–	–	–	**100.0%**	**1.1%**
Drill	Count	2	–	–	–	–	–	–	–	–	–	–	–	**2**	**2.2%**
	Row %	100.0%	–	–	–	–	–	–	–	–	–	–	–	**100.0%**	**1.1%**
Graver	Count	–	–	–	–	–	–	–	–	–	1	–	–	**1**	**1.1%**
	Row %	–	–	–	–	–	–	–	–	–	100.0%	–	–	**100.0%**	**1.1%**
Spokeshave	Count	1	–	–	–	–	–	–	–	–	–	1	–	**2**	**2.2%**
	Row %	50.0%	–	–	–	–	–	–	–	–	–	50.0%	–	**100.0%**	**1.1%**
Combination tool	Count	–	–	–	–	1	–	–	–	–	–	–	–	**1**	**1.1%**
	Row %	–	–	–	–	100.0%	–	–	–	–	–	–	–	**100.0%**	**1.1%**
Core - chopper	Count	–	–	–	–	–	–	–	1	–	–	–	–	**1**	**1.1%**
	Row %	–	–	–	–	–	–	–	100.0%	–	–	–	–	**100.0%**	**1.1%**
Scraper - graver	Count	1	–	–	1	–	–	–	–	–	–	–	–	**2**	**2.2%**
	Row %	50.0%	–	–	50.0%	–	–	–	–	–	–	–	–	**100.0%**	**1.1%**
Core - hammerstone	Count	–	–	–	–	–	–	–	–	–	1	3	–	**4**	**4.5%**
	Row %	–	–	–	–	–	–	–	–	–	25.0%	75.0%	–	**100.0%**	**1.1%**
Uniface	Count	5	1	–	–	–	1	–	–	–	1	1	–	**9**	**10.1%**
	Row %	55.6%	11.1%	–	–	–	11.1%	–	–	–	11.1%	11.1%	–	**100.0%**	**1.1%**
Scraper	Count	4	–	–	–	–	1	–	–	–	–	–	–	**5**	**5.6%**
	Row %	80.0%	–	–	–	–	20.0%	–	–	–	–	–	–	**100.0%**	**1.1%**
Biface	Count	13	–	–	–	–	–	1	–	–	2	1	–	**17**	**19.1%**
	Row %	76.5%	–	–	–	–	–	5.9%	–	–	11.8%	5.9%	–	**100.0%**	**1.1%**
Projectile point preform	Count	9	–	–	–	–	1	–	–	–	–	–	1	**11**	**12.4%**
	Row %	81.8%	–	–	–	–	9.1%	–	–	–	–	–	9.1%	**100.0%**	**1.1%**
Tabular knife	Count	–	–	–	–	–	–	–	5	–	–	–	–	**5**	**5.6%**
	Row %	–	–	–	–	–	–	–	100.0%	–	–	–	–	**100.0%**	**1.1%**
Dart point	Count	9	–	–	–	2	1	–	–	–	–	–	1	**13**	**14.6%**
	Row %	69.2%	–	–	–	15.4%	7.7%	–	–	–	–	–	7.7%	**100.0%**	**1.1%**

(Table 17.29, continued)

TOOL TYPE		NON-DURA-BLE CHERT	PEDER-NAL CHERT	ALI-BATES CHERT	SAN ANDRES CHERT	EDWARDS PLATEAU CHERT	SILICIFIED CHERT	DURABLE RHYOLITE	LIME-STONE	SAND-STONE	META-QUARTZ-ITE	PURPLE QUARTZ-ITE	ORTHO - QUARTZ-ITE	**TOTAL**	**% OF TOTAL**
Arrow point	Count	11	–	1	–	–	1	–	–	–	–	–	–	**13**	**14.6%**
	Row %	84.6%	–	7.7%	–	–	7.7%	–	–	–	–	–	–	**100.0%**	**1.1%**
Total	**Count**	**55**	**1**	**1**	**1**	**3**	**5**	**1**	**7**	**1**	**6**	**6**	**2**	**89**	**100.0%**
		61.8%	**1.1%**	**1.1%**	**1.1%**	**3.4%**	**5.6%**	**1.1%**	**7.9%**	**1.1%**	**6.7%**	**6.7%**	**2.2%**	**100.0%**	

Figure 17.4[a – m]. Preforms and unidentified projectile point fragments. Two specimens were recovered from LA 113042, three specimens from LA 129214, two came from LA 129222, and one was found at LA 129300.

preform from LA 129300 was snapped off; while the break is a nondiagnostic snap fracture, the location and appearance of the break suggests that too much downward pressure was applied during reduction, breaking the tool.

Type 2 projectile points. Leslie (1978:89) places all side-notched arrow points in this category, and recognizes six varieties: convex base (Type 2-A); straight base (Type 2-B); concave base (Type 2-C); straight base with small basal notch (Type 2-D); concave base with small basal notch (Type 2-E); and deep V-shaped basal notch (Type 2-F). Only a chert example of the first variety was identified in our sample, and it was recovered from LA 113042 (Fig. 17.5[a]).

This specimen was classified as a Neff-style Livermore Point, and is mostly complete except for its tip, which was removed by an impact fracture, indicating that it was discarded after being broken during use. Livermore Points are thought to date between AD 900 and 1400 (Turner and Hester 1993:220).

Type 3 projectile points: Leslie (1978:89) places all corner-notched arrow points in this category and recognizes six varieties: convex base (Type 3-A), Straight base (Type 3-B), straight to slightly contracting stem and straight to convex base (Type 3-C), bulb-like base (Type 3-D), straight or bulb-like base with slender blades and projecting barbs (Type 3-E), and straight or convex base with slender serrated blades and projecting barbs (Type 3-F).

Six Type 3 points were identified, and include

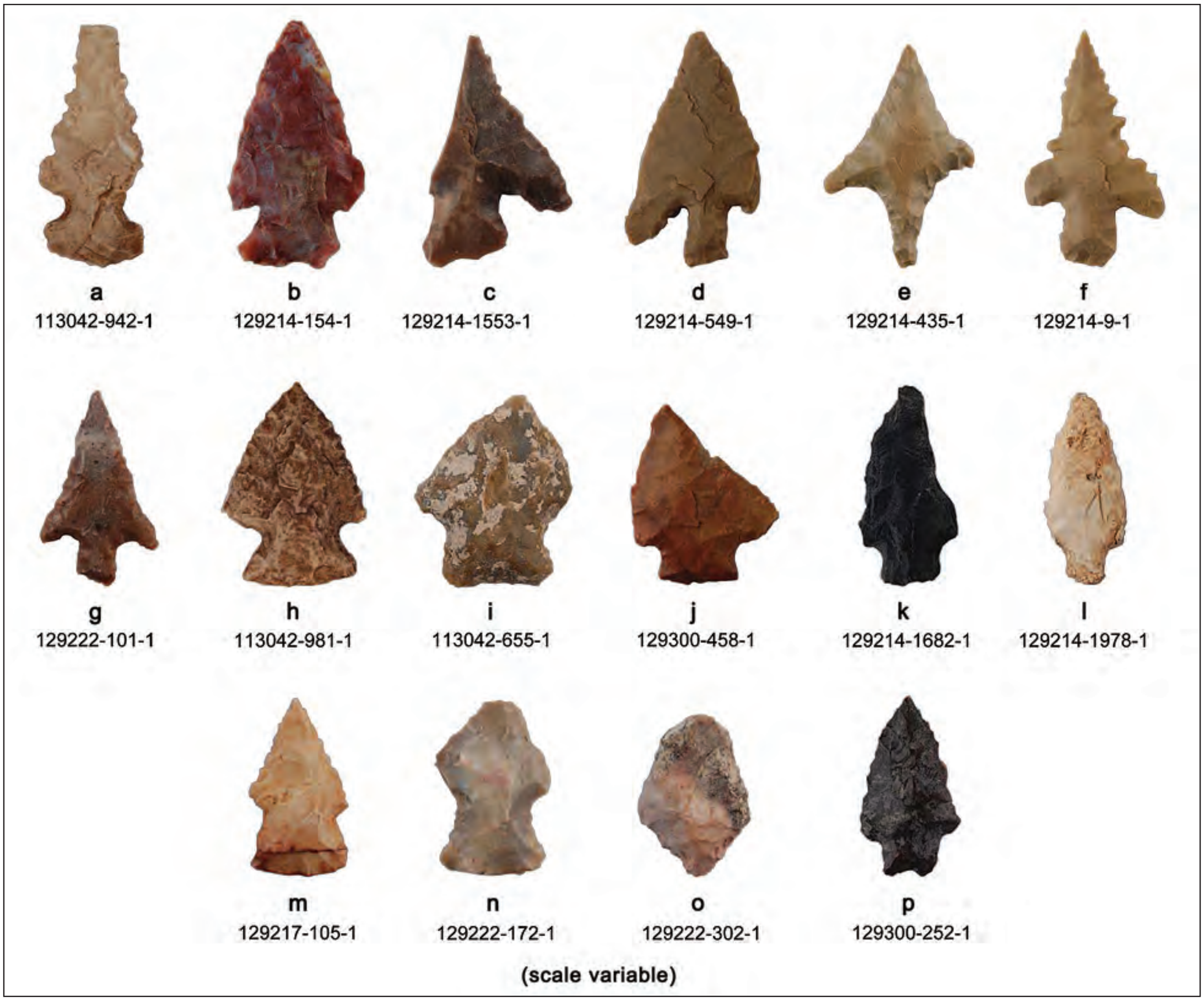

Figure 17.5[a – p]. Arrow and small dart points. Six Type 3 points were identified, and include five specimens from LA 129214 and one from LA 129222.

five specimens from LA 129214 and one from LA 129222. Four specimens from LA 129214 were made from unsourced cherts, while the fifth was made from Alibates chert. The latter was complete except for a barb and a tang that were probably removed by post-depositional damage (Fig. 17.5[b]). Since this point is lustrous, it was probably thermally altered. The Alibates chert point was assigned to the Type 3-B category and differed from the others in having a markedly expanding base. Typologically, this specimen was classified as a possible Martindale Point. If this type designation is correct, this specimen dates to the Early Archaic period (Turner and Hester 1993:151–152). However, this point is small for a dart tip, suggesting that this specimen may instead represent a large arrow point of uncertain type.

Two specimens from LA 129214 were categorized as Type 3-C (Fig. 17.5[c, d]), and one each as Types 3-E and 3-F (Fig. 17.5[e, f]). The Type 3-C points were characterized by straight to slightly bulbous bases. One specimen was tentatively categorized as a Scallorn Point (Fig. 17.5[c]), while the second was just as tentatively classified as a Deadman's Point (Fig. 17.5[d]).

If these identifications are correct, they suggest a date between AD 700 and 1200 for the former, and a Late Prehistoric date for the latter. The possible Scallorn Point exhibited a twisting break indicative of use-related fracturing. The Type 3-F point closely resembled the two Type 3-C points, but was serrated with prominent barbs. This specimen was categorized as a second Neff-style Livermore Point. The Type 3-E point has a sharply contracting base and is probably a Perdiz Point, dating ca. AD 1200 to 1500 (Turner and Hester 1993:227–228). This specimen was lustrous, suggesting that it was thermally altered. The specimen from LA 129222 was another Type 3-C that resembles the Cuney Point (Fig. 17.5[g]) that dates to the Late Prehistoric to Historic period. This point was lustrous and potlidded, indicating that it was thermally altered.

Type 4 projectile points: Leslie (1978:117) considers this type to mostly represent preforms for large arrow points or small dart points, though some may have been finished tools. Three chert bifaces were assigned to this category because they were substantially larger than the Type 1 preforms, but were un-notched and therefore potentially unfinished. Two specimens were distal fragments of early stage bifaces, and one apiece came from LA 113042 and LA 129214. The third specimen was part of a late stage biface from LA 129217.

The specimen from LA 113042 (Fig. 17.4[a]) displayed a probable lateral snap, suggesting that it broke during manufacture. No evidence of breakage type was recorded from the specimen from LA 129214. Considering the size, fragmentary nature, and reduction stage of these specimens, both probably represent dart point preforms that were broken during manufacture and discarded.

The specimen from LA 129217 (Fig. 17.4[g]) was not as easy to classify. Though considered a preform during analysis, closer examination of this tool cast doubt on this conclusion. This specimen possesses only one edge that appeared to be finished and was heavily rounded from use toward the tip. Thus, this artifact could as easily represent a fragment of a knife or dart point. However, since it could not be assigned to a more definite functional category because of its fragmentary nature, this tool remained classified as a preform.

Type 6 projectile points: Leslie (1978:117–124) classifies corner-notched large arrow or small dart points as Type 6 that he separates into four varieties according to hafting element shape. Type 6-A points have expanding stems with convex bases and shoulders that are pronounced to well-barbed. Type 6-B points are similar to Type 6-A, except their bases are mostly straight. Type 6-C points have wide stems that are either straight, contracting, or slightly expanding, with straight or convex bases and shoulders that range from slight to more-pronounced. Type 6-D points have wide expanding stems, convex bases, and shoulders ranging from weak to pronounced; they appear to have been resharpened, and the stem usually makes up half or more of their length. All Type 6 points in our sample are thought to be small dart points, though this classification is not definite.

This was the most common category of projectile points identified during this study, and is represented by seven specimens including one Type 6-A, two Type 6-B, two Type 6-C, and two Type 6-D. Two chert specimens were recovered from LA 113042, including a Type 6-A and a Type 6-B (Fig. 17.5[h, i]). Both of these artifacts were further classified as Ellis Points, a type that dates to the middle to transitional Archaic ca. 2000 BC to AD 700 (Turner and Hester 1993:113). The Type 6-A point is nearly complete, and is lustrous indicating that it was probably thermally altered. The Type 6-B point is missing one barb and is somewhat lopsided, so it was probably broken and re-sharpened. LA 129214 yielded two Type 6-C points (Fig. 17.5[k, l]), both of which were fairly poorly made, one from silicified wood and the other from chert.

The silicified wood specimen is complete, but is made from a laminar material that was difficult to shape, causing it to have an irregular shape (Fig. 17.5[k]). The chert specimen was made from a very flawed material that contained voids and was prone to step-fracturing, so this point was difficult to thin and turned out rather thick and badly made. Because of these manufacturing problems, neither specimen could be more accurately typed.

The three remaining specimens came from different sites. A chert Type 6-B point was recovered from LA 129300 and is complete, but lopsided because it was broken and re-sharpened so it could continue to be used (Fig. 17.5[j]). This specimen was tentatively classified as a reworked Marcos Point, a type that dates to the late to transitional Archaic ca. 600 BC to AD 200 (Turner and Hester 1993:147–148). The last two specimens are Type 6-D points from LA 129217 and LA 129222 (Fig. 17.5[m, n]), and both are made from chert. These points were re-sharpened after being broken, resulting in rather short blades and comparatively long bases. The reworking on these specimens was so extensive that they could not be further typed.

The specimen from LA 129217 is lustrous, indicating that it was probably thermally altered. When re-sharpened, both edges of this point were shal-

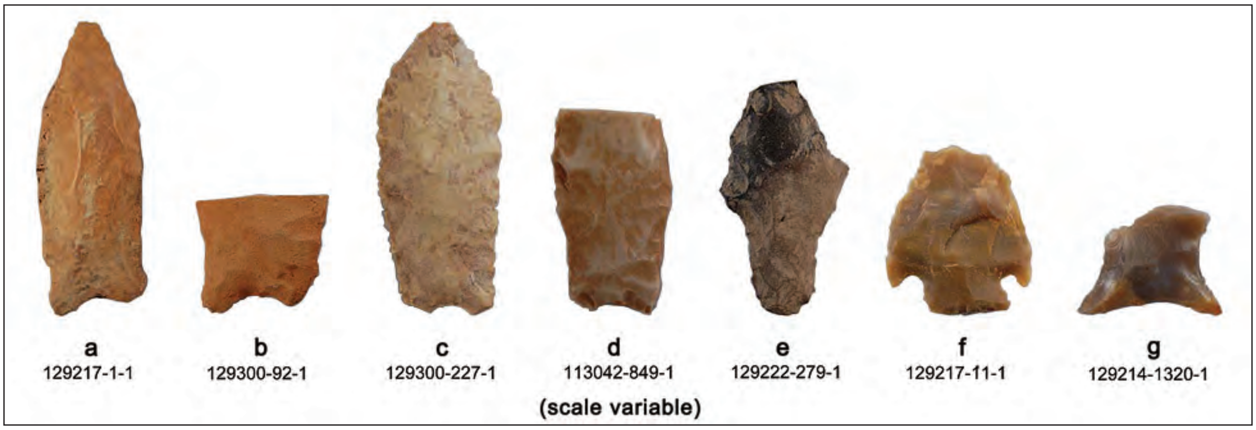

Figure 17.6[a – g]. Dart points. Three specimens were classified as Golondrina points including one from LA 129217, and two from LA 129300.

lowly serrated. The specimen from LA 129222 was also thermally altered, and it has a very lustrous appearance and is slightly reddened from oxidation. The tip of this point appears to have been removed by an impact fracture, suggesting that it was discarded after being broken a second time and its presence at this site is evidence of shaft refurbishing.

Type 8 projectile points: This category includes most corner-notched dart points and is divided into four categories (Leslie 1978:125): convex base (Type 8-A), straight base (Type 8-B), bulb-like base (Type 8-C), and expanding stem with straight or convex base (Type 8-D). A single Type 8-A point was recovered from LA 129217 (Fig. 17.6[f]), and is a proximal fragment from a Marcos Point.

The chert from which this point was made is badly flawed, causing numerous step fractures on both surfaces. Despite the presence of a thick plateau that could not be removed from one surface, this tool was finished and, since the tip was removed by an impact fracture, it was used until broken. The presence of this tool at LA 129217 is evidence of shaft refurbishing.

Stemmed, bifurcated base arrow point: A single complete specimen of this type was recovered from LA 129300, and from its size is an arrow point (Fig. 17.5[p]). The blade edges of this chert point are shallowly serrated, and this specimen is lustrous, suggesting that it was thermally altered.

Stemmed dart point: The only example of this type was recovered from LA 129222 (Fig. 17.5[o]). Made from chert, this specimen is potlidded and lustrous, demonstrating thermal alteration. Despite the appearance of its tip, this point is complete and was heavily re-sharpened. Because of the extensive nature of that re-sharpening, this point was difficult to assign to a specific type. While possible that this represents a Wells Point, it could also be a Gary Point. Both of these types are of Archaic derivation, the former dating to the Early Archaic, and the latter to the Middle to Transitional Archaic ca. 2500 BC to AD 700 (Turner and Hester 1993:123–124, 193).

Golondrina points: Three specimens were classified as Golondrina points including one from LA 129217 (Fig. 17.6[a]) and two from LA 129300 (Fig. 17.6[b, c]). The specimen from LA 129217 is complete except for its tip, which may have been removed by an impact fracture. The chert from which this point was made is now heavily patinated, which has caused a color change from gray to tan.

One point from LA 129300 is complete except for its ears that were probably lost to post-depositional damage. This was the only example of this type found in a subsurface context; the others were recovered from site surfaces. The second specimen from LA 129300 is a base made from orthoquartzite that exhibits a snap fracture and could have broken at any time. According to Justice (2002:77–78), Golondrina points are similar in form to Plainview Points, and may represent a related type.

However, with a deeper basal concavity, a recurved blade, and flaking that appears to be more random than that seen on Plainview Points, the Golondrina point could also represent a completely different tradition (Hester 1977a:176; see also Bouseman et al. 2004).

Dalton point-like: One specimen from LA 129214 was classified as a possible Dalton Point (Fig. 17.6[g]). Though small for the type, this specimen has a heavily ground basal edge and appears to be part of a stemmed point. This Edwards Plateau chert base exhibits a haft snap, is very lustrous and was undoubtedly thermally altered. Considering the type of break exhibited by this point, it was discarded when the shaft to which it was attached was refurbished. Dalton Points date to the Paleoindian period ca. 8500 to 7900 BC (Turner and Hester 1993:90–91).

Wells points: Wells Points are characterized by long contracting stems that are sometimes roughly parallel-edged and usually ground smooth; blade edges are often serrated (Turner and Hester 1993:193). One chert specimen from LA 129222 was assigned to this type (Fig. 17.6[e]). This point is mostly complete, but its tip was removed by a snap fracture. From the shape of its blade, this point may have been re-sharpened at some time prior to the occurrence of the snap fracture. Its lustrous appearance suggests that this specimen was thermally altered.

Bajada points: These are stemmed dart points with slight to distinct shoulders and concave bases that exhibit deliberate thinning and are usually heavily ground. Through time, the shoulders of this type become increasingly well-defined and overall length becomes shorter. Blade edges are straight to slightly convex and contract toward the tip, while stem edges are straight and parallel or slightly expanding toward the base. Blade length is often shortened by re-sharpening. One chert specimen of this type was recovered from LA 113042, and consists of a proximal fragment exhibiting an impact fracture (Fig. 17.6[d]). Uncharacteristically, no basal grinding was noted on this specimen, and it was lustrous indicating that it was probably thermally altered. This specimen is evidence of shaft refurbishing after it broke during use.

Unclassifiable specimens: Three specimens could not be classified because they were distal or medial fragments, and were therefore lacking the most important characteristics used for categorization. From their sizes, all three are sections of arrow points. Two specimens were recovered from LA 129214, and include a chert medial fragment exhibiting an impact fracture (Fig. 17.4[k]) and a chert tip exhibiting a snap fracture (Fig. 17.4[l]). Neither of these specimens displayed evidence of thermal alteration. It is likely that the medial fragment is evidence of a successful hunt and would have been transported back to a residential camp in a meat package. The same may be true of the other fragment, but cannot be satisfactorily demonstrated.

The third specimen is a medial fragment from LA 129222, is very lustrous, and was probably thermally altered (Fig. 17.4[m]). Like the distal fragment from LA 129214, this specimen may have been transported to a camp in a meat package, but this cannot be satisfactorily demonstrated owing to the ambiguous nature of the breaks that it exhibits.

Unclassified Bifaces

Seventeen unclassified bifaces were in the composite assemblage; nine specimens from LA 129214 and one from LA 129222 were examined in more detail to determine potential reasons for discard. Only seven bifaces were included in the full analysis sample, the rest were in the abbreviated sample for LA 129214. Three of the fully analyzed bifaces were whole, and seven were broken in various ways. Five of the fragmentary bifaces exhibit manufacturing breaks: four have lateral snaps and one broke along an incipient fracture plane.

All three of the complete specimens were discarded during manufacture because of difficulties encountered during thinning that led to the creation of plateaus on one or more surface. The last two broken bifaces exhibit snap fractures that could have occurred at any time but probably reflect manufacturing breakage. Thus, most if not all of the bifaces examined in more detail were discarded because of problems encountered during manufacture.

The remaining specimens came from LA 129214 (n = 6) and LA 129300 (n = 1). Five of the specimens from LA 129214 were biface fragments referred to as edge bites that represent mistakes made during reduction during which an ill-aimed blow breaks out a half moon-shaped piece. Thus, all five of these specimens are evidence of manufacturing-related breaks, though whether or not the damaged tools were salvaged is unknown. The specimen from LA 129300 was an early stage tool, while the last specimen from LA 129214 was a middle stage biface. The specimen from LA 129300 may actually have been a finished tool, perhaps intended for use in piercing materials, but a lack of wear suggests it was either never put into use or was left unfinished. Why this tool may have been abandoned is unknown.

The final biface from LA 129214 was an indeterminate fragment, possibly shattered during manufacture. Analysis suggests that most of the unclassified bifaces represent blanks abandoned or broken during manufacture. Detailed analysis demonstrated similar results for eight of the 10 bifaces that were examined to determine breakage pattern, as well as for the five edge bites. At least 13 of the 17 unclassified bifaces were definitely discarded or broken during manufacture.

Other Formal Tools

Other types of formal tools were also identified in these assemblages, but as Table 17.29 illustrates, they were not common. In this section, these tools are discussed by site and general tasks in which they might have been used are suggested.

LA 113042: Four formal tools other than projectile points and bifaces were recovered from LA 113042 (Table 17.28). Surprisingly, the graver was made from metaquartzite, and the presence of this type of tool suggests that bone or wood carving occurred at the site. The limestone maul would have been used in pounding activities, though whether this involved the processing of vegetal foods, bones, or other materials is unknown. The chert uniface was reworked and complete, and probably functioned in general tasks involving manufacture or maintenance. A similar function can be assigned to the Edwards Plateau chert combination tool that combined a uniface edge with a spokeshave edge, suggesting that it was used in woodworking.

LA 129214: Twenty-one formal tools other than projectile points and bifaces were recovered from LA 129214 (Table 17.28). These tools can be placed in several categories including chopping tools, pounding tools, scraping tools, and carving tools. Three specimens fall into the chopping category, including two choppers (sandstone and metaquartzite) and a limestone core-chopper. The choppers are cobble tools made for this task, while the core-chopper was initially used as a source for debitage and was then converted to this task. Choppers were probably used to cut medium to hard materials like wood and bone. Four metaquartzite core-hammerstones fall into the pounding category. Like the core-chopper, these tools began as sources for debitage and were eventually converted into hammers that were probably used in chipped stone reduction.

Five scrapers—four chert and one silicified wood—represent the scraping category, and the type of wear noted on their edges suggests they were used to process hides. The carving tool category is very general, and includes two types of tools: spokeshaves and unifaces. The single chert spokeshave was probably used to carve and shape wood. A similar function might apply to the unifaces as well, but this is uncertain. All seven unifaces were early stage tools and most likely represent unfinished pieces abandoned during manufacture. Because of this possibility, the unifaces are classified as general manufacture/maintenance tools. Six of the unifaces were made from various cherts, and one was made from metaquartzite.

LA 129216: Only one other formal tool was recovered from this site: a scraper-graver made from San Andres chert that was probably used to carve wood or bone.

LA 129217: No other formal tools were recovered from this site.

LA 129218: Like LA 129216, the only other formal tool recovered was a chert scraper-graver that was probably used to carve wood or bone.

LA 129222: Only one other formal tool was recovered from this site: a spokeshave that was probably used to shape wood or bone implements.

LA 129300: Two additional formal tools were recovered from LA 129300, a drill and a uniface. The drill was made from chert and was used to perforate materials, while the uniface was a middle stage tool made from metaquartzite that may have been used in general manufacture or maintenance activities.

Informal Tools

Informal tools are debitage and cores whose edges were damaged through use as cutting and scraping tools, but the amount of modification was slight and insufficient for assignment to a specific functional category. Conservative standards were applied when defining edge damage as evidence of use because trampling and mechanical transport often cause scarring that can be mistaken for cultural wear. Only when scar patterns were consistent along an edge and the edge margin was regular (lacking deep scoops or projections) were artifacts categorized as informal tools. This means that only

Table 17.30. Utilized and unutilized debitage and cores, by site; counts and row percentages.

SITE		UTILIZED DEBITAGE	UNUTILIZED DEBITAGE	UTILIZED CORE	UNUTILIZED CORE	**TOTAL**	**% OF TOTAL**
LA 113042	Count	21	1466	1	39	**1527**	**15.1%**
	Row %	1.4%	96.0%	0.1%	2.6%	**100.0%**	**0.0%**
LA 129214	Count	96	7019	3	117	**7119**	**70.4%**
	Row %	1.3%	98.6%	0.0%	1.6%	**100.0%**	**0.0%**
LA 129216	Count	3	46	–	2	**51**	**0.5%**
	Row %	5.9%	90.2%	–	3.9%	**100.0%**	**0.0%**
LA 129217	Count	–	342	–	1	**343**	**3.4%**
	Row %	–	99.7%	–	0.3%	**100.0%**	**0.0%**
LA 129218	Count	4	134	–	–	**138**	**1.4%**
	Row %	2.9%	97.1%	–	–	**100.0%**	**0.0%**
LA 129222	Count	9	377	–	12	**398**	**3.9%**
	Row %	2.3%	94.7%	–	3.0%	**100.0%**	**0.0%**
LA 129300	Count	8	406	–	8	**422**	**4.2%**
	Row %	1.9%	96.2%	–	1.9%	**100.0%**	**0.0%**
Total	**Count**	**141**	**9790**	**4**	**179**	**10,114**	**100.0%**
	Row %	**1.4%**	**96.8%**	**0.0%**	**1.8%**	**100.0%**	

specimens that exhibited extreme evidence of use were classified as tools; those with inconsistent scarring were not considered informal tools, though many may have been used as such.

The presence of a few informal tools in an assemblage may be the tip of the iceberg; they indicate that debitage were used as tools, but do not allow quantification of the amount of that use. Thus, varying percentages of informal tools in assemblages do not demonstrate differences in the intensity of informal-tool use, but instead show the amount of variation in our ability to recognize these tools.

As use-wear experiments demonstrate, several factors contribute to consistent edge scarring, the most important of which is contact with a hard material (Vaughan 1985:22). However, nearly half of the edges used on hard materials and 80 percent of those used on medium to hard materials in Vaughan's (1985) experiments were not consistently scarred. These findings mirror experimental results reported by Schutt (1980), who found that consistent edge scarring only occurred when hard materials were contacted. The amount of recognizable scarring also varies with the type of material used as a tool. Brittle materials like obsidian and thermally altered chert scar more easily than strong and tough materials like unaltered chert and basalt. Scars are also easier to define on glassy and fine-grained materials than on coarse-grained rocks.

Foix and Bradley (1985) conducted use-wear experiments on rhyolite and found that evidence of wear was almost invisible, with coarse-grained varieties exhibiting more resistance to wear than fine-grained types. Thus, much higher percentages of cherts are expected to evidence use as informal tools. These experiments also indicate that consistent scarring, which would be defined as cultural wear by our analysis, probably only occurred when fairly hard materials were encountered by an edge. Thus, flakes used to cut soft materials like meat or vegetal matter probably were not identified, unless those materials were cut on an anvil. Wear patterns may not be identifiable on coarse-grained materials like rhyolite and quartzite, even if they were extensively used.

Low-powered magnification (below 100x) was used to examine debitage edges. As Andrefsky (1998:7) notes, studies show that low-powered microscopic analysis can be an accurate technique for identifying evidence of use, but it cannot determine the types of materials on which tools were used. Though high-powered microscopic analysis of microwear patterns and polish are highly touted, there is some question as to whether they are really as accurate in determining the materials that were worked as some analysts suggest (Andrefsky 1998:7). This point is moot, since we did not conduct any high-powered microscopic analysis. Thus, we can identify some debitage that were used as tools, but we cannot determine the materials upon which they were used in other than very general terms.

Table 17.30 shows the distribution of utilized

Table 17.31. Material category, by site, for informal tools; counts and row percentages.

SITE		CHERT	SAND-STONE	META-QUARTZITE	**TOTAL**	**% OF TOTAL**
LA 113042	Count	19	1	2	**22**	**15.2%**
	Row %	86.4%	4.5%	9.1%	**100.0%**	**0.7%**
LA 129214	Count	87	–	12	**99**	**68.3%**
	Row %	87.9%	–	12.1%	**100.0%**	**0.7%**
LA 129216	Count	3	–	–	**3**	**2.1%**
	Row %	100.0%	–	–	**100.0%**	**0.7%**
LA 129218	Count	4	–	–	**4**	**2.8%**
	Row %	100.0%	–	–	**100.0%**	**0.7%**
LA 129222	Count	8	–	1	**9**	**6.2%**
	Row %	88.9%	–	11.1%	**100.0%**	**0.7%**
LA 129300	Count	8	–	–	**8**	**5.5%**
	Row %	100.0%	–	–	**100.0%**	**0.7%**
Total	**Count**	**129**	**1**	**15**	**145**	**100.0%**
	Row %	**89.0%**	**0.7%**	**10.3%**	**100.0%**	

and unutilized debitage and cores by site. Only LA 129217 yielded no recognizable informal tools. Overall, only 1.42 percent of the debitage and 2.19 percent of the cores were defined as informal tools. In only one case was more than 3 percent of a debitage assemblage demonstrably used as informal tools (LA 129216), and that was the smallest assemblage, containing only 52 artifacts. This suggests that the comparatively higher percentage for LA 129216 was due to sample error rather than functional differentiation.

Only two assemblages contained utilized cores, with the same percentage being used in both. Since these were also the two largest core assemblages, evidence for use in these cases and not in others was probably due to chance rather than functional differences. The more common occurrence of utilized debitage in assemblages is probably attributable to the much larger number of specimens included in this category, and to their greater suitability for most cutting or scraping tasks than cores.

Table 17.31 shows the distribution of informal tools by material category for each site. As suggested earlier, the informal-tool assemblage is dominated by cherts, with few specimens identified for the tougher and coarser materials. Table 17.32 illustrates the distribution of wear patterns for each material category; several informal tools had multiple utilized edges, accounting for numeric differences between Tables 17.31 and 17.32. The types of scars that occur can vary with the way in which a tool was used as well as the material upon which it was used.

Experiments by Vaughan (1985:20) showed that cutting caused mostly bidirectional scarring (65 percent), though a significant number of specimens were scarred on only one surface (17 percent). Scraping or whittling produced bidirectional scarring in 46 percent of Vaughan's experiments, and unidirectional scarring in 54 percent. Thus, assigning a specific function to these wear patterns is very difficult. Similarly, rounding occurred during both cutting and scraping/whittling use (Vaughan 1985:26). Robertson and Attenbrow (2008) summarize information on wear patterns from a variety of tasks, and note that rounding (at times extreme) can also be caused by working dry hides, especially by scraping, while abrasion is often indicative of wood working.

While retouch could represent an attempt to resharpen an edge dulled by use, this is unlikely in most cases. Most informal tools were probably discarded when they became dulled, and a new flake was struck as a replacement because that required less effort than re-sharpening the dulled edge. In addition, un-retouched edges also tend to be much sharper than are retouched edges. Thus, we assume that retouch on informal-tool edges was caused by use rather than intent. Debitage that were minimally retouched to produce a specific edge angle or shape were assigned functions based on those attributes, and were included in the array of formal tools.

Though many wear patterns were identified in this assemblage (Table 17.32), assigning them to specific functions is very difficult, as the above dis-

Table 17.32. Wear pattern, by material category; counts and row percentages.

WEAR PATTERN		CHERT	SAND-STONE	META-QUARTZITE	**TOTAL**	**% OF TOTAL**
Unidirectional wear	Count	97	–	3	**100**	**63.7%**
	Row %	97.0%	–	3.0%		
Bidirectional wear	Count	4	–	–	**4**	**2.5%**
	Row %	100.0%	–	–		
Unidirectional retouch	Count	8	–	4	**12**	**7.6%**
	Row %	66.7%	–	33.3%		
Bidirectional retouch and unidirectional wear	Count	1	–	–	**1**	**0.6%**
	Row %	100.0%	–	–		
Rounding	Count	3	–	–	**3**	**1.9%**
	Row %	100.0%	–	–		
Rounding and unidirectional wear	Count	7	–	–	**7**	**4.5%**
	Row %	100.0%	–	–		
Rounding and bidirectional wear	Count	–	–	1	**1**	**0.6%**
	Row %	–	–	100.0%		
Rounding and unidirectional retouch	Count	1	–	–	**1**	**0.6%**
	Row %	100.0%	–	–		
Battering	Count	–	–	1	**1**	**0.6%**
	Row %	–	–	100.0%		
Unidirectional retouch and wear	Count	13	–	1	**14**	**8.9%**
	Row %	92.9%	–	7.1%		
Unidirectional retouch and battering	Count	1	–	1	**2**	**1.3%**
	Row %	50.0%	–	50.0%		
Abrasion	Count	–	–	2	**2**	**1.3%**
	Row %	–	–	100.0%		
Serrated	Count	–	–	1	**1**	**0.6%**
	Row %	–	–	100.0%		
Bidirectional retouch and unidirectional wear	Count	1	–	–	**1**	**0.6%**
	Row %	100.0%	–	–		
Unidirectional retouch and wear, rounding	Count	3	–	–	**3**	**1.9%**
	Row %	100.0%	–	–		
Bidirectional retouch	Count	2	–	–	**2**	**1.3%**
	Row %	100.0%	–	–		
Cobble tool edge	Count	–	2	–	**2**	**1.3%**
	Row %	–	100.0%	–		
Total	**Count**	**141**	**2**	**14**	**157**	**100.0%**

cussion should have made clear. The presence of obvious signs of wear suggests that informal tools encountered hard or medium-to-hard materials such as stone, wood, bone, or antler, though use on dry hides cannot be ruled out. The widest ranges of wear patterns were identified on chert debitage, which is not surprising since this material dominates the array of informal tools.

While most wear patterns are not always good indicators of the sort of use to which an informal tool was put, other attributes can provide some pertinent information. Schutt (1980) conducted experiments on the suitability of a range of edge angles for different tasks, and often noted that most of the edges used in her experiments that measured over 40 degrees were poorly suited to cutting and were better for scraping. Thus, we tentatively assume that edge angles smaller than 40 degrees were best for cutting, while those larger than 40 degrees were better for scraping.

Table 17.33 shows the distribution of wear patterns by edge angle classification for utilized edges; some informal tools exhibit multiple utilized edges, and not all informal tools from LA 129214 had their edge angles recorded, so the numbers in this table vary from those in the preceding two tables. Nearly 84 percent of these edges had angles that exceeded 40 degrees, suggesting that scraping may have been the most common use. About 80 percent of informal-tool edges exhibited simple unidirectional scarring,

Table 17.33. Edge angle categories, by material, for each site; counts and percentages.

SITE	EDGE ANGLE CATEGORY		CHERT	SAND-STONE	META-QUARTZITE
LA 113042	<40 degrees	Count	2	–	–
		%	6.9%	–	–
	≥40 degrees	Count	23	2	2
		%	79.3%	6.9%	6.9%
LA 129214	<40 degrees	Count	11	–	–
		%	17.2%	–	–
	≥40 degrees	Count	49	–	4
		%	76.6%	–	6.3%
LA 129216	<40 degrees	Count	–	–	–
		%	–	–	–
	≥40 degrees	Count	2	–	–
		%	100.0%	–	–
LA 129218	<40 degrees	Count	4	–	–
		%	66.7%	–	–
	≥40 degrees	Count	2	–	–
		%	33.3%	–	–
LA 129222	<40 degrees	Count	2	–	–
		%	25.0%	–	–
	≥40 degrees	Count	5	–	1
		%	62.5%	–	12.5%
LA 129300	<40 degrees	Count	1	–	–
		%	11.1%	–	–
	≥40 degrees	Count	8	–	–
		%	88.9%	–	–

and nearly 83 percent of these specimens had edge angles that exceeded 40 degrees, suggesting that this wear pattern may primarily represent scraping use.

Rounding occurred on 10.66 percent of edges, and these tools were probably used for scraping hides, with 84.62 percent exhibiting edge angles over 40 degrees. Bidirectional scarring occurred on 4.92 percent of these tools, with 83.33 percent of these specimens exhibiting edge angles greater than 40 degrees, again suggesting scraping use. Abrasion was very uncommon and occurred on only one edge that had an angle greater than 40 degrees, suggesting that it was used for scraping wood.

Other wear patterns were rare and included a specimen with two utilized edges whose wear pattern was simply identified as a cobble-tool edge, probably used for chopping. One tool edge was battered, suggesting pounding use, and the final tool edge for which we have data was serrated, suggesting it was used as a saw.

In order to define the possible activities in which informal-tool edges were used, we assume that rounding indicates hide working—probably dry hides—and abrasion indicates woodworking, as suggested by information summarized by Robertson and Attenbrow (2008). Thus, at least 13 edges—10.66 percent—were probably used for hide scraping, while only one— 0.01 percent—was used for scraping wood.

At least 104 edges exhibiting unidirectional or bidirectional scarring were probably used for general cutting and scraping activities. Of these, 86 edges—82.69 percent—were more suited to scraping, while 18 edges—17.31 percent—were best suited to cutting. One additional edge exhibited a damage pattern suggesting it was used for sawing wood or bone. Battering is assumed to have resulted from pounding, with only one example of this damage pattern being noted. The only edges used for chopping measured over 40 degrees.

Information on possible tasks for which informal tools were used is shown for site components in Table 17.34, with assemblages also divided into edge angle categories to allow examination of the distribution of that attribute. General-purpose

Table 17.34. Use category, by edge angle category, by site, for informal tool edges; counts and row percentages.

SITE	EDGE ANGLE CATEGORY		GENERAL PURPOSE	CHOPPING, HAMMER-ING	HIDE WORKING	WOOD-WORKING	**TOTAL**	**% OF TOTAL**
LA 113042	<40 degrees	Count	3	–	–	–	**3**	
		Row %	100.0%	–	–	–	**100.0%**	**2.5%**
	>41 degrees	Count	21	2	5	1	**29**	
		Row %	72.4%	6.9%	17.2%	3.4%	**100.0%**	**23.8%**
LA129214	<40 degrees	Count	11	–	2	–	**13**	
		Row %	84.6%	–	15.4%	–	**100.0%**	**10.7%**
	>41 degrees	Count	45	1	5	1	**52**	
		Row %	86.5%	1.9%	9.6%	1.9%	**100.0%**	**42.6%**
LA 129216	<40 degrees	Count	1	–	–	–	**1**	
		Row %	100.0%	–	–	–	**100.0%**	**0.8%**
	>41 degrees	Count	1	–	–	–	**1**	
		Row %	100.0%	–	–	–	**100.0%**	**0.8%**
LA 129218	<40 degrees	Count	4	–	–	–	**4**	
		Row %	100.0%	–	–	–	**100.0%**	**3.3%**
	>41 degrees	Count	2	–	–	–	**2**	
		Row %	100.0%	–	–	–	**100.0%**	**1.6%**
LA 129222	<40 degrees	Count	2	–	–	–	**2**	
		Row %	100.0%	–	–	–	**100.0%**	**1.6%**
	>41 degrees	Count	6	–	–	–	**6**	
		Row %	100.0%	–	–	–	**100.0%**	**4.9%**
LA 129300	<40 degrees	Count	1	–	–	–	**1**	
		Row %	100.0%	–	–	–	**100.0%**	**0.8%**
	>41 degrees	Count	7	–	1	–	**8**	
		Row %	87.5%	–	12.5%	–	**100.0%**	**6.6%**
Total		**Count**	**104**	**3**	**12**	**2**	**122**	
		Row %	**85.2%**	**2.5%**	**9.8%**	**1.6%**	**100.0%**	**100.0%**

activities involving informal tools can be proposed for all six assemblages that contained informal tools, and is the only category identified in three cases. General-purpose activities probably involved a mixture of cutting and scraping actions on a variety of materials. One assemblage yielded evidence for hide working in addition to general-purpose use for this class of tool, while two assemblages contained evidence for at least four tool-using activities, including chopping/pounding and wood working in addition to the aforementioned tasks.

Discussion of Activities Performed

We can use the data discussed above to suggest the performance of a variety of tasks related to chipped stone reduction and tool use for these sites. The range of materials and the types of cortex they exhibit can be used to infer material procurement and foraging locally and, possibly, at medium distances. Local foraging is suggested by materials obtained near a site, while medium-distance foraging is suggested by materials from gravel beds along the Pecos River.

While the presence of rocks from primary or secondary deposits in Texas could be evidence of long-distance foraging, they were more likely obtained through exchange, either with groups that lived in what is now the Texas Panhandle or though down-the-line exchange.

Since this portion of the discussion is concerned only with site assemblages as a whole, the types of activities defined here refer only to general tasks performed at these locations during one or more occupations. Site-specific discussions comprise the last part of this chapter.

Several tasks can be defined using the presence of specific types of debris produced by flintknapping. Core reduction is indicated by the presence of cores, core-flakes, and angular debris. A variant of this task—bipolar reduction—is evidenced by the presence of bipolar flakes or cores. Biface reduction is demonstrated by the presence of biface flakes and unfinished bifaces that were broken in manufacture.

This task can be divided into two categories—small and large biface manufacture—based on the size of these artifacts. Projectile point manufacture is indicated by the presence of preforms that were either broken during manufacture or discarded because of problems encountered during production.

The types of formal tools in an assemblage can be used to suggest some of the tasks performed by site occupants. Projectile points broken during use infer two separate tasks. Distal and medial fragments exhibiting use-related breaks suggest they were returned to the site in meat packages after a hunt, and discarded after processing. Proximal fragments that exhibit use-related breaks are indicative of shaft refurbishing.

Scrapers are considered evidence for leather working, as are informal tools with rounded edges. Wood and bone working are inferred by the presence of denticulates, spokeshaves, gravers, and informal tools exhibiting signs of abrasion. Drills were also used in these tasks, but could also function as general purpose perforators. Similarly, many informal tools were probably used to carve or scrape wood or bone. Choppers represent general chopping activities that cannot be more accurately defined. Tabular knives appear to be evidence of vegetal procurement and processing.

Table 17.35a and Table 17.35b lists potential tasks that could have been performed with chipped stone tools at these sites and sources of evidence for their performance. This list should not be considered exhaustive for several reasons. First, none of the sites were completely excavated, so evidence for the performance of other tasks might be available in uninvestigated areas. Second, tools, especially formal tools, were almost certainly transported away from these locations at the end of each occupational period, so evidence for many tasks is lacking because it simply was no longer available. Third, as noted earlier, for a number of reasons many informal tools undoubtedly went unrecognized. Thus, the list of tasks in Table 17.35a and Table 17.35b is considered a minimum representation of those performed at the sites involving the use of chipped stone tools.

Percentages of materials presumed to have been obtained from various areas are used to define sources as primary, secondary, and trace in the first division of Table 17.35a. Since the acquisition of materials for reduction was often embedded in other procurement activities, source areas probably also represent general hunting and foraging zones. While we can suggest different levels of importance for the collection of raw materials from these foraging zones, we cannot draw similar conclusions for other resources based simply on the results of this analysis. For example, local materials may have been incidentally collected while exploiting other resources near a residential site, while the acquisition of rocks may have been the main focus of trips to the Pecos Valley or further afield, with other resources being acquired incidentally.

The main source for materials used in chipped stone reduction at all seven sites was Pecos River gravels, possibly including both contemporary gravel beds along the river as well as Pleistocene-age gravel deposits located several kilometers nearer the project area. Indeed, while Madera chert was not specifically monitored for, incidental observations made during analysis suggest that a large percentage of the unsourced cherts are of this type, which was only available from Pecos River gravels. Most of the other materials used at these sites—with the exceptions of San Andres chert, unsourced cherts with non-waterworn cortex, sandstone, and limestone—were probably also obtained from Pecos River gravels. Local materials comprise far less than half of each assemblage, but are present in significant quantities in every case. Exotic materials obtained from sources in Texas or from gravel deposits along the Rio Grande were found at every site except for LA 129216, which was also the smallest assemblage. In two cases (LA 129217 and LA 129218), exotic materials comprised more than 2 percent of assemblages and were considered to be secondary sources rather than evidence of trace amounts as was the case for the other sites. However, even in the cases where exotic sources were classified as secondary, they provided far fewer materials than did local sources.

The presence of large percentages of materials obtained from Pecos River gravels in these assemblages suggests two possibilities: the Pecos Valley and/or areas containing Pleistocene-age deposits of Pecos River gravels were the major focus of foraging for raw chipped stone materials, or the Pecos Valley represented an important residential locale occupied for part of the year. If the former is correct, then lithic-materials acquisition was probably embedded in a strategy that also involved foraging

Table 17.35a. Activities suggested by chipped stone assemblages for each site, Divisions 1-3; materials of uncertain origin are dropped from consideration for sourcing.

SITE	ASSEMBLAGE SIZE	PERCENT BIFACE FLAKES	DIVISION 1			DIVISION 2			DIVISION 3	
			LOCAL SOURCES	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	SMALL BIFACE REDUCTION/ MANUFACTURE	LARGE BIFACE REDUCTION/ MANUFACTURE
LA 113042	1,538	1.54%	S	P	T	P	T	–	P:D,	S:D, F
LA 129214	7,290	6.92%	S	P	T	P	S	T	P:D, F	S:D, F
LA 129216	52	2.78%	S	P	–	P	T	–	–	P:D
LA 129217	347	12.34%	S	P	S	P	S	–	P:D, F	S:D
LA 129218	139	1.08%	S	P	S	P	T	–	S:D	–
LA 129222	407	4.26%	S	P	T	P	S	–	P:D, F	S:D
LA 129300	430	1.79%	S	P	T	P	T	–	P:D, F	S:D

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.35b. Activities suggested by chipped stone assemblages for each site, Divisions 4; materials of uncertain origin are dropped from consideration for sourcing.

SITE	ASSEMBLAGE SIZE	PERCENT BIFACE FLAKES	DIVISION 4								
			PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURBISHING	MEAT PROCESSING	ARROW/ DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/ BONE WORKING	CHOPPING/ HAMMERING	VEGETAL PROCESSING	GENERAL MANUFACTURE/ MAINTENANCE
LA 113042	1,538	1.54%	F	F	–	F	I	F,I	F	–	I
LA 129214	7,290	6.92%	F	D	F	F	F, I	F, I	F	F	I
LA 129216	52	2.78%	–	–	–	–	F	–	–	–	I
LA 129217	347	12.34%	F	F	–	F	–	–	–	–	–
LA 129218	139	1.08%	–	F	–	–	F	–	–	–	I
LA 129222	407	4.26%	F	F	–	F	–	F	–	–	I
LA 129300	430	1.79%	F	F	–	–	I	F	–	–	I

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

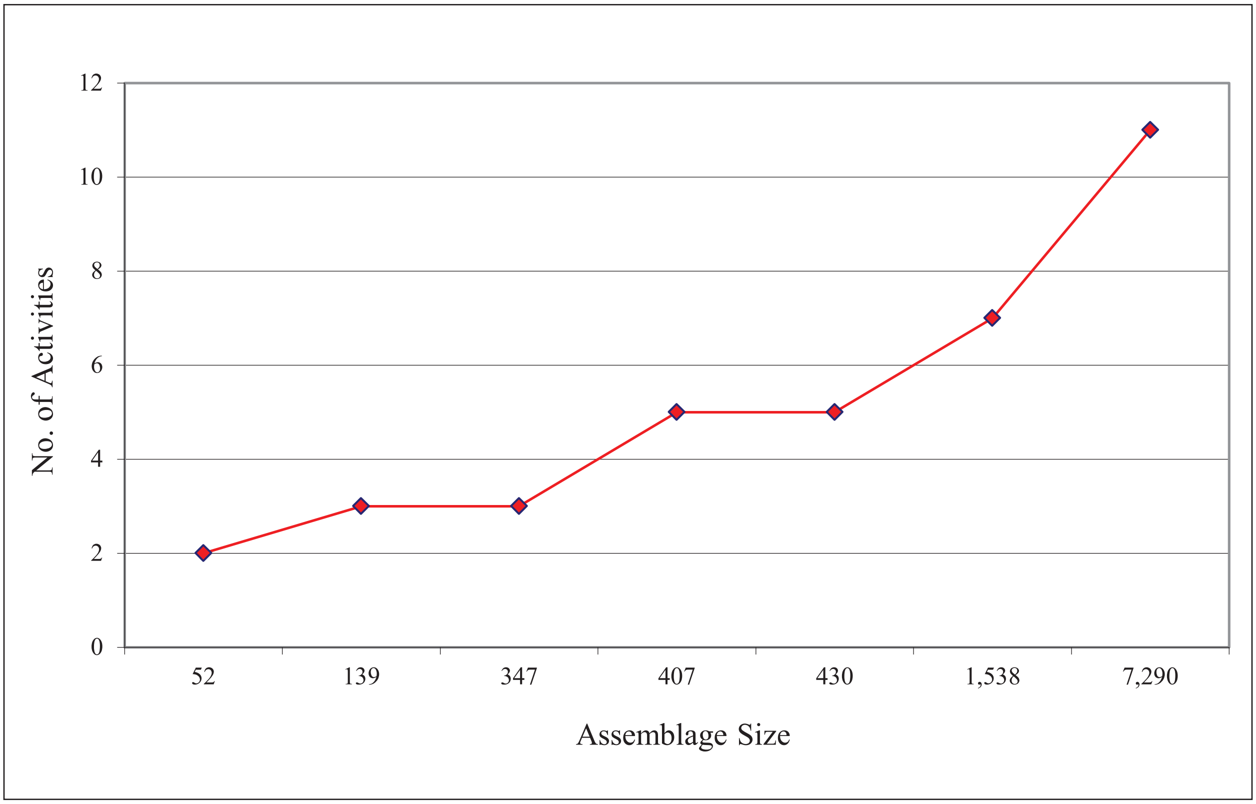

Figure 17.7. Number of tool-related activties by assemblage size.

for vegetal foods and meat. If the latter is correct, then the Pecos Valley served as a residential locale during certain times of the year, perhaps during seasons when the availability of plant foods was limited.

The next division of Table 17.35a provides information on reduction techniques based on characteristics of debitage assemblages. Core-flake reduction dominated at each site. There was some evidence for biface manufacture in all seven assemblages, but this technique was more common at LA 129214, LA 129217, and LA 129222, with enough evidence for biface manufacture being found to classify it as a secondary reduction task. Trace amounts of debitage from biface manufacture were identified at the other four sites.

Limited evidence for bipolar reduction was found at LA 129214, which was by far the largest assemblage. As Division 3 in Table 17.35a shows, evidence for the manufacture of both large and small bifaces was found in five assemblages, with small biface reduction appearing to dominate in all of them. Two assemblages only contained evidence for large biface manufacture (LA 129217) or small biface manufacture (LA 129216), but in the latter case the amount of evidence was so small that it was classified as a secondary activity.

The fourth division in Table 17.35b provides evidence for the execution of nine tasks employing chipped stone tools. As Figure 17.7 shows, the number of tool-related activities in assemblages tends to covary with assemblage size, indicating that the number of activities using chipped stone tools that can be documented is a function of occupational longevity/intensity rather than an indication of cultural or functional differences. Longer or more intense occupations generate more debris than do short or less intense occupations, resulting in the discard of more tools after use and, an increase in the amount of evidence for a wider range of activities.

LA 129214 contained evidence for the performance of all nine tasks defined for the chipped stone tools, and was also the largest assemblage. Seven activities were identified for LA 113042, which was the second largest assemblage, though it was only about a fifth the size of the LA 129214 assemblage. The number of activities visible in assemblages

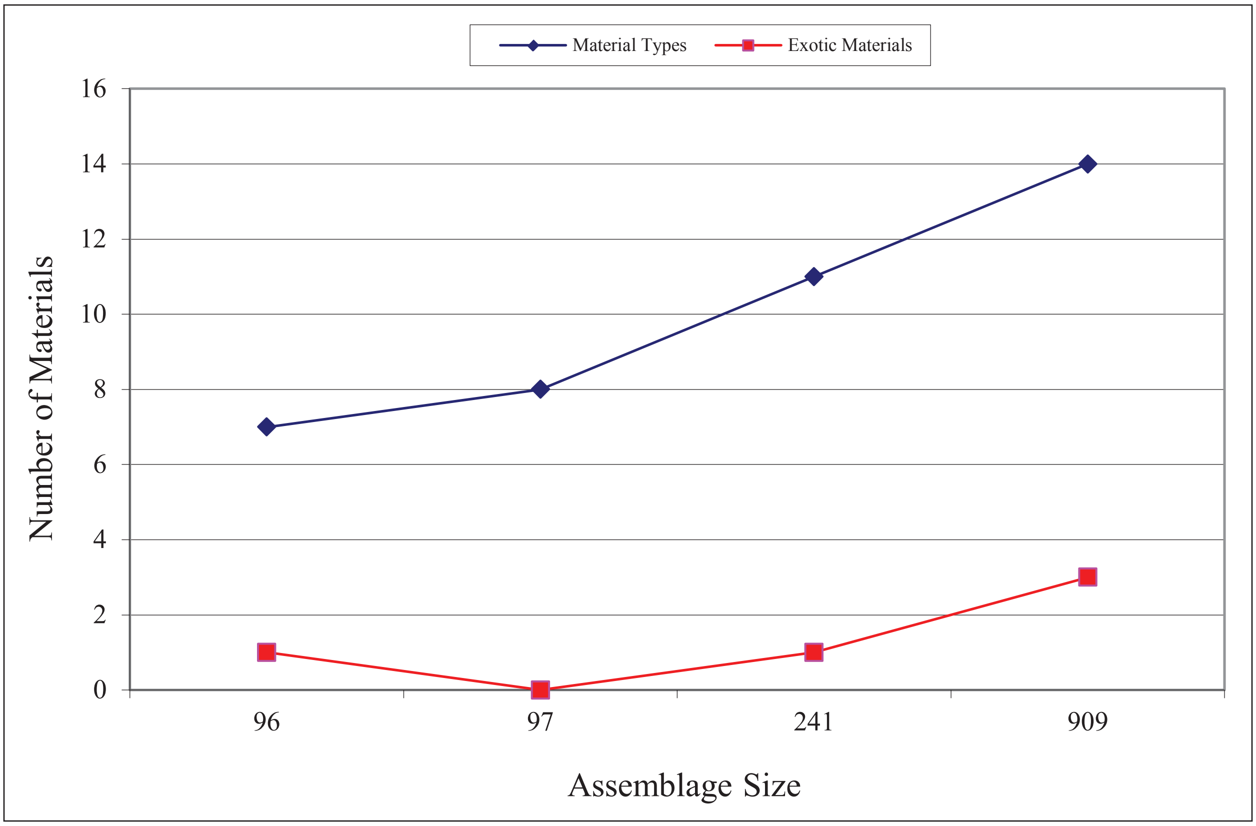

Figure 17.8. LA 113042, number of materials and exotic materials for analytic groups by assemblage size.

drops steadily to only two at LA 129216, which is the smallest assemblage.

The range and number of activities represented in assemblages suggest a residential function for each site, though it must be remembered that these are all multioccupational locales, so every use may not have been as a residential camp.

In order to provide a somewhat better resolution of site function and use as reflected by chipped stone assemblages, the next section of this chapter summarizes analytic data for each site by analytic group to help determine whether variation in occupational type can be discerned across site areas.

Discussion of Individual Sites

All but two of these sites can be subdivided into multiple analytic groups, based on excavational block proximity. The exceptions are LA 129216, which yielded the fewest chipped stone artifacts, and LA 129222, where all excavated chipped stone artifacts came from a single analytic group. In these cases, materials could be examined by excavational blocks to look for differences and similarities, but the number of artifacts included in those subdivisions is so small that little credence could be placed on any results. Thus, while the other sites are discussed in greater detail, LA 129216 and LA 129222 are merely summarized as single units. Hopefully, this analysis will allow us to determine whether there is intrasite variation in material selection, reduction strategy, or use that might be related to cultural or temporal factors.

LA 113042

LA 113042 yielded the second largest chipped stone assemblage at 1538 artifacts, and was divided into five analytic groups: Group 1 contains Blocks 1 and 2; Group 2 contains Blocks 7–12 and 15; Group 3 contains Blocks 3–6, 13–14, and 16–22; and Group 4 is Block 12. The fifth group includes artifacts—mostly surficial—that were not assigned to specific analytic groups, and so are not further considered in this discussion. With the latter eliminated, the remaining assemblage contains 1,343 specimens.

Table 17.36 shows the distribution of material

Table 17.36. LA 113042, material type, by analytic group; counts and column percentages.

MATERIAL TYPE		GROUP 1	GROUP 2	GROUP 3	GROUP 4	TOTAL
Chert	Count	635	185	90	54	**964**
	Col. %	69.9%	76.8%	93.8%	55.7%	**71.8%**
Pedernal chert	Count	2	–	–	–	**2**
	Col. %	0.2%	–	–	–	**0.2%**
Tecovas chert	Count	2	–	–	–	**2**
	Col. %	0.2%	–	–	–	**0.2%**
San Andres chert	Count	8	–	1	–	**9**
	Col. %	0.9%	–	1.0%	–	**0.7%**
Edwards Plateau chert	Count	7	4	1	–	**12**
	Col. %	0.8%	1.7%	1.0%	–	**0.9%**
Possible Edwards Plateau chert	Count	3	2	–	–	**5**
	Col. %	0.3%	0.8%	–	–	**0.4%**
Silicified wood	Count	20	11	–	6	**37**
	Col. %	2.2%	4.6%	–	6.2%	**2.8%**
Granite	Count	1	–	–	–	**1**
	Col. %	0.1%	–	–	–	**0.1%**
Red rhyolite	Count	–	1	–	–	**1**
	Col. %	–	0.4%	–	–	**0.1%**
Gray rhyolite	Count	–	2	1	–	**3**
	Col. %	–	0.8%	1.0%	–	**0.2%**
Red aphanitic rhyolite	Count	–	1	–	–	**1**
	Col. %	–	0.4%	–	–	**0.1%**
Limestone	Count	44	2	–	2	**48**
	Col. %	4.8%	0.8%	–	2.1%	**3.6%**
Sandstone	Count	3	–	–	2	**5**
	Col. %	0.3%	–	–	2.1%	**0.4%**
Metaquartzite	Count	74	14	–	10	**98**
	Col. %	8.1%	5.8%	–	10.3%	**7.3%**
Purple quartzite	Count	90	14	1	17	**122**
	Col. %	9.9%	5.8%	1.0%	17.5%	**9.1%**
Orthoquartzite Variety 1	Count	8	1	1	1	**11**
	Col. %	0.9%	0.4%	1.0%	1.0%	**0.8%**
Orthoquartzite	Count	10	4	1	5	**20**
	Col. %	1.1%	1.7%	1.0%	5.2%	**1.5%**
Quartz	Count	2	–	–	–	**2**
	Col. %	0.2%	–	–	–	**0.2%**
Total	**Count**	**909**	**241**	**96**	**97**	**1343**
	Row %	**67.7%**	**17.9%**	**7.1%**	**7.2%**	**100.0%**

types by analytic group for LA 113042. The groups vary widely in size, with Group 1 containing the most artifacts, and Groups 3 and 4 the fewest. It comes as no surprise that Group 1 contains both the largest number of individual material types as well as exotic material types.

Fig. 17.8 graphs the number of individual materials and exotics in each group by assemblage size and shows the same general relationship that was noted in Fig. 17.2 for the composite assemblage. The number of individual materials and the number of exotics vary according to assemblage size, with the larger assemblages containing the most material types as well as the most types of exotic materials.

Materials used at LA 113042 were mainly obtained from gravel deposits. Of 463 specimens that retain part of their cortical surface, only two—0.43 percent—exhibit non-waterworn cortex, and one of these specimens is possible Edwards Plateau chert, suggesting that it was obtained through trade rather than by direct procurement. The other specimen is an unidentified chert, and the fact that it has non-waterworn cortex suggests that it was probably locally available. Both specimens with non-wa-

Table 17.37. LA 113042, distribution of durability measures, by analytic group; counts and row percentages.

ANALYTIC GROUP		BRITTLE	STRONG	TOUGH	**TOTAL**	**% OF TOTAL**
1	Count	13	615	281	**909**	
	Row %	1.4%	67.7%	30.9%	**100.0%**	**67.7%**
2	Count	4	183	54	**241**	
	Row %	1.7%	75.9%	22.4%	**100.0%**	**17.9%**
3	Count	2	82	12	**96**	
	Row %	2.1%	85.4%	12.5%	**100.0%**	**7.1%**
4	Count	6	43	48	**97**	
	Row %	6.2%	44.3%	49.5%	**100.0%**	**7.2%**
Total	**Count**	**25**	**923**	**395**	**1343**	
	Row %	**1.9%**	**68.7%**	**29.4%**	**100.0%**	**100.0%**

terworn cortex are in Group 2, which is otherwise dominated by waterworn cortex (98.02 percent). Thus, there is no good evidence for differences in material acquisition patterns between the various occupations represented by the analytic groups.

Table 17.37 shows the distribution of durability categories by analytic group. Though there is quite a bit of variability in this table—probably because of differences in sample size—some patterning is visible. Strong materials dominate three assemblages, with tough materials a distant second. Brittle materials are in the minority in each group. Group 4 differs from the others in that it contains the highest percentages of brittle and tough materials and the smallest percentage of strong materials. Indeed, this is the only group in which tough materials dominate. Values for all three durability categories fall outside the first standard deviation range, supporting the idea that durability parameters used to select materials in Group 4 differed from those used in the other groups.

Table 17.38 shows the distribution of attributes related to reduction strategy for LA 113042. In general, Groups 3 and 4 stand out from the rest when these attributes are considered. Most flake type values for these two groups fall outside the first standard deviation ranges, including all three values for Group 3 and values for primary and secondary flakes for Group 4. While tertiary flakes dominate each assemblage, both primary and secondary flakes are more common in Group 4 than they are in the others, suggesting that the earlier stages of core reduction were more important in that group. This is partly supported by the dominance of snap fractures in the broken-flake assemblage, and by the lowest percentage of lipped platforms for the site, indicating that little soft hammer reduction occurred in Group 4. While percentages of biface flakes and modified platforms do not appear to support this conclusion, since they are the second highest for the site, small sample size may be responsible for the comparatively high percentages derived for these attributes. Group 4 has the highest flake to angular debris ratio, though it still falls within the range considered indicative of expedient reduction. This may indicate more systematic core reduction in this group than elsewhere.

In contrast, Group 3 contains the highest percentages of biface flakes and modified platforms, as well as the largest percentage of lipped platforms. These attributes suggest that the later stages of reduction, including tool manufacture, were more prevalent in Group 3 than elsewhere. Flake breakage information suggests that core reduction was dominant in this group, as does the low flake to angular debris ratio. The fact that no cores and comparatively fewer flakes were recovered from this group could indicate that some usable materials were transported elsewhere, though this is speculative. In general, data in Table 17.38 suggest that expedient core-flake reduction dominated in all four groups. Tool manufacture is also indicated for all four groups, but little evidence for this activity is actually reflected in the data for any group, including Group 3. The presence of notching flakes in addition to biface flakes in Group 1 suggests that projectile points were made in that part of the site. As discussed above, the later stages of reduction dominated in Group 3 while the early stages of re-

Table 17.38. LA 113042, reduction information for analytic groups.

GROUP NO.		REDUCTION STAGE			FLAKE TYPE			PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTI-ARY	SECOND-ARY	PRIMARY	CORE FLAKE	BIFACE FLAKE	NOTCH-ING FLAKE	UNMODI-FIED	MODI-FIED	SNAP FRACT-URE	MANU-FACTUR-ING BREAK	PRES-ENT	NOT PRES-ENT			
1	Count	428	71	93	578	11	3	389	8	134	55	18	434	2.02:1	31.21:1	41.29:1
	%	72.3%	12.0%	15.7%	97.6%	1.9%	0.5%	98.0%	2.0%	70.9%	29.1%	4.0%	96.0%	–	–	–
2	Count	106	32	33	170	1	–	112	1	44	9	8	113	2.71:1	42.75:1	–
	%	62.0%	18.7%	19.3%	99.4%	0.6%	–	99.1%	0.9%	83.0%	17.0%	6.6%	93.4%	–	–	
3	Count	52	6	5	61	2	–	45	2	19	–	4	45	1.97:1	no cores	–
	%	82.5%	9.5%	7.9%	96.8%	3.2%	–	95.7%	4.3%	100.0%	–	8.2%	91.8%	–	–	–
4	Count	44	17	17	76	2	–	58	2	17	–	2	60	5.57:1	26.33:1	38.00:1
	%	56.4%	21.8%	21.8%	97.4%	2.6%	–	96.7%	3.3%	100.0%	–	3.2%	96.8%	–	–	–
Mean		68.3%	15.5%	16.2%	97.8%	2.0%	–	97.4%	2.6%	88.5%	11.5%	5.5%	94.5%	3.06:1	33.43:1	69.95:1
SD		11.55	5.71	6.04	1.11	1.11	–	1.48	1.48	14.19	14.19	2.29	2.29	1.70	8.43	66.85

SD = Standard Deviation

Table 17.39a. LA 113042, activities suggested by chipped stone assemblages for each analytic group; Divisions 1-3.

		DIVISION 1			DIVISION 2			DIVISION 3	
ANALYTIC GROUP	ASSEMBLAGE SIZE	LOCAL SOURCES	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE-FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	SMALL BIFACE REDUCTION/ MAINTENANCE	LARGE BIFACE REDUCTION/ MAINTENANCE
1	909	T	P	T	P	T	–	D	F, D
2	241	S	P	T	P	T	–	D	–
3	96	–	P	T	P	S	–	F, D	D
4	97	S	P	–	P	S	–	D	F,D

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.39b. LA 113042, activities suggested by chipped stone assemblages for each analytic group; Division 4.

		DIVISION 4								
ANALYTIC GROUP	ASSEMB-LAGE SIZE	PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURB-ISHING	MEAT PROCESS-ING	ARROW/DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/ BONE WORKING	CHOPPING/ HAMMER-ING	VEGETAL PROCESS-ING	GENERAL MANUFACTURE/ MAINTENANCE
1	909	F	–	–	–	I	F	–	–	F,I
2	241	–	–	–	F	I	–	–	–	I
3	96	–	–	–	–	–	–	–	–	I
4	97	F	F	–	–	–	I	1	–	1

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

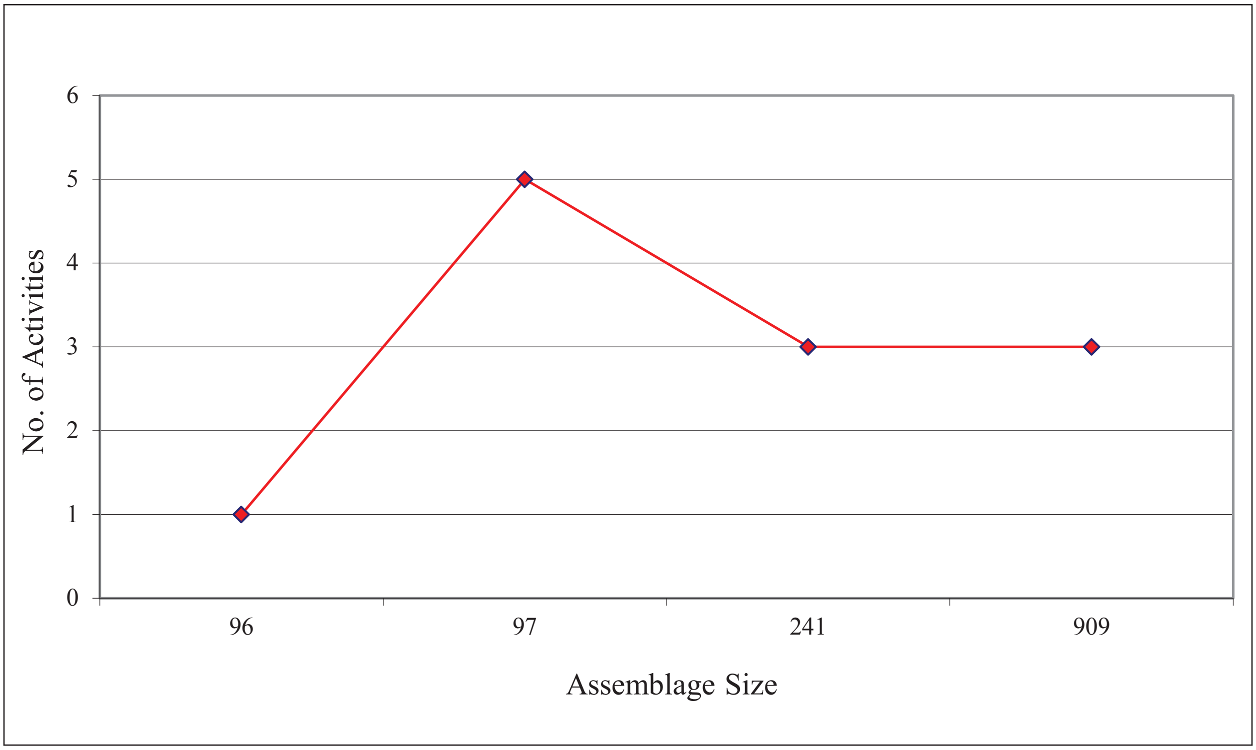

Figure 17.9. LA 113042, number of tool-using activities for analytic groups by assemblage size.

duction dominated in Group 4, otherwise no great differences are visible between assemblages.

Table 17.39a and Table 17.39b show the types of activities involving chipped stone artifacts that can be defined for each analytic group. Material selection, on the whole, was dominated by procurement from Pecos River gravel beds. There is some evidence for local materials acquisition in three groups, and no direct evidence for local procurement in one. However, these conclusions are tempered by a default assignment of most unsourced cherts to Pecos River gravels, which is undoubtedly not the case. In all likelihood, local gravel beds were probably a secondary source of materials in all four groups, despite the representation in Table 17.39a and Table 17.39b.

All four analytic groups were dominated by expedient core-flake reduction, with at least some bifacial flaking occurring in all cases. This is especially true for Groups 1 and 4, where the presence of dart point preforms discarded during manufacture supports evidence from the debitage assemblage. This evidence is especially strong for Group 1, despite the fact that only trace amounts of debitage from this process were recovered, since three notching flakes were also identified in this assemblage. Data suggest that large bifaces were made in three groups, with small bifaces possibly being made in all four groups, though this is less certain.

Several other activities are indicated for each analytic group, surprisingly with the most being recorded for Group 4, which is one of the smaller assemblages. Figure 17.9 graphs the number of tool-using activities for each group by assemblage size.

As this graph illustrates, Group 4 is quite atypical in the number of activities visible in its assemblage, suggesting that the type of occupation represented by this group differed from those represented by the others. In general, all four assemblages probably represent residential camps in which a variety of activities were performed. Assemblage sizes suggest that Groups 1 and 2 represent occupations of greater duration or intensity than Groups 3 and 4.

Unfortunately, this is probably illusory for at least Group 2, since that assemblage contained an Early Archaic projectile point as well as a projectile point from the Neoarchaic, in addition to Neoarchaic radiocarbon dates suggesting that multiple occupations may be represented in this group. Of course, the Bajada Point recovered from Group 2 could have been salvaged from an earlier site, but this cannot be demonstrated. Similarly, both Ar-

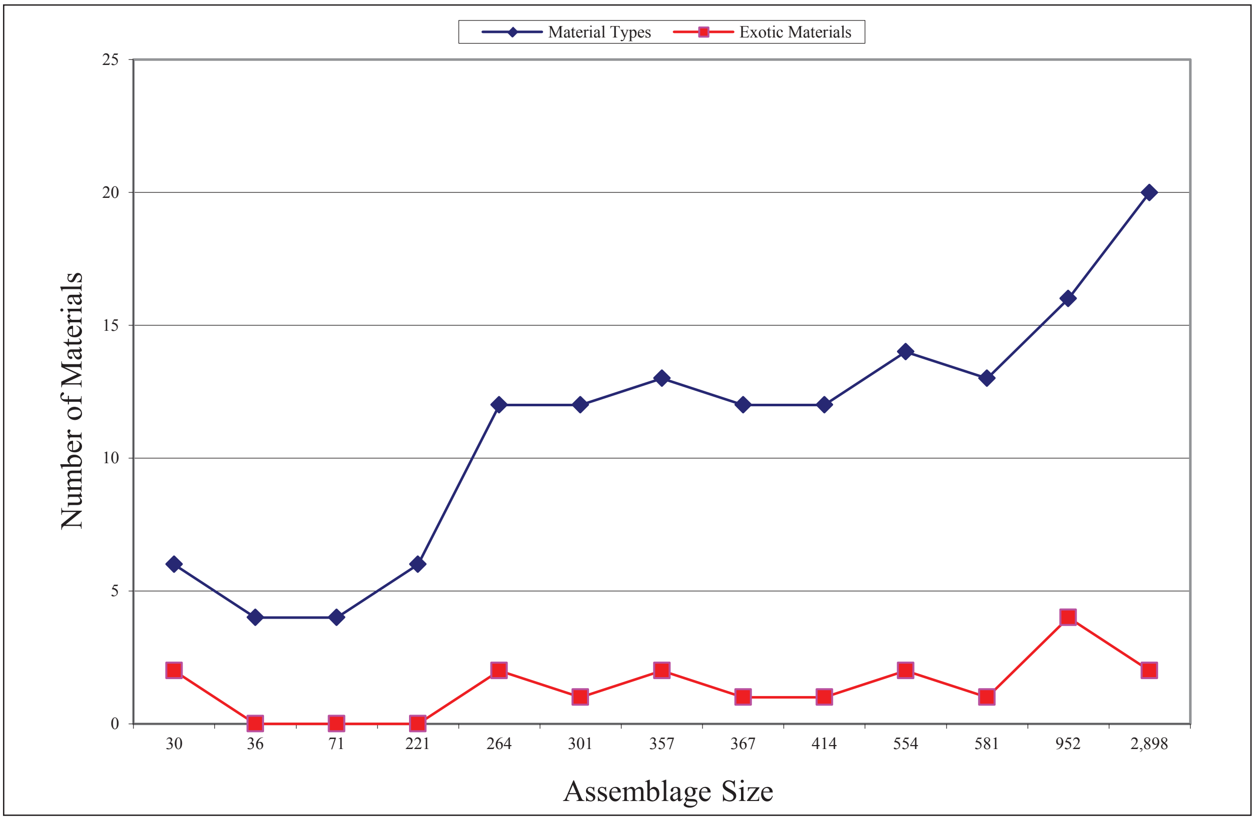

Figure 17.10. LA 129214, number of materials and exotic materials for analytic groups by assemblage size.

chaic and Neoarchaic dates were derived for Groups 1 and 3, suggesting that mixed assemblages in those cases as well. Conversely, a radiocarbon date in the AD 600s from Group 4 matches the date range for the Ellis Point found in that assemblage, suggesting that Group 4 might represent a single temporal component.

LA 129214

LA 129214 yielded the largest chipped stone assemblage at 7291 artifacts, and was divided into 14 analytic groups. Group division is as follows: Group 1, Blocks 17–19; Group 2, Block 13; Group 3, Block 12; Group 4, Block 9; Group 5, Blocks 10 and 11; Group 6, Blocks 16 and 20; Group 7, Block 8; Group 8, Block 1, Group 9-Blocks 5, 7, and 14; Group 10, Block 6; Group 11, Block 4; Group 12, Blocks 2–3; and Group 13, Block 15. The fourteenth group consists of artifacts that were not assigned to an analytic group and will not be further considered in this discussion. With those artifacts eliminated, the remaining assemblage contains 7047 specimens.

Table 17.40 shows the distribution of material types by analytic group. The groups vary widely in size, with Group 6 containing the most artifacts and Groups 11 and 12 the fewest. Thus, it comes as quite a surprise that, while Group 6 has the largest number of individual materials, it contains only two types of exotics, putting it on par with four smaller assemblages for this attribute, including the smallest. Figure 17.10 graphs the number of materials and exotics in each group by assemblage size. This graph suggests that the number of material types tends to covary with assemblage size, though the relationship is not nearly as clear as it was in Figure 17.2.

However, in this case the number of exotic materials does not covary with assemblage size as it did in Figure 17.2, suggesting that something different is going on at this site. Groups 6 and 12 are the most anomalous; Group 6 contains the most material types and the largest assemblage, yet has no more exotic materials than Group 12, which is the smallest assemblage and contains more material types than might be expected. Multiple dates were derived for Group 6, ranging from the AD 500 to 1200, while Group 12 can only be assigned to the

Table 17.40. LA 129214, material type, by analytic group; counts and column percentages.

MATERIAL TYPE		GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7	GROUP 8	GROUP 9	GROUP 10	GROUP 11	GROUP 12	GROUP 13	**TOTAL**	**% OF TOTAL**
Unknown	Count	1	–	–	–	–	3	–	–	–	1	–	–	–	**5**	**0.1%**
	Col. %	20.0%	–	–	–	–	60.0%	–	–	–	20.0%	–	–	–		
Chert	Count	251	653	398	181	162	2,323	224	55	192	368	30	17	292	**5,146**	**73.0%**
	Col. %	4.9%	12.7%	7.7%	3.5%	3.2%	45.1%	4.4%	1.1%	3.7%	7.2%	0.6%	0.3%	5.7%		
Pedernal chert	Count	1	1	–	1	–	–	1	–	1	–	–	1	–	**6**	**0.1%**
	Col. %	16.7%	16.7%	–	16.7%	–	–	16.7%	–	16.7%	–	–	16.7%	–		
Alibates chert	Count	–	–	–	–	–	1	–	–	–	–	–	1	–	**2**	**0.0%**
	Col. %	–	–	–	–	–	50.0%	–	–	–	–	–	50.0%	–		
Tecovas chert	Count	–	2	–	–	–	–	–	–	–	–	–	–	–	**2**	**0.0%**
	Col. %	–	100.0%	–	–	–	–	–	–	–	–	–	–	–		
San Andres chert	Count	2	9	2	1	–	2	1	–	–	1	–	–	2	**20**	**0.3%**
	Col. %	10.0%	45.0%	10.0%	5.0%	–	10.0%	5.0%	–	–	5.0%	–	–	10.0%		
Edwards Plateau chert	Count	1	7	7	–	–	2	–	–	1	–	–	–	–	**18**	**0.3%**
	Col. %	5.6%	38.9%	38.9%	–	–	11.1%	–	–	5.6%	–	–	–	–		
Possible Edwards Plateau chert	Count	1	4	3	–	–	4	–	–	–	1	–	–	1	**14**	**0.2%**
	Col. %	7.1%	28.6%	21.4%	–	–	28.6%	–	–	–	7.1%	–	–	7.1%		
Silicified wood	Count	4	18	12	6	6	28	8	10	6	14	2	1	8	**123**	**1.7%**
	Col. %	3.3%	14.6%	9.8%	4.9%	4.9%	22.8%	6.5%	8.1%	4.9%	11.4%	1.6%	0.8%	6.5%		
Obsidian	Count	–	1	–	–	–	–	–	–	–	1	–	–	–	**2**	**0.0%**
	Col. %	–	50.0%	–	–	–	–	–	–	–	50.0%	–	–	–		
Igneous	Count	–	–	–	–	–	2	–	–	–	–	–	–	1	**3**	**0.0%**
	Col. %	–	–	–	–	–	66.7%	–	–	–	–	–	–	33.3%		
Basalt	Count	3	5	5	–	–	11	–	–	1	–	–	–	3	**28**	**0.4%**
	Col. %	10.7%	17.9%	17.9%	–	–	39.3%	–	–	3.6%	–	–	–	10.7%		
Red rhyolite	Count	1	–	–	2	1	7	1	–	–	–	–	–	–	**12**	**0.2%**
	Col. %	8.3%	–	–	16.7%	8.3%	58.3%	8.3%	–	–	–	–	–	–		
Gray rhyolite	Count	–	–	–	1	–	–	–	–	3	1	–	–	–	**5**	**0.1%**
	Col. %	–	–	–	20.0%	–	–	–	–	60.0%	20.0%	–	–	–		
Red aphanitic rhyolite	Count	–	–	–	–	–	1	8	–	1	–	–	–	–	**10**	**0.1%**
	Col. %	–	–	–	–	–	10.0%	80.0%	–	10.0%	–	–	–	–		
Gray aphanitic rhyolite	Count	–	1	1	–	–	1	–	–	–	–	–	–	–	**3**	**0.0%**
	Col. %	–	33.3%	33.3%	–	–	33.3%	–	–	–	–	–	–	–		
Andesite	Count	–	–	–	–	–	3	–	–	–	–	–	–	1	**4**	**0.1%**
	Col. %	–	–	–	–	–	75.0%	–	–	–	–	–	–	25.0%		

(Table 17.40, continued)

MATERIAL TYPE		GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7	GROUP 8	GROUP 9	GROUP 10	GROUP 11	GROUP 12	GROUP 13	**TOTAL**	**% OF TOTAL**
Limestone	Count	9	58	22	6	1	65	1	–	4	6	–	–	14	**186**	**2.6%**
	Col. %	4.8%	31.2%	11.8%	3.2%	0.5%	35.0%	0.5%	–	2.2%	3.2%	–	–	7.5%		
Sandstone	Count	–	2	–	1	–	2	–	–	–	1	–	–	–	**6**	**0.1%**
	Col. %	–	33.3%	–	16.7%	–	33.3%	–	–	–	16.7%	–	–	–		
Siltstone	Count	–	–	–	–	–	–	–	–	–	2	–	–	–	**2**	**0.0%**
	Col. %	–	–	–	–	–	–	–	–	–	100.0%	–	–	–		
Orthoquartz- ite Variety 1	Count	–	3	1	–	–	3	1	–	3	–	–	–	–	**11**	**0.2%**
	Col. %	–	27.3%	9.1%	–	–	27.3%	9.1%	–	27.3%	–	–	–	–		
Metaquartzite	Count	43	86	73	51	27	293	68	4	24	108	3	8	50	**838**	**11.9%**
	Col. %	5.1%	10.3%	8.7%	6.1%	3.2%	35.0%	8.1%	0.5%	2.9%	12.89%	0.4%	1.0%	6.0%		
Purple quartzite	Count	36	97	38	42	24	126	48	2	23	40	1	2	37	**516**	**7.3%**
	Col. %	7.0%	18.8%	7.4%	8.1%	4.7%	24.4%	9.3%	0.4%	4.5%	7.8%	0.2%	0.4%	7.2%		
Orthoquartz- ite	Count	3	5	1	7	–	9	3	–	6	7	–	–	4	**45**	**0.6%**
	Col. %	6.7%	11.1%	2.2%	15.6%	–	20.0%	6.7%	–	13.3%	15.6%	–	–	8.9%		
Quartz	Count	1	–	18	2	–	12	3	–	–	3	–	–	1	**40**	**0.6%**
	Col. %	2.5%	–	45.0%	5.0%	–	30.0%	7.5%	–	–	7.5%	–	–	2.5%		
Total	**Count**	**357**	**952**	**581**	**301**	**221**	**2,898**	**367**	**71**	**265**	**554**	**36**	**30**	**414**	**7,047**	**100.0%**
	Row %	**5.1%**	**13.5%**	**8.2%**	**4.3%**	**3.1%**	**41.1%**	**5.2%**	**1.0%**	**3.8%**	**7.9%**	**0.5%**	**0.4%**	**5.9%**	**100.0%**	

Ceramic period based on the presence of a single diagnostic projectile point and a small number of sherds. These discrepancies cannot be explained at this level of analysis, but suggest that there may have been differential access to or use of materials during various periods of occupation at this site.

Materials used in these groups at LA 129214 were mainly obtained from gravel deposits. Of 1908 specimens that retain part of their cortical surfaces, only eight (0.42 percent) exhibit non-waterworn cortex, and none of these are known exotics. Non-waterworn cortex was found on an unknown material (n = 1), unsourced chert (n = 2), undifferentiated igneous (n = 1), limestone (n = 2), metaquartzite (n = 1), and orthoquartzite (n = 1).

The chert and limestone specimens probably represent local materials rather than imports, and the unknown material was probably also of local origin. This leaves the igneous undifferentiated and quartzite specimens as possible exotics, two of which were from Group 6, and one (metaquartzite) was from Group 7. Thus, the potential evidence for nonlocal materials suggested from cortex type comes from Group 6, which contained the largest assemblage as well as the most materials, and Group 7, which had a much smaller assemblage. This suggests that a few pieces of nonlocal material in addition to the known exotics may have been transported to the site during one or more of the occupations represented by these groups, but they did not comprise a significant proportion of the materials that were used. However, if this possibility is correct, this would increase the number of exotic material types in Group 6–4, correcting the position of this group in Figure 17.10, and placing it on a par with the second largest assemblage as far as number of exotic materials goes. And, if this is the case, our observation concerning differential access during some occupations may be incorrect. Using the same argument increases the number of exotic materials in Group 7 to two, which is on a par with several other assemblages of similar size, and does not change this conclusion.

Table 17.41 shows the distribution of durability categories by analytic group. Though there is quite a bit of variability that may mostly be due to differences in sample sizes, some patterning is visible. Strong materials dominate in 11 assemblages, with tough materials a distant second in 10 cases. Brittle materials are in the minority in each analytic group, but are around or above 10 percent in five cases. Groups 4, 8, 11, 12, and 13 differ from the other groups in that they contain percentages that are above or below the first standard deviation range for at least two durability categories. For Groups 8 and 10, there were lower-than-expected percentages of tough materials and higher-than-expected percentages of strong materials. For Groups 12 and 13 there were higher-than-expected percentages of brittle materials and lower-than-expected percentages of strong materials. Group 4 differs from these assemblages in that it has higher-than-expected percentages of tough materials and lower-than-expected percentages of brittle materials. These trends suggest that there may have been less formal-tool manufacture in Group 4 than elsewhere on the site, and more than elsewhere in Groups 12 and 13. The production of edges suitable for cutting or scraping may have been a more important consideration in Groups 8 and 10, with less importance placed on durable edges.

Table 17.42 shows the distribution of attributes related to reduction strategy. Information on platforms and breakage patterns was not available for the entire assemblage because of sampling, with no data available for these attributes for Groups 1 and 13. In general, Groups 6, 8, and 12 stand out from the others when these attributes are considered, though not always consistently. While tertiary flakes dominate in all assemblages, percentages for Groups 4 and 8 fall above the first standard deviation range, while the percentage of tertiary flakes falls below the first standard deviation range for Group 12. While percentages of primary flakes are also above the first standard deviation range for Group 6 and below it for Group 12, this attribute falls within the first standard deviation for Group 8. When percentages of biface flakes are considered, Groups 3, 7, and 8 fall above the first standard deviation, while Group 9 falls below it.

These data suggest that Group 12 exhibits more evidence for the earlier stages of core reduction than any of the other groups, while Group 12 and probably Group 8 exhibit more evidence for later stage reduction. Four groups contained atypical percentages of biface flakes, with Groups 3, 7, and 8 exhibiting more evidence for biface reduction than normal, and Group 9 less. While Groups 3 and 7 also contained comparatively higher percentages of modified platforms, none were noted in Group

Table 17.41. LA 129214, distribution of durability measures by analytic group; counts and row percentages.

GROUP NO.		BRITTLE	STRONG	TOUGH	**TOTAL**	**% OF TOTAL**
1	Count	35	192	130	357	**5.1%**
	Row %	9.8%	53.8%	36.4%	100.0%	**0.0%**
2	Count	98	515	339	952	**13.5%**
	Row %	10.3%	54.1%	35.6%	100.0%	**0.0%**
3	Count	44	327	210	581	**8.2%**
	Row %	7.6%	56.3%	36.1%	100.0%	**0.0%**
4	Count	10	145	146	301	**4.3%**
	Row %	3.3%	48.2%	48.5%	100.0%	**0.0%**
5	Count	20	133	68	221	**3.1%**
	Row %	9.0%	60.2%	30.8%	100.0%	**0.0%**
6	Count	164	1756	978	2898	**41.1%**
	Row %	5.7%	60.6%	33.7%	100.0%	**0.0%**
7	Count	33	188	146	367	**5.2%**
	Row %	9.0%	51.2%	39.8%	100.0%	**0.0%**
8	Count	6	55	10	71	**1.0%**
	Row %	8.5%	77.5%	14.1%	100.0%	**0.0%**
9	Count	17	165	83	265	**3.8%**
	Row %	6.4%	62.3%	31.3%	100.0%	**0.0%**
10	Count	17	336	201	554	**7.9%**
	Row %	3.1%	60.6%	36.3%	100.0%	**0.0%**
11	Count	3	27	6	36	**0.5%**
	Row %	8.3%	75.0%	16.7%	100.0%	**0.0%**
12	Count	4	13	13	30	**0.4%**
	Row %	13.3%	43.3%	43.3%	100.0%	**0.0%**
13	Count	51	182	181	414	**5.9%**
	Row %	12.3%	44.0%	43.7%	100.0%	**0.0%**
Total	**Count**	**502**	**4034**	**2511**	**7047**	**100.0%**
	Row %	**7.1%**	**57.2%**	**35.6%**	**100.0%**	

8, and Group 9 contained the second smallest percentage. Thus, platform modification partly supports the idea that these four assemblages contain atypical percentages of biface flakes. Interestingly, evidence for bipolar reduction was not common, but was noted in four different groups, suggesting that this reduction technique was fairly widespread at LA 129214.

While flake breakage patterns indicate the dominance of core reduction in all cases, percentages of lipped platforms suggest that soft hammer reduction was more common in some groups than in others. In particular, Groups 8, 3, and 2 (in descending order) exhibit much higher percentages of lipped platforms than the other groups. This is partly supported by distributional data, with Groups 3 and 8 falling above the first standard deviation, and Groups 11 and 12—neither of which contained any lipped platforms— falling below the first standard deviation range. Flake to angular debris ratios tend to be a good measure of the dominance of core versus biface reduction, and all of the ratios in Table 17.42 fall comfortably within a range indicative of core reduction. However, this ratio was atypically high for Groups 8 and 12, both of which fell above the first standard deviation for this attribute.

Flake to core ratios in Table 17.42 show a high degree of variability, with all assemblages except for Groups 3, 6, and 13 falling within the first standard deviation range. Groups 8 and 11 should be added to the list of assemblages that fall outside the first standard deviation, since neither contained any cores at all. Cores were probably removed from the parts of LA 129214 represented by these five assemblages, since flake to angular debris ratios are not indicative of systematic core reduction in any of these cases. Similarly, there was a high degree of

Table 17.42. LA 129214, reduction information for analytic groups.

ANALYTIC GROUP NO.		REDUCTION STAGE			FLAKE TYPE					PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS RATIO	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%	CORE	BIFACE	RESHARPENING	NOTCHING	BIPOLAR	UNMODIFIED	MODIFIED	SNAP FRACTURE	MANUFACTURING BREAK	PRESENT	NOT PRESENT			
1	N	169	36	44	221	26	–	–	–	no data	no data	no data	no data	no data	no data	2.77:1	22.64:1	8.50:1
	%	67.9%	14.5%	17.7%	89.5%	10.5%	–	–	–	no data	no data	no data	no data	no data	no data			
2	N	481	81	97	584	67	–	4	–	90	7	86	11	13	84	2.52:1	25.35:1	8.78:1
	%	73.0%	12.3%	14.7%	89.2%	10.2%	–	0.6%	–	92.8%	7.2%	88.7%	11.3%	13.4%	86.6%			
3	N	321	60	44	372	47	–	4	–	229	20	215	34	39	208	2.89:1	106.25:1	8.00:1
	%	75.5%	14.1%	10.4%	87.9%	11.1%	–	1.0%	–	92.0%	8.0%	86.4%	13.7%	15.8%	84.2%			
4	N	143	35	27	193	10	–	–	–	118	4	82	23	6	116	2.36:1	41.00:1	19.30:1
	%	69.8%	17.1%	13.2%	95.1%	4.9%	–	–	–	96.7%	3.3%	78.1%	21.9%	4.9%	95.1%			
5	N	129	20	19	161	7	–	–	–	79	5	47	17	8	76	3.43:1	56.00:1	23.00:1
	%	76.8%	11.9%	11.3%	95.8%	4.2%	–	–	–	94.1%	6.0%	73.4%	26.6%	9.5%	90.5%			
6	N	1683	147	164	1857	118	–	9	4	297	23	276	44	35	285	2.29:1	79.76:1	15.85:1
	%	84.4%	7.4%	8.2%	93.4%	5.9%	–	0.5%	0.2%	92.8%	7.2%	86.3%	13.8%	10.9%	89.1%			
7	N	186	40	33	224	31	1	1	1	151	13	60	34	13	151	2.59:1	51.80:1	7.32:1
	%	71.8%	15.4%	12.7%	86.8%	12.0%	0.4%	0.4%	0.4%	92.1%	7.9%	63.8%	36.2%	7.9%	92.1%			
8	N	51	4	6	52	9	–	–	–	29	–	25	2	6	23	6.10:1	no cores	5.78:1
	%	83.6%	6.6%	9.8%	85.3%	14.8%	–	–	–	100.0%	–	92.6%	7.4%	20.7%	79.3%			
9	N	126	30	28	178	4	–	–	1	128	2	120	7	4	125	2.63:1	20.44:1	44.75:1
	%	68.5%	16.3%	15.2%	97.3%	2.2%	–	–	0.6%	98.5%	1.5%	94.5%	5.5%	3.1%	96.9%			
10	N	266	68	59	378	13	–	1	1	138	1	138	1	5	133	2.67:1	32.75:1	29.23:1
	%	67.7%	17.3%	15.0%	96.2%	3.3%	–	0.3%	0.3%	99.3%	0.7%	99.3%	0.7%	3.6%	96.4%			
11	N	20	2	3	24	1	–	–	–	13	–	12	–	–	13	2.27:1	no cores	24.00:1
	%	80.0%	8.0%	12.0%	96.0%	4.0%	–	–	–	100.0%	–	100.0%	–	–	100.0%			
12	N	13	3	7	22	1	–	–	–	14	1	13	2	–	15	4.60:1	23.00:1	22.00:1
	%	56.5%	13.0%	30.4%	95.7%	4.4%	–	–	–	93.3%	6.7%	86.7%	13.3%	–	100.0%			

(Table 17.42, continued)

ANALYTIC GROUP NO.		REDUCTION STAGE			FLAKE TYPE					PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS RATIO	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%	CORE	BIFACE	RESHARPENING	NOTCHING	BIPOLAR	UNMODIFIED	MODIFIED	SNAP FRACTURE	MANUFACTURING BREAK	PRESENT	NOT PRESENT			
13	N	208	25	30	243	14	–	2	–	no data	no data	no data	no data	no data	no data	1.88:1	87.67:1	17.50:1
	%	79.1%	9.5%	11.4%	93.8%	5.4%	–	0.8%	–	no data	no data	no data	no data	no data	no data			
Mean		73.4%	12.6%	14.0%	92.5%	7.2%	–	–	–	95.6%	4.4%	86.3%	13.7%	8.2%	91.8%	3.00:1	49.70:1	18.00:1
SD		7.67	3.71	5.56	4.13	4.02	–	–	–	3.33	3.33	10.98	10.98	6.65	6.65	1.15	29.74	11.05

SD = Standard Deviation

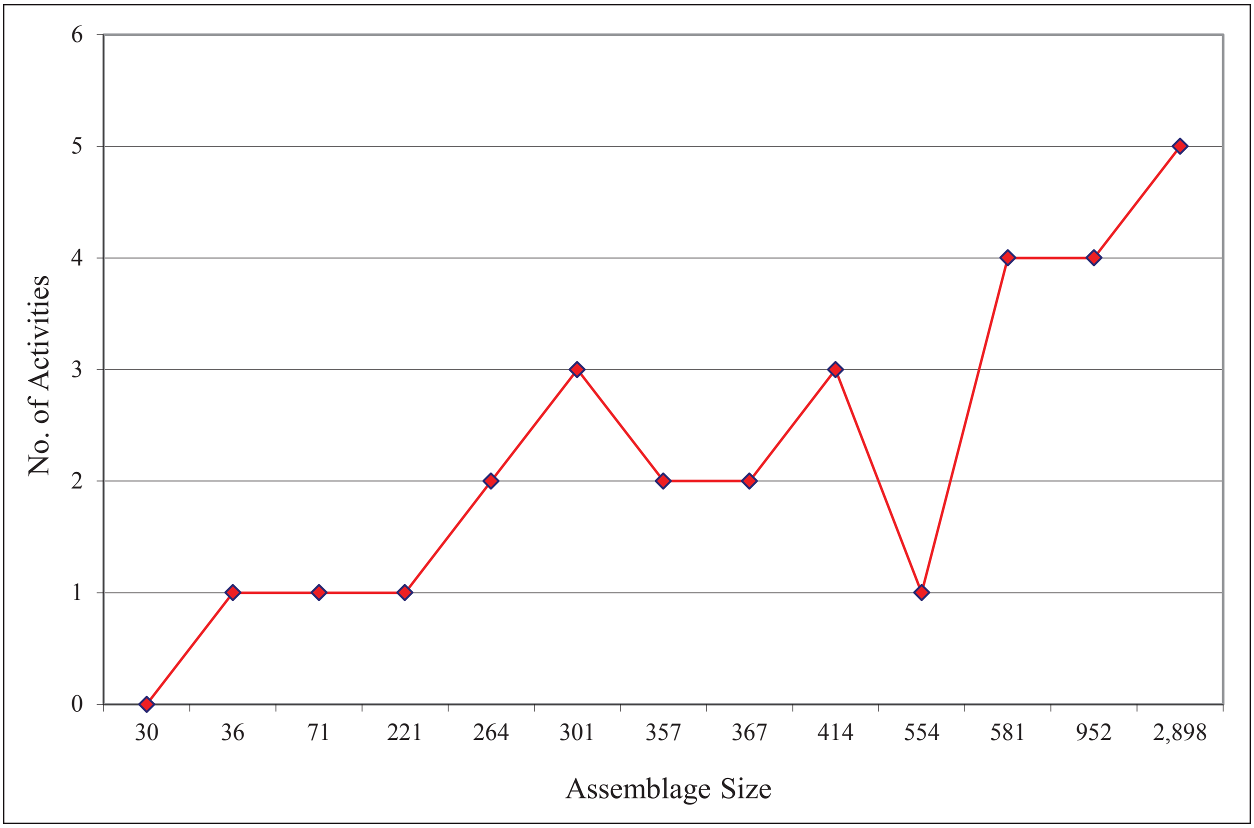

Figure 17.11. LA 129214, number of tool-using activities for analytic groups by assemblage size.

variability in core-flake to biface flake ratios, though all assemblages except for Group 8 fall within the first standard deviation range. This may indicate that atypical amounts of formal-tool manufacture occurred in Group 8.

Table 17.43a and Table 17.43b show the types of activities involving chipped stone artifacts that can be defined for each analytic group. Material selection was dominated by procurement from Pecos River gravel beds in every analytic group. There is some evidence for the local acquisition of materials in 10 groups and no direct evidence for local procurement in three. However, these conclusions are tempered by the default assignment of most unsourced cherts to Pecos River gravels, which is undoubtedly not the case. In all likelihood, local gravel beds were probably a secondary source of materials in all 13 groups, despite the representation in Table 17.43a and Table 17.43b. Comparatively significant percentages of exotic materials (2 percent or more) were identified in only one group, and sample error is responsible for that percentage. These materials were probably obtained through down-the-line exchange rather than from main source, though the latter remains a possibility.

All analytic groups were dominated by expedient core-flake reduction, with at least some bifacial flaking occurring in every case. This was especially true for Groups 1, 3, 4, 6, 7, and 13, where the presence of bifaces that had been broken or discarded because of manufacturing errors supports and enhances evidence from the debitage assemblage. Projectile points were probably made in Groups 2, 3, 6, 7, 10, and 13 because of the presence of notching flakes, with preforms broken during manufacture supporting this conclusion for Groups 6 and 13. Evidence suggests that large bifaces were made in five groups, with small bifaces being made in 11, though this is less certain in the five cases where evidence for this activity is only available from the debitage assemblage.

Several other activities are indicated for 12 analytic groups, with the most being identified for Group 6, which also yielded the largest assemblage. Figure 17.11 graphs the number of tool-using activities identified for each group by assemblage size. Two groups appear to be atypical. Group 4 contains evidence for

Table 17.43a. LA 129214, activities suggested by chipped stone assemblages, by division, for each analytic group; Divisions 1-3.

		DIVISION 1			DIVISION 2			DIVISION 3	
ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	LOCAL SOURCES	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	SMALL BIFACE REDUCTION/ MANUFACTURE	LARGE BIFACE REDUCTION/ MANUFACTURE
1	357	S	P	T	P	S	–	F	–
2	952	S	P	T	P	S	–	D	D
3	581	S	P	T	P	S	–	D, F	D
4	301	S	P	T	P	S	–	D, F	–
5	221	T	P	–	P	S	–	–	D
6	2,898	S	P	T	P	S	T	D, F	D
7	367	T	P	T	P	S	T	D, F	–
8	71	–	P	–	P	S	–	D	–
9	264	T	P	T	P	S	T	D	–
10	554	T	P	T	P	S	T	–	D
11	36	–	P	–	P	S	–	D	–
12	30	–	P	S	P	S	–	D	–
13	414	S	P	–	P	S	–	F	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.43b. LA 129214, activities suggested by chipped stone assemblages, by division, for each analytic group; Division 4.

		DIVISION 4								
ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURBISHING	MEAT PROCESSING	ARROW/DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/ BONE WORKING	CHOPPING/ HAMMERING	VEGETAL PROCESSING	GENERAL MANUFACTURE/ MAINTENANCE
1	357	–	–	–	–	–	–	I	–	I
2	952	–	–	–	F	I	I	–	–	I
3	581	–	D	–	–	I	–	–	F	I
4	301	–	–	–	–	F	–	I	–	F, I
5	221	–	–	F	–	–	–	–	–	I
6	2,898	F	–	–	–	F	F	–	F	F, I
7	367	–	–	–	–	F, I	–	–	–	I
8	71	–	–	–	–	–	–	–	–	I
9	264	–	–	–	–	–	I	–	–	F, 1
10	554	–	–	–	–	–	–	–	–	I
11	36	–	–	–	–	–	–	–	–	I
12	30	–	–	–	–	–	–	–	–	–
13	414	F	–	–	F	–	–	–	–	I

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.44. LA 129216 and LA 129222, distribution of durability measures; counts and row percentages.

SITE		BRITTLE	STRONG	TOUGH	**TOTAL**
LA 129216	Count	5	28	19	**52**
	Row %	9.6%	53.8%	36.5%	**100.0%**
LA 129222	Count	22	255	130	**407**
	Row %	5.4%	62.7%	31.9%	**100.0%**

an unexpectedly large number of activities, while Group 10 contains evidence for fewer than expected.

In general, considering the types and range of activities evident in each assemblage, all 13 groups appear to represent residential camps at which a variety of stone-tool use occurred. Assemblage sizes suggest that Groups 2 and 6 may evidence occupations of greater duration or intensity than any of the others. Unfortunately, this is probably illusory for both of these groups, since radiocarbon dates indicative of multiple occupations over wide time intervals were recovered from each.

Except for Group 1, all of the analytic groups are atypical in one way or another. However, two assemblages in particular stand out. These are Groups 6 and 12, which deviate from the norm for most of the attributes discussed above. In both of these cases, this level of deviation may be due to sample size rather than cultural or temporal factors, since these assemblages include both the largest and smallest from LA 129214.

Group 6 definitely represents multiple occupations that may be the cause of differences between this assemblage and most of the others, though multiple occupational periods can also be documented for Groups 1-5, 8-10, and 13. This may mean that there was indeed something different about one or more of the occupations represented by Group 6. In the case of Group 12, sample error is almost certainly why this assemblage appears to differ from the rest.

LA 129216

LA 129216 yielded the smallest assemblage, at 52 artifacts. All excavation areas at this site were considered part of the same analytic group, so the assemblage is discussed as a whole rather than being broken into smaller parts related to different areas. Since separating surface from subsurface artifacts would severely limit the size of this already very small assemblage, all collected proveniences are included in this discussion.

Table 17.2 shows the distribution of material types for LA 129216. Only six material types were defined in this assemblage that was dominated by unsourced cherts and quartzites—both metaquartzite and orthoquartzite. The materials recovered from this site appear to have been mainly obtained from gravel deposits. Other than a single specimen exhibiting an indeterminate type of cortex, this assemblage was dominated by waterworn cortex—32 of 33 examples. Cortex was very common on artifacts from this site, occurring on 63.46 percent. This is the largest percentage of cortical artifacts among the array of sites, with the second highest percentage at a distant 43.26 percent coming from LA 129300. This factor suggests that primary core reduction may have been more common at LA 129216 than elsewhere.

Most of the materials used at this site were probably obtained from Pecos River gravels. This is especially true for the quartzites, as well as for most of the cherts. Both of the local materials in this assemblage—San Andres chert and limestone—included specimens exhibiting waterworn cortex, indicating that even local materials were mostly or completely obtained from gravel beds. No exotic materials were identified in this assemblage.

Table 17.44 shows the distribution of materials in durability categories for LA 129216. Among the seven site assemblages, LA 129216 contained the second largest percentage of tough materials and the largest percentage of brittle materials. This seems contradictory. Indeed, percentages for both the brittle and tough materials from LA 129216 fall above the first standard deviation range. Interestingly, only LA 129218 also had two durability categories that fell outside the first standard deviation, with both the brittle and tough materials from that site falling below that range. Since these are the two smallest assemblages, sample error is probably responsible for these discrepancies rather than cultural or temporal factors.

Table 17.45 shows the distribution of attributes related to reduction strategy. While this assemblage

Table 17.45. LA 129216 and LA 129222, reduction information.

SITE		REDUCTION STAGE			FLAKE		PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS RATIO	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTIARY	SECOND-ARY 1–49%	PRIMARY 50–100%	CORE FLAKE	BIFACE FLAKE	UN-MODI-FIED	MODI-FIED	SNAP FRACT-URE	MANU-FACT-URING BREAK	PRESENT	NOT PRESENT			
LA 129216	Count	22	7	7	35	1	25	1	36	–	1	26	2.85:1	18.50:1	35.00:1
	%	61.1%	19.4%	19.4%	97.2%	2.8%	96.2%	3.9%	100.0%	–	3.7%	96.3%	–	–	–
LA 129222	Count	177	32	26	225	10	129	9	194	41	2	162	1.55:1	19.58:1	22.50:1
	%	75.3%	13.6%	11.1%	95.7%	4.3%	93.5%	6.5%	82.6%	17.5%	1.2%	98.8%	–	–	–
Mean		73.2%	13.9%	12.8%	95.5%	5.4%	94.7%	5.3%	74.4%	25.6%	4.6%	95.4%	2.24:1	62.52:1	39.66:1
SD		9.61	4.70	5.02	4.06	4.04	5.12	5.12	18.02	18.02	2.66	2.66	0.40	84.95	29.64

SD = Standard Deviation

Table 17.46a. LA 129216 and 129222, activities suggested by chipped stone assemblages for each analytic group by division; Groups 1-3.

		DIVISION 1			DIVISION 2			DIVISION 3	
ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	LOCAL SOURCES	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	SMALL BIFACE REDUCTION/ MANUFACTURE	LARGE BIFACE REDUCTION/ MANUFACTURE
LA 129216	357	S	P	–	P	S	–	–	–
LA 129222	407	S	P	T	P	S	–	F, D	D

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.46b. LA 129216 and 129222, activities suggested by chipped stone assemblages for each analytic group by division; Group 4.

		DIVISION 4								
ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURBISHING	MEAT PROCESSING	ARROW/DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/ BONE WORKING	CHOPPING/ HAMMERING	VEGETAL PROCESS-ING	GENERAL MANUFACTURE/ MAINTENANCE
LA 129216	357	–	–	–	–	–	F	–	–	I
LA 129222	407	F	F	F?	F	–	F	–	–	I

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.47. LA 129217, material types by analytic group; counts and column percentages.

MATERIAL TYPE		GROUP 1	GROUP 2	GROUP 3	GROUP 4	**TOTAL**
Chert	Count	163	8	59	30	**260**
	Col. %	79.5%	80.0%	64.8%	90.9%	**76.7%**
Edwards Plateau chert	Count	5	–	2	1	**8**
	Col. %	2.4%	–	2.2%	3.0%	**2.4%**
Possible Edwards Plateau chert	Count	6	–	2	–	**8**
	Col. %	2.9%	–	2.2%	–	**2.4%**
Silicified wood	Count	–	–	1	–	**1**
	Col. %	–	–	1.1%	–	**0.3%**
Sandstone	Count	2	–	–	–	**2**
	Col. %	1.0%	–	–	–	**0.6%**
Metaquartzite	Count	7	–	9	1	**17**
	Col. %	3.4%	–	9.9%	3.0%	**5.0%**
Purple quartzite	Count	19	1	14	1	**35**
	Col. %	9.3%	10.0%	15.4%	3.0%	**10.3%**
Orthoquartzite	Count	3	1	4	–	**8**
	Col. %	1.5%	10.0%	4.4%	–	**2.4%**
Total	**Count**	**205**	**10**	**91**	**33**	**339**
	Row %	**60.5%**	**2.9%**	**26.8%**	**9.7%**	**100.0%**

was dominated by tertiary flakes, it also contained fairly large percentages of secondary and primary flakes. In comparison with the other six sites, LA 129216 is one of three atypical examples, along with LA 129217 and LA 129218.

In the case of LA 129216, the percentage of tertiary flakes falls below the first standard deviation while those for the secondary and primary flakes fall above that range. This is opposite of the results obtained for LA 129217 and LA 129218, where the percentage of tertiary flakes falls above the first standard deviation, while the percentages of secondary and primary flakes both fall below that range. These data suggest that proportionally more early stage core reduction occurred at LA 129216 than at any of the other sites, and this is supported by other data in Table 17.45.

Only one biface flake was identified in this assemblage, and this flake also possessed the only modified platform. This distribution resulted in a moderately high core-flake to biface flake ratio. Thus, very little evidence for formal-tool manufacture or maintenance was actually found in the debitage assemblage. Little evidence for soft hammer percussion was also found, with only a single core-flake exhibiting a lipped platform. The flake to angular debris ratio for LA 129216 falls comfortably within the range associated with expedient reduction, and the flake to core ratio suggests that site occupants were not systematically reducing cores.

Table 17.46a and Table 17.46b shows the types of activities involving chipped stone artifacts that can be defined for LA 129216. Material selection was dominated by procurement from Pecos River gravels, with some use of local materials also occurring. As was the case for all of the other assemblages, local material use is probably under-represented because of the high percentage of unsourced cherts that could not be confidently assigned to either source. However, in all likelihood the Pecos Valley gravel beds served as the main source for material acquisition, with only small amounts of local materials being used for reduction at this site. No exotic materials were identified in this assemblage.

Core-flake reduction dominated at LA 129216, and was only slightly supplemented by biface reduction. The only evidence for the latter was a single flake, with no unfinished bifacial tools or tools that were broken in manufacture being recovered.

Unfortunately, the biface flake from this site was broken, so determining whether it was generated while making a large or small biface is impossible.

Since the presence of a single biface flake in a small assemblage like this can hardly be considered evidence for the manufacture of a formal tool, this

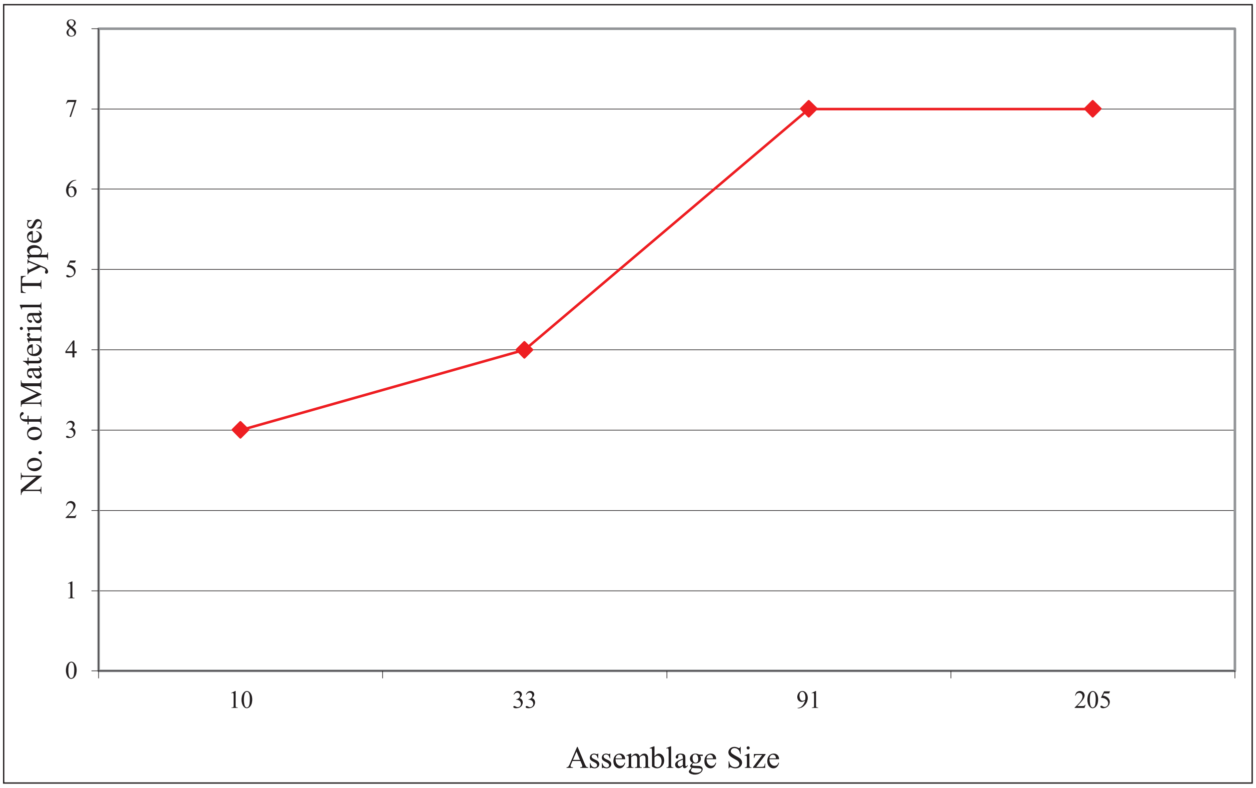

Figure 17.12. LA 129217, number of materials and exotic materials for analytic groups by assemblage size.

flake was more likely generated by tool refurbishing, though this cannot be demonstrated. The only other activities that can be suggested for LA 129216 are wood and bone working and general manufacture or maintenance.

LA 129217

LA 129217 yielded 347 chipped stone artifacts, and was divided into five analytic groups. Group 1 includes Blocks 1–2 and 5, Group 2 contains Block 6, Group 3 contains Block 3, and Group 4 is comprised of Block 4. The fifth group includes artifacts that could not be assigned to any specific analytic group, and so are not further considered in this discussion. With these artifacts eliminated, the remaining assemblage contains 339 specimens.

Table 17.47 shows the distribution of material types by analytic group. The analytic groups vary widely in size, with Group 1 containing the most artifacts and Group 2 the fewest. Groups 1 and 3 contain the same number of material types, while Groups 1, 3, and 4 all contain the same number of exotic materials. As Figure 17.12 shows, the number of material types tends to covary with assemblage size, with the smallest assemblages containing the fewest types and the largest the most.

The number of exotic materials does not correspond quite as closely with assemblage size, with one exotic material apiece occurring in the three largest assemblages and none in the smallest. However, since the smallest group contains only 10 artifacts, sample error is probably responsible for this lack. All 56 specimens that retain part of their cortical surface exhibit waterworn cortex. This suggests that most materials used at this site came from gravel deposits rather than outcrops. There is no good evidence for differences in material acquisition patterns between the various occupations represented by the analytic groups.

Table 17.48 shows the distribution of durability categories by analytic group. Though there is quite a range of variability in this table, probably mostly due to differences in sample sizes, some patterning is visible. Strong materials dominate in all four assemblages, with tough materials a distant second in three cases. Brittle materials are in the minority except in Group 4, where they are more common than tough materials. No brittle materials were

Table 17.48. LA 129217, distribution of durability measures, by analytic group; counts and row percentages.

GROUP NO.		BRITTLE	STRONG	TOUGH	**TOTAL**	**% OF TOTAL**
1	Count	18	148	39	**205**	
	Row %	8.8%	72.2%	19.0%	**100.0%**	**60.5%**
2	Count	–	7	3	**10**	
	Row %	–	70.0%	30.0%	**100.0%**	**2.9%**
3	Count	4	60	27	**91**	
	Row %	4.4%	65.9%	29.7%	**100.0%**	**26.8%**
4	Count	6	25	2	**33**	
	Row %	18.2%	75.8%	6.1%	**100.0%**	**9.7%**
Total	**Count**	**28**	**240**	**71**	**339**	
	Row %	**8.3%**	**70.8%**	**20.9%**	**100.0%**	**100.0%**
Mean		7.8%	71.0%	21.2%		
SD		7.77	4.12	11.30		

SD = Standard Deviation

found in Group 2, but considering the small size of this assemblage, this is probably due to sample error. Group 4 differs most from the other groups in that it contains a very high percentage of brittle materials and a very low percentage of tough materials, suggesting that the parameters used to select materials in this group differed from those used in the others. Indeed, all three durability classes for Group 4 fall outside their respective first standard deviations, showing that this group differs from the others for this assemblage characteristic.

Table 17.49 shows the distribution of attributes related to reduction strategy. In general, Groups 2 and 3 stand out from the others in terms of reduction stage, with Group 2 containing no primary flakes and Group 3 containing the highest percentage of primary flakes.

However, only the reduction-stage values for Group 2 consistently fall outside the first standard deviation, this would suggest that this group differs from the rest for this assemblage characteristic, except that error related to small sample size is probably ultimately responsible. When Group 2 is dropped from consideration, standard deviations drop considerably, from 6.19 to 1.35 for tertiary flakes, from 9.05 to 1.54 for secondary flakes, and from 3.65 to 2.77 for tertiary flakes. This suggests that Group 2 was skewing the distribution considerably, and in this case, sample error does not appear to be a factor.

Since small sample size is skewing values for Group 2, that assemblage is dropped from further consideration unless specifically noted. Biface flakes were identified in all three of the remaining groups, with the highest percentage occurring in Group 4 and the lowest in Group 1. When flake types are considered, the percentage of core and biface flakes for Group 4 fall outside the first standard deviation. This suggests that Group 4 contains a significantly higher percentage of biface flakes than the other groups.

By extension, this suggests that formal-tool manufacture was more common in Group 4 than it was elsewhere on the site. This is supported by higher percentages of modified platforms in Group 4, and a very low core-flake to biface flake ratio. Despite the apparent evidence for larger amounts of formal-tool reduction in Group 4, flake to angular debris ratios for all four groups fall comfortably within the range associated with an expedient reduction strategy, as do percentages for flake breakage types. Thus, while we can infer that formal-tool manufacture was more common in Group 4 than it was elsewhere on the site, this activity did not dominate in any assemblage. A lack of cores in three analytic groups either suggests that cores were transported away at the end of each occupational period, or they were actually reduced or discarded in areas outside the zones that were investigated.

Other than dart-shaft refurbishing, there was no evidence for chipped stone-tool use in these assemblages (Table 17.50a and Table 17.50b). Core reduction was the main activity pursued in all four analytic groups, with a small amount of formal-tool reduction occurring in three.

Since evidence of thermal features was found

Table 17.49. LA 129217, reduction information for analytic groups.

ANALYTIC GROUP NO.		REDUCTION STAGE			FLAKE TYPE		PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS RATIO	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%	CORE FLAKE	BIFACE FLAKE	UNMODIFIED	MODIFIED	SNAP FRACTURE	MANUFACTURING BREAK	PRESENT	NOT PRESENT			
1	Count	129	11	6	130	16	77	11	48	18	4	94	2.52:1	no cores	8.13:1
	%	88.4%	7.5%	4.1%	89.0%	11.0%	87.5%	12.5%	72.7%	27.3%	4.1%	95.9%			
2	Count	3	1	–	4	–	3	–	2	–	–	3	0.80:1	4.00:1	no biface flakes
	%	75.0%	25.0%	–	100.0%	–	100.0%	–	100.0%	–	–	100.0%			
3	Count	48	3	5	48	8	22	7	17	13	3	29	1.60:1	no cores	6.00:1
	%	85.7%	5.4%	8.9%	85.7%	14.3%	75.9%	24.1%	56.7%	43.3%	9.4%	90.6%			
4	Count	21	2	1	19	5	10	4	7	4	1	16	2.67:1	no cores	3.80:1
	%	87.5%	8.3%	4.2%	79.2%	20.8%	71.4%	28.6%	63.6%	36.4%	5.9%	94.1%			
Total, all groups	**Mean**	**84.1%**	**11.6%**	**4.3%**	**88.5%**	**11.5%**	**83.7%**	**16.3%**	**73.3%**	**26.7%**	**4.8%**	**95.2%**	**1.90:1**	**n/a**	**5.98:1**
	SD	**6.19**	**9.05**	**3.65**	**8.71**	**8.71**	**12.81**	**12.81**	**19.00**	**19.00**	**3.90**	**3.90**	**0.87**	**n/a**	**2.17**
Group 2 eliminated	Mean	87.2%	7.1%	5.7%	84.6%	15.4%	78.3%	21.7%	64.4%	35.7%	6.5%	93.6%	2.26:1	n/a	5.98:1
	SD	1.35	1.54	2.77	5.02	5.02	8.30	8.30	8.05	8.05	2.70	2.69	0.58	n/a	2.17

SD = Standard Deviation

Table 17.50a. LA 129217, activities suggested by chipped stone assemblages for each analytic group by division, Divisions 1-3.

ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	DIVISION 1			DIVISION 2			DIVISION 3	
		LOCAL SOURCE	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	SMALL BIFACE REDUCTION/ MANUFACTURE	LARGE BIFACE REDUCTION/ MANUFACTURE
1	205	T	P	S	P	S	–	D	D
2	10	–	P	–	P	S	–	–	–
3	91	–	P	S	P	–	–	D	D
4	33	–	P	S	P	S	–	D	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.50b. LA 129217, activities suggested by chipped stone assemblages for each analytic group by division, Division 4.

ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	DIVISION 4								
		PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURBISHING	MEAT PROCESSING	DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/ BONE WORKING	CHOPPING/ HAMMERING	VEGETAL PROCESSING	GENERAL MANUFACTURE/ MAINTENANCE
1	205	–	–	–	F	–	–	–	–	–
2	10	–	–	–	–	–	–	–	–	–
3	91	–	–	–	–	–	–	–	–	–
4	33	–	–	–	–	–	–	–	–	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.51. LA 129218, material type, by analytic group; counts and column percentages.

MATERIAL TYPE		GROUP 1	GROUP 2	**TOTAL**
Chert	Count	95	12	**107**
	Col. %	79.8%	63.2%	**77.5%**
Edwards Plateau chert	Count	6	1	**7**
	Col. %	5.0%	5.3%	**5.1%**
Possible Edwards Plateau chert	Count	4	–	**4**
	Col. %	3.4%	–	**2.9%**
Sandstone	Count	1	1	**2**
	Col. %	0.8%	5.3%	**1.5%**
Metaquartzite	Count	3	1	**4**
	Col. %	2.5%	5.3%	**2.9%**
Purple quartzite	Count	8	2	**10**
	Col. %	6.7%	10.5%	**7.3%**
Orthoquartzite	Count	2	2	**4**
	Col. %	1.7%	10.5%	**2.9%**
Total	**Count**	**119**	**19**	**138**
	Row %	**86.2%**	**13.8%**	**100.0%**

Table 17.52. LA 129218, distribution of durability measure, by analytic group; counts and row percentages.

GROUP NO.		BRITTLE	STRONG	TOUGH	**TOTAL**	**% OF TOTAL**
1	Count	1	97	21	**119**	**86.2%**
	Row %	0.8%	81.5%	17.6%	**100.0%**	**0.7%**
2	Count	1	12	6	**19**	**13.8%**
	Row %	5.3%	63.2%	31.6%	**100.0%**	**0.7%**
Total	**Count**	**2**	**109**	**27**	**138**	**100.0%**
	Row %	**1.4%**	**79.0%**	**19.6%**	**100.0%**	

in all four groups, these manifestations probably represent a series of short-term residential camps. Core reduction for the sake of core reduction seems unlikely, so there is a high probability that at least some of the pieces of debitage were used as informal tools, although evidence of use was not visible at the level of magnification used during analysis.

While it cannot be stated explicitly that informal-tool use occurred in the four groups, it can be suggested that these types of activities were most likely pursued.

LA 129218

LA 129218 yielded the second smallest assemblage, at 139 artifacts. This assemblage was divided into three analytic groups: Group 1 contains Blocks 2-7 and Group 2 contains Blocks 1 and 8-11. The third group consists of artifacts that could not be assigned to any specific analytic group, and so are not further considered in this discussion. With these artifacts eliminated, the remaining assemblage contains 138 specimens.

Table 17.51 shows the distribution of material types by analytic group. The groups vary widely in size, with Group 1 containing over 86 percent of the artifacts in this assemblage. With definite and possible Edwards Plateau cherts combined, both groups contain the same number of material types as well as the same number of exotic materials, despite the great difference in assemblage sizes. For this site, there is no real correspondence between number of materials, including exotics, and assemblage size. All 33 specimens that retain part of their cortical surface exhibit waterworn cortex. This suggests that most materials used at this site came from gravel deposits rather than outcrops. There is no good evidence for differences in material acquisition patterns between the various occupations represented by the analytic groups.

Table 17.52 shows the distribution of durability categories by analytic group. Most of the variability in this table is probably due to the extreme differences in sample sizes. However, a pattern similar to that seen at other sites is also visible. Strong materials dominate both assemblages, with tough materials even less apparent, and brittle materials in the minority. Since the differences between these analytic groups may be attributable to sample error, we cannot say whether they reflect variation in the parameters used to select materials.

Table 17.53 shows the distribution of attributes related to reduction strategy. Unfortunately, sample size is so small for Group 2 in particular, that little meaning can be derived from the patterns displayed for that assemblage. The later stages of core reduction dominated the reduction sequence in Group 1, augmented by a very small amount of formal-tool reduction as evidenced by a single biface flake in that group.

The comparative insignificance of tool reduction is supported by a high ratio of core-flakes to biface flakes, and a very low flake to angular debris ratio. Interestingly, the high percentage of lipped platforms in Group 1 suggests that soft hammer percussion was fairly common, though hard hammer reduction probably dominated. For Group 2, we can only conclude that core reduction was accomplished in that part of the site. This is supported by a total lack of biface flakes, modified platforms, and evidence for soft hammer percussion, and by a fairly low flake to angular debris ratio. The lack of cores in both groups either indicates that cores were transported elsewhere at the end of each occupational period, or they were actually reduced and discarded elsewhere on the site.

Table 17.54a and Table 17.54b show the activities involving chipped stone tools that can be defined for both groups. Other than core reduction, no other activities are visible in Group 2. The only biface flake from Group 1 was whole and was shorter than 15 mm, so it could have been removed from any size of biface, and can only be considered evidence of general biface reduction.

Wood or bone working is suggested by the occurrence in Group 1 of a scraper-graver made on a piece of debitage, and general manufacture/maintenance activities are indicated by the presence of four informal tools. Thus, while a small range of chipped stone-tool use can be documented for Group 1, suggesting that the site functioned as a short-term residential camp, the only activity evident in the small Group 2 assemblage is core reduction, suggesting that this group represents an activity area associated with a residential occupation elsewhere on the site.

LA 129222

LA 129222 yielded a moderate-sized assemblage of 407 artifacts. All excavation areas at this site were considered part of the same analytic group, so the assemblage is discussed as a whole rather than being broken into smaller parts related to different areas. Since separating surface from subsurface artifacts would severely limit the size of this assemblage, all collected proveniences are included in this discussion.

Table 17.2 shows the distribution of material types for LA 129222. Ten material types were defined in this assemblage, which was dominated by unsourced cherts and quartzites (both metaquartzite and orthoquartzite). These materials were predominantly obtained from gravel deposits. Other than single pieces of chert and limestone with non-waterworn cortex and a piece of sandstone with an indeterminate type of cortex, waterworn cortex was dominant (120 examples). Cortex was comparatively uncommon on artifacts from this site, occurring on only 27.03 percent of the assemblage, which is the third smallest percentage of cortical artifacts among the array of analyzed sites. This factor suggests that the later stages of core reduction were more prevalent at this site than elsewhere.

Most of these materials were probably obtained from Pecos River gravels. This is especially true for the quartzites, as well as for most of the cherts. The limestone and chert specimens that exhibit non-waterworn cortex are evidence for local procurement of materials from outcrops. Other local limestones and cherts were undoubtedly obtained from gravel beds, though not necessarily those deposited by the Pecos River.

Table 17.44 also shows the distribution of materials in durability categories for LA 129222. In comparison with the other assemblages (Table 17.6), percentages in each durability category for LA 129222 can be considered normal, with all falling within the first standard deviation. While strong materials dominate this assemblage, tough materials are also quite common. Brittle materials are comparatively un-

Table 17.53. LA 129218, reduction information for analytic groups.

GROUP NO.		REDUCTION STAGE			FLAKE TYPE		PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS RATIO	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%	CORE FLAKE	BIFACE FLAKE	UNMODIFIED	MODIFIED	SNAP FRACTURE	MANUFACTURING BREAK	PRESENT	NOT PRESENT			
1	Count	65	8	4	76	1	41	1	33	–	5	48	1.98:1	no cores	78.00:1
	Row %	84.4%	10.4%	5.2%	98.7%	1.3%	97.6%	2.4%	100.0%	–	9.4%	90.6%	–	–	–
2	Count	11	1	3	15	–	9	–	4	–	–	11	3.75:1	no cores	no biface flakes
	Row %	73.3%	6.7%	20.0%	100.0%	–	100.0%	–	100.0%	–	–	100.0%	–	–	–

Table 17.54a. LA 1292178, activities suggested by chipped stone assemblages for each analytic group by division, Divisions 1-3.

ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	DIVISION 1			DIVISION 2			DIVISION 3
		LOCAL SOURCES	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE-FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	BIFACE REDUCTION/ MANUFACTURE
1	119	T	P	S	P	T	–	D
2	19	S	P	S	P	–	–	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.54b. LA 129218, activities suggested by chipped stone assemblages for each analytic group by division, Division 4.

ANALYTIC GROUP NO.	ASSEMBLAGE SIZE	DIVISION 4								
		PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURBISHING	MEAT PROCESSING	ARROW/DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/BONE WORKING	CHOPPING/ HAMMERING	VEGETAL PROCESS-ING	GENERAL MANUFACTURE/ MAINTENANCE
1	119	–	–	–	–	–	F	–	–	I
2	19	–	–	–	–	–	–	–	–	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.55. LA 129300, material type, by analytic group; counts and column percentages.

MATERIAL TYPE		GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	**TOTAL**
Chert	Count	86	19	37	18	67	10	**237**
	Col. %	76.1%	26.8%	62.7%	60.0%	71.3%	90.9%	**62.7%**
Pedernal chert	Count	–	1	–	–	–	–	**1**
	Col. %	–	1.4%	–	–	–	–	**0.3%**
San Andres chert	Count	1	–	–	–	–	–	**1**
	Col. %	0.9%	–	–	–	–	–	**0.3%**
Edwards Plateau chert	Count	–	1	–	1	–	–	**2**
	Col. %	–	1.4%	–	3.3%	–	–	**0.5%**
Possible Edwards Plateau chert	Count	–	–	1	1	–	–	**2**
	Col. %	–	–	1.7%	3.3%	–	–	**0.5%**
Silicified wood	Count	2	1	1	1	7	1	**13**
	Col. %	1.8%	1.4%	1.7%	3.3%	7.5%	9.1%	**3.4%**
Red rhyolite	Count	2	–	–	–	–	–	**2**
	Col. %	1.8%	–	–	–	–	–	**0.5%**
Limestone	Count	1	30	1	–	–	–	**32**
	Col. %	0.9%	42.3%	1.7%	–	–	–	**8.5%**
Sandstone	Count	–	–	2	1	–	–	**3**
	Col. %	–	–	3.4%	3.3%	–	–	**0.8%**
Mudstone	Count	–	–	–	–	1	–	**1**
	Col. %	–	–	–	–	1.1%	–	**0.3%**
Metaquartzite	Count	8	1	2	3	8	–	**22**
	Col. %	7.1%	1.4%	3.4%	10.0%	8.5%	–	**5.8%**
Purple quartzite	Count	11	18	15	3	8	–	**55**
	Col. %	9.7%	25.4%	25.4%	10.0%	8.5%	–	**14.6%**
Orthoquartzite	Count	2	–	–	2	3	–	**7**
	Col. %	1.8%	–	–	6.7%	3.2%	–	**1.9%**
Total	**Count**	**113**	**71**	**59**	**30**	**94**	**11**	**378**
	Row %	**29.9%**	**18.8%**	**15.6%**	**7.9%**	**24.9%**	**2.9%**	**100.0%**

common, and fall in the middle of the range shown in Table 17.6. This suggests that formal-tool manufacture was probably not an important consideration in materials acquisition for this site.

Table 17.45 shows the distribution of attributes related to reduction strategy. This assemblage was dominated by tertiary flakes and contained rather small percentages of secondary and primary flakes. In comparison with the other sites, percentages of all three flake categories from LA 129222 fall within the first standard deviation, suggesting that there is nothing out of the ordinary for this attribute. These percentages indicate that a small amount of early stage core reduction occurred at this site, but the later stages of reduction predominated. A dominance of core reduction rather than tool manufacture is indicated by other data shown in Table 17.45. Biface flakes comprise only a small part of this assemblage, indicating that some formal-tool manufacture occurred but was not common. This is also suggested by a very low flake to angular debris ratio that indicates reliance on an expedient reduction strategy. Though the percentage of modified platforms is higher than the percentage of biface flakes, all flakes with modified platforms were classified as biface flakes, so this difference merely reflects the absence of flakes with missing or obscured platforms from this part of the table. Flake breakage percentages are indicative of core reduction rather than tool manufacture, and the presence of only two flakes with lipped platforms suggests that most reduction was accomplished with hard hammers, which is also consistent with a dominance of core reduction. The flake to core ratio indicates that cores were not systematically reduced.

Table 17.46 shows the types of activities involving chipped stone artifacts that can be defined for LA 129222. Material selection was dominated by procurement from Pecos River gravels, with some use of local materials also occurring. As was the case for the other sites, the use of local materials is probably under-represented because of the high percentage of unsourced cherts that could be either local or from Pecos gravels, but cannot be confidently assigned to either source. However, in all likelihood the Pecos River gravels served as the main source for material acquisition, with only small amounts of local materials being used at this site. In addition, a few probable exotic materials were noted, suggesting interaction with groups located to both the east and west of the study area.

Core-flake reduction dominated at LA 129222, but some formal-tool manufacture also occurred, as evidenced by the presence of two projectile point preforms. Some biface re-sharpening may also have occurred, as suggested by the presence of a reworked projectile point. Meat processing can be inferred by the presence of a medial fragment of a projectile point that was probably transported back to the site in a meat package, though the lack of diagnostic breaks on this tool renders this possibility uncertain. A reworked projectile point that exhibits an impact-fractured distal end is indicative of shaft refurbishing, while the presence of several informal tools can only be used to infer general manufacture/maintenance activities.

LA 129300

LA 129300 yielded 429 chipped stone artifacts, and was divided into seven analytic groups: Group 1 contains Block 1; Group 2 includes Blocks 2 and 4; Group 3 is comprised of Blocks 6, 10, and 12; Group 4 contains Blocks 5 and 13; Group 5 includes Blocks 7, 9, and 11; and Group 6 is comprised of Blocks 3, 8, and 14. The seventh group includes artifacts that could not be assigned to any specific analytic group, and so are not further considered in this discussion. With those artifacts removed, the remaining assemblage contains 378 specimens.

Table 17.55 shows the distribution of material types by analytic group. The analytic groups vary widely in size, with Groups 1 and 5 being the largest and Group 6 the smallest. With definite and possible Edwards Plateau cherts combined, it is no surprise that Group 1 contains the largest variety of material types. However, the second smallest assemblage—Group 4—contains the same number of material types, while the second largest assemblage—Group 5—contains the second smallest number. As Figure 17.13 shows, there is some correspondence between assemblage size and number of material types in each assemblage, though Group 5 is atypical in that it contains slightly fewer material types than do the next three smaller assemblages.

There is no correspondence between assemblage size and number of exotic materials represented, with neither of the two largest assemblages containing any recognizable exotics at all. This suggests that there might be a difference between Groups 1 and 5 and the others that could be further explored using other types of data. If differences are consistently found, this possibility will be upheld. However, if consistent differences between these two assemblages and the rest are not found, we can conclude that error due to sample size is responsible.

Materials used at LA 129300 were mainly obtained from Pecos River gravels, though some use of local gravel beds as well as long-distance exchange are also indicated. Of 159 specimens that retain part of their cortical surface, only three—1.89 percent—exhibit non-waterworn cortex, including two pieces of unsourced chert and one of limestone. These specimens were probably obtained locally, and all three are from Group 2, which also contains the most varieties of exotic materials. Thus, materials in Group 2 were mostly obtained from Pecos River gravels, but there was also some use of local outcrops as well as exchange with groups living to the east and west.

Materials in Group 1 were mostly obtained from Pecos River gravels, but the presence of a piece of San Andres chert with waterworn cortex also suggests procurement from local gravel beds. Since the piece of limestone in Group 1 lacked any cortex, it can only be used to indicate local acquisition from gravel beds or outcrops. Only Pecos River gravels appear to have been exploited in Group 5. Materials in Groups 3 and 4 were mainly acquired from Pecos River gravels, supplemented by a little exchange with groups to the east. Some exploitation of local gravels is probably also indicated by the presence of pieces of sandstone debitage exhibiting waterworn cortex in both of these assemblages. Local materials are probably under-represented in all analytic groups because of the high percentage of unsourced cherts that could either be local or from Pecos River gravels, but cannot be confidently assigned to either. In all likelihood, Pecos River gravels served as the main source for material acquisition, with

Table 17.56. LA 129300, distribution of durability measures, by analytic group; counts and row percentages.

GROUP NO.		BRITTLE	STRONG	TOUGH	**TOTAL**	**% OF TOTAL**
1	Count	6	69	38	**113**	**29.9%**
	Row %	5.3%	61.1%	33.6%	**100.0%**	**0.3%**
2	Count	1	18	52	**71**	**18.8%**
	Row %	1.4%	25.4%	73.2%	**100.0%**	**0.3%**
3	Count	2	35	22	**59**	**15.6%**
	Row %	3.4%	59.3%	37.3%	**100.0%**	**0.3%**
4	Count	–	17	13	**30**	**7.9%**
	Row %	–	56.7%	43.3%	**100.0%**	**0.3%**
5	Count	1	62	31	**94**	**24.9%**
	Row %	1.1%	66.0%	33.0%	**100.0%**	**0.3%**
6	Count	1	8	2	**11**	**2.9%**
	Row %	9.1%	–	–	**–**	**–**
Total	**Count**	**11**	**209**	**158**	**378**	**100.0%**
	Row %	**2.9%**	**55.3%**	**41.8%**	**100.0%**	
Mean		3.4%	56.9%	39.8%		
SD		3.38	16.44	18.38		
Mean, all but Group 6		2.2%	53.7%	44.1%		
SD, all but Group 6		2.11	16.19	16.80		

SD = Standard Deviation

only small amounts of local materials being used at this site.

Table 17.56 shows the distribution of durability categories by analytic group. Though there is quite a bit of variability in this table, probably mostly due to differences in sample sizes, some patterning is visible. Strong materials dominate in five assemblages, with tough materials a distant second in four of those cases. Brittle materials are in the minority in each analytic group, with none being identified in Group 4. Group 2 is more unusual than the other groups because it is dominated by tough materials that comprise nearly three-quarters of this assemblage.

Tough materials are also quite common in Group 4, though this distribution could be due to sample error, considering the small size of that assemblage. These data suggest that parameters used to select materials in Group 2 and possibly Group 4 differed from those used in the others. When examined more closely, it is Groups 2 and 6 that differ most. Only these assemblages have percentages for durability categories that fall outside the first standard deviation range, and in both cases there are two durability categories outside that range. Group 2 had a lower-than-expected percentage for strong materials, and a higher-than-expected percentage for tough materials. Conversely, Group 6 has a higher-than-expected value for brittle materials and a lower-than-expected value for the tough materials.

Considering the small size of the Group 6 assemblage, sample error could be responsible for some of the durability values derived for this group, affecting the standard deviations for this analysis. For that reason, Group 6 was dropped from consideration, and the durability class percentages were reassessed.

With Group 6 dropped, three assemblages had at least one durability category that fell outside the first standard deviation, and only Group 2 had two (brittle for Groups 1 and 4, strong and tough for Group 2). This suggests that only Group 2 is significantly different from the others, unless sample error was not responsible for the values in Group 6, as assumed.

Table 17.57 shows the distribution of attributes related to reduction strategy. In general, Groups 2 and 6 appear to stand out from the rest, though not consistently through each variable in Table 17.57. However, once again sample error is probably responsible for the variation seen in Group 6 that con-

Table 17.57. LA 129300, reduction information for analytic groups.

ANALYTIC GROUP NO.		REDUCTION STAGE			FLAKE TYPE		PLATFORM CATEGORY		BREAK TYPE		PLATFORM LIPPING		FLAKE: ANGULAR DEBRIS RATIO	FLAKE: CORE RATIO	CORE FLAKE: BIFACE FLAKE RATIO
		TERTIARY 0%	SECONDARY 1–49%	PRIMARY 50–100%	CORE FLAKE	BIFACE FLAKE	UNMODIFIED	MODIFIED	SNAP FRACTURE	MANUFACTURING BREAK	PRESENT	NOT PRESENT			
1	Count	46	23	9	78	–	54	–	16	5	–	63	2.52:1	26.00:1	no biface flakes
	Row %	59.0%	29.5%	11.5%	100.0%	–	100.0%	–	76.2%	23.8%	–	100.0%	–	–	–
2	Count	28	2	6	35	1	22	1	10	9	–	27	1.06:1	no cores	35.00:1
	Row %	77.8%	5.6%	16.7%	97.2%	2.8%	95.7%	4.4%	52.6%	47.4%	–	100.0%	–	–	–
3	Count	26	6	9	39	2	28	1	5	6	–	35	2.47:1	no cores	20.00:1
	Row %	63.4%	14.6%	22.0%	95.1%	4.9%	96.6%	3.5%	45.5%	54.6%	–	100.0%	–	–	–
4	Count	20	3	3	24	2	15	1	8	–	1	19	8.67:1	no cores	12.00:1
	Row %	76.9%	11.5%	11.5%	92.3%	7.7%	93.8%	6.3%	100.0%	–	5.0%	95.0%	–	–	–
5	Count	33	18	9	60	–	46	–	11	–	3	47	2.18:1	15.25:1	no biface flakes
	Row %	55.0%	30.0%	15.0%	100.0%	–	100.0%	–	100.0%	–	6.0%	94.0%	–	–	–
6	Count	6	–	3	9	–	5	–	3	–	–	6	4.50:1	1.29:1	no biface flakes
	Row %	66.7%	–	33.3%	100.0%	–	100.0%	–	100.0%	–	–	100.0%	–	–	–
Mean, all but Group 6		66.4%	18.2%	15.3%	96.9%	3.1%	97.2%	2.8%	74.9%	25.1%	2.2%	97.8%	3.38:1	n/a	n/a
SD, all but Group 6		10.42	11.00	4.31	3.30	3.30	2.76	2.76	25.62	25.62	3.03	3.03	3.02	n/a	n/a

SD = Standard Deviation

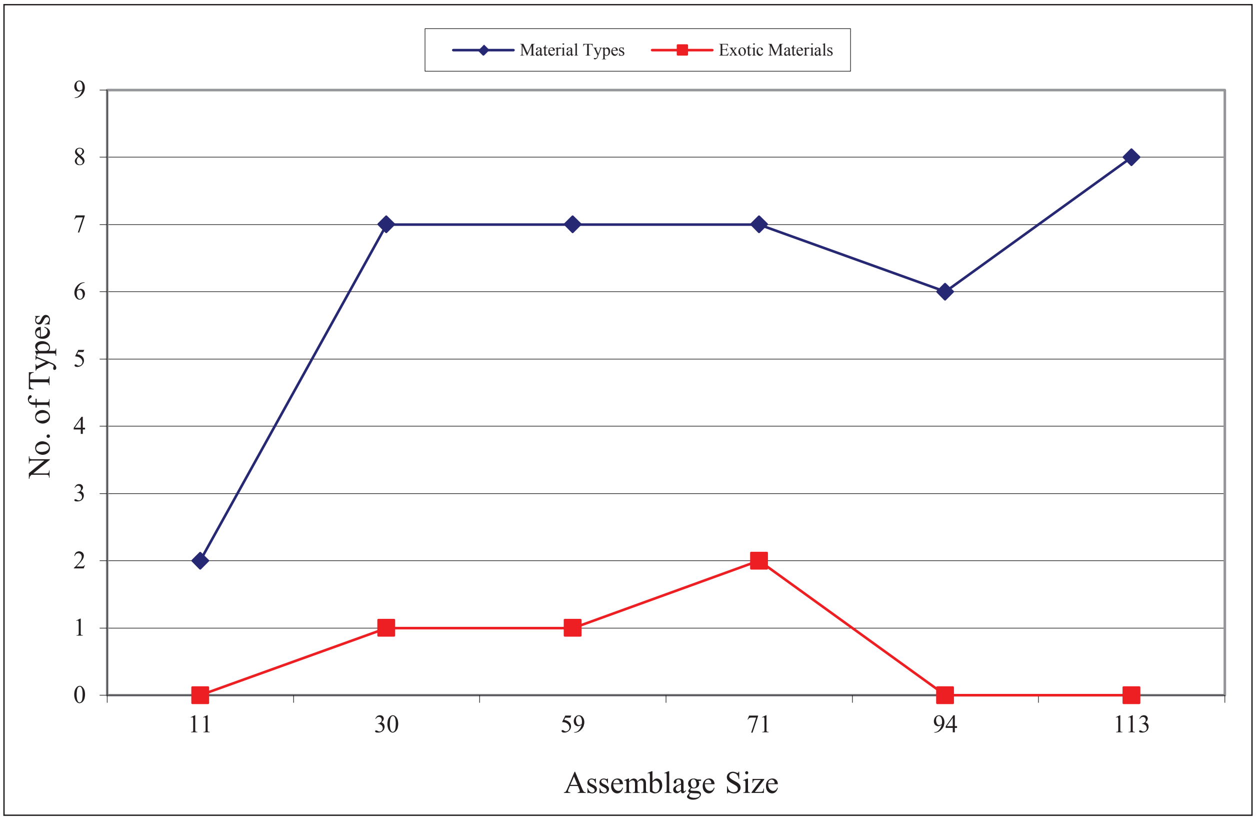

Figure 17.13. LA 129300, number of materials and exotic materials for analytic groups by assemblage size.

tains no secondary flakes or biface flakes, and in which cores are over-represented. Thus, this assemblage is again dropped from consideration.

When standard deviations for reduction stages are considered, no assemblage consistently falls outside the first standard deviation, but percentages for tertiary and secondary flakes fall outside their respective first standard deviations for both Groups 2 and 5. While tertiary flakes are over-represented and secondary flakes are under-represented for Group 2, the opposite is true for Group 5. This suggests a greater-than-average focus on the later stages of reduction for Group 2, and a less-than-average focus on the earlier stages of reduction for Group 5. Interestingly, these conclusions are not well supported by any of the other data sets.

Evidence for formal-tool reduction was found in three assemblages, including Group 2 but not Group 5. This partly supports the previous conclusions, providing some evidence for later stage reduction for Group 2 and none for Group 5. Variation in percentages of biface flakes and modified platforms are not reliable indicators for this site, because small assemblage sizes tend to greatly inflate percentages for these attributes when only one or two examples are present.

However, it should be noted that only Group 4 falls outside the first standard deviation range for both flake types. Flake break type distributions are indicative of core reduction except, perhaps, for Group 3 where manufacturing breaks are more common than elsewhere. However, the percentage shown in Table 17.57 is not high enough to suggest that efficient reduction was dominant in this group, though it may have been more important here than elsewhere. Lipped platforms were only identified in Groups 4 and 5 and suggest that some soft hammer reduction occurred in those groups. However, the lack of lipped platforms in Group 3 coupled with the presence of only two biface flakes suggests that mostly core reduction was accomplished in that group.

Flake to angular debris ratios suggest expedient reduction for all analytic groups, with the possible exception of Group 4, which had the highest ratio, and the only one that was outside the first standard deviation range. The ratio of core-flakes to biface flakes is also lowest for Group 4, again suggesting that efficient reduction was more important in this group. However, this possibility is supported by no other data set in Table 17.57. Flake to core ratios suggest that only a few flakes were struck from a comparatively large number of cores in Group 6, and that all cores were either carried off at the end of the occupations represented by Groups 2–4, or that core reduction and discard actually occurred elsewhere on the site.

Table 17.58a and Table 17.58b show the types of activities involving chipped stone artifacts that can be defined for each analytic group. Material selection appears to have been dominated by procurement from Pecos River gravels in every analytic group. There is some evidence for the local acquisition of materials in four groups, and no direct evidence for local procurement in two.

However, these conclusions are tempered by a default assigning of the unsourced cherts to Pecos River gravels that is undoubtedly not true in all cases. In all likelihood, local deposits—in this case primarily gravel beds—were a secondary source of materials in all six groups, despite the representation in Table 17.58a and 17.58b. Comparatively significant percentages of exotic materials—2 percent or more—were identified in two analytic groups, and trace amounts were recovered from a third. These materials were probably obtained through down-the-line exchange rather than directly from sources. In reality, exotic sources were probably of tertiary importance, with local sources serving a secondary role, as implied above.

All analytic groups were dominated by expedient core-flake reduction, with at least some bifacial flaking also occurring in three cases. This is especially true for Group 2, where the presence of a biface that was broken and discarded during manufacture supports and enhances evidence from the debitage assemblage. While formal-tool manufacture could have been aimed at the production of projectile points, no evidence that would directly support this possibility was recovered. The data suggest that large bifaces were manufactured in Group 2, with small bifaces being manufactured in Groups 3 and 4, though this is less certain in the latter cases where evidence for this activity is only available from the debitage assemblage.

Various other activities are also suggested for at least five of the six assemblages from LA 129300. In four cases, only one additional activity is suggested by the presence of either formal or informal tools. However, at least two additional activities are suggested by formal and informal tools in Group 5. The only consistency is evidence for the occurrence of general manufacture/maintenance activities in three groups, which is shorthand for saying that informal tools that could not be assigned to more specific tasks were the only tools present. The recovery of an apparent reworked Marcos Point in Group 4 suggests that tool refurbishing may have occurred during that occupation. Unfortunately, this possibility remains tenuous since the reworked point could simply have been transported to LA 129300 and lost there.

This analysis suggests that only Groups 1 and 3 can be considered "normal" in terms of the attributes discussed by this analysis, with something out of the ordinary occurring in the other four assemblages. However, Groups 2 and 5 tend to stand out from the rest, since they are more consistently different. To the evidence on reduction presented here can be added some discrepancies noted in the distributions of material types, with Group 2 containing more than the expected number of exotic materials, and Group 5 containing fewer than expected exotics as well as fewer materials overall. While Group 6 was also consistently different, in this case sample error rather than cultural or temporal factors are probably responsible.

The apparent "normalness" of Groups 1 and 3 is interesting, since a Paleoindian period Golondrina point was recovered from Group 3 and we would expect that assemblage to look different from the others if the presence of that projectile point was a good indication of occupational date. Three radiocarbon dates were obtained for Group 3, one suggesting an occupation during the Early Archaic ca. 4250 BC, and two suggesting a single use during the mid-AD 600s. If the Golondrina point was lost or discarded during Paleoindian use of this area, three widely spaced periods of occupation are suggested for Group 3. However, if the Golondrina point represents a salvaged tool, as is more likely, only two widely spaced periods of occupation are indicated.

This is important because a second Golondrina point was also recovered from the surface of LA 129300, and could not be accurately assigned to an analytic group. The occurrence of two Paleoindian points of the same type on a single site is suspicious and potentially indicative of a Paleoindian occu-

Table 17.58a. LA 129300, activities suggested by chipped stone assemblages for each analytic group by division; Divisions 1-3.

GROUP NO.	ASSEMBLAGE SIZE	DIVISION 1			DIVISION 2			DIVISION 3	
		LOCAL SOURCES	PECOS RIVER GRAVELS	DISTANT SOURCES	CORE/FLAKE REDUCTION	BIFACE REDUCTION	BIPOLAR REDUCTION	SMALL BIFACE REDUCTION/ MANUFACTURE	LARGE BIFACE REDUCTION/ MANUFACTURE
1	113	T	P	–	P	–	–	–	–
2	71	S	P	S	P	S	–	–	F, D
3	59	S	P	T	P	S	–	D	–
4	30	S	P	S	P	S	–	D	–
5	94	–	P	–	P	–	–	–	–
6	11	–	P	–	P	–	–	–	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

Table 17.58b. LA 129300, activities suggested by chipped stone assemblages for each analytic group by division; Division 4.

GROUP NO.	ASSEMB-LAGE SIZE	DIVISION 4								
		PROJECTILE POINT MANUFACTURE	BIFACIAL TOOL REFURBISHING	MEAT PROCESSING	ARROW/DART SHAFT REFURBISHING	LEATHER WORKING	WOOD/BONE WORKING	CHOPPING/ HAMMERING	VEGETAL PROCESSING	GENERAL MANUFACTURE/ MAINTENANCE
1	113	–	–	–	–	–	–	–	–	I
2	71	–	–	–	–	I	F	–	–	–
3	59	–	–	–	–	–	–	–	–	I
4	30	–	F	–	–	–	–	–	–	–
5	94	–	–	–	–	–	F	–	–	I
6	11	–	–	–	–	–	–	–	–	–

P = primary, >50% of assemblage
S = secondary, >2% and <50% of assemblage
T = trace amount, <2% of assemblage
F = evidence from formal tool assemblage
I = evidence from informal tool assemblage
D = evidence from debitage assemblage

pation at this location. Unfortunately, without corroborating data we cannot confidently conclude that part of the Group 3 assemblage represents that occupation. But if it does, few differences, other than projectile points, may exist between Paleoindian assemblages and those deposited during the later Archaic and Neoarchaic periods, making it difficult to distinguish these occupations without corroborating radiocarbon dates and diagnostic artifacts.

Summary and Conclusions

The discussions in this chapter have been wide ranging, and include considerations at both the site and analytic group levels. Rather than representing discrete components, the analytic groups were defined spatially and do not necessarily include materials from single occupations, as would be preferable. Indeed, both levels of analysis were hampered by a mixture of artifacts derived from different uses of these locations, as demonstrated by radiocarbon and artifact-related dates indicative of multiple occupations at both the site and analytic group levels. Thus, these manifestations represent palimpsests in which materials from multiple occupations overlap and are mixed to an extent that makes them impossible to separate at this level of analysis.

Nonetheless, there is a consistency to the data that suggests continuity in reduction strategies over time, beginning with at least the Early Archaic and continuing through the Neoarchaic into the Protohistoric period. Throughout this occupational sequence, material selection was dominated by the acquisition of rocks from Pecos River gravels, supplemented by the procurement of some materials from local outcrops and gravel beds, and by exchange for a few exotic materials. While the use of exotics seems to have been more important in some analytic groups than in others, the comparative importance is often inflated by sample error, where one or two pieces imply a level of importance in the procurement system that was probably never true prehistorically.

Because most materials were obtained as mechanically transported nodules from gravel deposits, core size was comparatively small for most materials, limiting their utility in formal-tool manufacture. This factor contributed to the dominance of an expedient reduction strategy through time. While efficient strategies focused on the manufacture and use of large generalized bifaces are usually considered to be a hallmark of a mobile hunter-gatherer lifestyle, reduction strategy was also dependent on the types and sizes of materials available for tool manufacture. Most hunter-gatherers probably used a combination of efficient and expedient reduction, depending on the availability of suitable materials and the requirements of their settlement and subsistence systems. Kelly (1988) associates curated strategies with mobility, while Bamforth (1986) argues that they are more closely related to the availability of high-quality materials. Both positions are probably correct.

Studies at Archaic sites near San Ildefonso showed a differential reduction of local and exotic materials (Moore 1993, 2001). While local materials were primarily reduced expediently, exotics were mostly used to make curated bifaces. Exotic materials were reduced efficiently because they were desirable, of high quality, and in limited supply. Local materials were expediently reduced because they were easily obtained and plentiful, making conservation unnecessary.

A similar situation was encountered during the examination of chipped stone assemblages near Santa Teresa in southern New Mexico (Moore 1996). There, both Archaic and ceramic period chipped stone assemblages showed a focus on expedient reduction resulting from the limited local availability of high-quality, tool-stone nodules large enough for the manufacture of large bifaces. Temporal differences were noted in material procurement sources, with the Archaic assemblage demonstrating a greater dependence on nonlocal materials. Some evidence for the use of large bifaces was found in the Archaic assemblage, indicating that efficient reduction did play a role in that subsistence system, but was simply not an important factor in reduction at that particular location because available nodules were too small for any but expedient reduction.

A similar situation prevails in the current study. The high-quality, tool-stone nodules that were available in Pecos River gravels and in local sources appear to have been limited in size, precluding the manufacture of many large generalized bifaces, especially within the study area. However, there is evidence that large bifaces were used in some analytic groups at most of these sites.

Evidence for large biface reduction was found in three analytic groups at LA 113042, five at LA 129214, two at LA 129217, one in the LA 129222 assemblage, and in one analytic group at LA 129300. This suggests a situation similar to that seen in the Santa Teresa assemblage: large bifacial tools were indeed made and used, and probably included large generalized bifaces. The manufacture of these tools mostly occurred elsewhere in the settlement system, though some reduction was carried out in the study area.

However, the manufacture of efficient tools made in anticipation of use was not a reduction focus, because tool-stone nodules of sufficient size were not common. Rather, reduction focused on the expedient removal of flakes from cores for informal use and to serve as blanks for the manufacture of comparatively small formal bifacially flaked tools.

Considering the nature of all seven sites, their lack of visible structural remains and the small number of chipped stone artifacts discarded at those locations, we can conclude that these sites represent amalgams of overlapping short-term residential camps. A variety of stone-tool use activities was performed at most of these sites and in most of the analytic groups, suggesting that they were foraging camps rather than logistical camps focused on the acquisition of targeted resources. While atypical groups were noted at all of the sites that were broken into multiple analytic groups, this analysis was not detailed enough to allow determination of what those atypical examples mean. While at least some of the atypical assemblages could be evidence of variation in occupational type on a cultural or temporal basis, the multioccupational nature of most if not all of the analytic groups must also be taken into account.

Thus, the main conclusions that can be made from this analysis are threefold, concerning generalities of material procurement, reduction strategy, and range of activities performed. To reiterate, material procurement focused on Pecos River gravels, resulting in the use of materials that were not native to the region, but that originally outcropped far to the north. Cherts from the Madera formation of north-central New Mexico appear to have been particularly important, though this was not closely tracked during analysis.

Local cherts, limestone, sandstone, and other materials were of secondary importance, and that importance was probably under-represented in this analysis by the necessity of assigning most cherts to a general unsourced category. Materials were imported in small amounts from both the east and west, with probable Pedernal chert and obsidian almost certainly being obtained from groups located to the west with access to gravel beds along the Rio Grande. Edwards Plateau, Alibates, and Tecovas cherts were obtained from groups with access to outcrops and gravel sources in Texas. Both the number of individual materials and the number of exotic materials tend to covary with assemblage size, both on intrasite and inter-site levels. There are a few exceptions to this, and those exceptions may be important, especially at LA 129300.

As already discussed, reduction focused on the expedient removal of flakes from cores in all assemblages though there was limited evidence for the manufacture and use of large bifaces in most site assemblages, indicating a probable secondary reliance on an efficient, or curated, reduction strategy. The types and ranges of chipped stone-tool use defined for most analytic groups suggest that these locations mainly functioned as residential camps. Since, in general, the number of activities represented also tends to covary with assemblage size the groups that demonstrated performance of the most activities were simply occupied more intensively or for longer periods of time than were those that contain evidence for only a few activities. Thus, it would be difficult to ascribe cultural or temporal differences between sites and analytic groups solely on the basis of the number and types of activities performed.

Despite the mixed condition of these site assemblages resulting from multiple, overlapping occupations over, perhaps, several thousand years, we were able to derive quite a bit of information from the database. While a finer-grained analysis focusing on even smaller subdivisions of analytic groups based on the areal distribution of features and artifacts might allow a more accurate discrimination of materials related to individual occupations, this is not guaranteed, nor even likely. Not knowing how often materials from different occupations were mixed through deflation and then covered with eolian sand to present the appearance of intact cultural deposits would potentially limit the usefulness of finer-grained analysis.

Added to that, error can easily creep in with smaller sample size, as demonstrated in several places in this discussion. Thus, by increasing the number of assemblages, average size would decrease to such a small number of artifacts that no coherent or accurate conclusions could be made.

While not ideal, the size of most of the analytic units used in this discussion allowed for the definition of important trends in the use and acquisition of materials, reduction strategy, and tool use that might not have otherwise been discernible. Interestingly, examination of analytic groups produced results similar to the analysis of entire site assemblages. This suggests an essential validity to the overall analytic conclusions and points to long-term continuity in basic occupational type, material use, and reduction strategy.

18 ⩡ Texas Lithic Materials on NM 128 Sites

Byron T. Hamilton

This study is a continuation of the "Lithic Material Sourcing Study" section of the Fox Place report (Wiseman 2002a), and is an effort to refine and apply these procedures to identify Texas lithic materials (i.e., Edwards chert, Alibates silicified dolomite, and Tecovas jasper) in the lithic assemblages from the NM 128 project sites.

There are, of course, problems to overcome in developing methods for the "positive" identification of these materials. A lack of confidence by some archaeologists to use such data as a basis for tracking the trading by, and mobility patterns of, prehistoric people is understandable. However, we are encouraged that a cautious and well trained analyst can avoid creating erroneous data.

A Brief Summary of the Lithic Material Sourcing Study from the Fox Place Report

Wiseman decided to develop dependable procedures to identify Texas cherts and then implement these procedures to distinguish imported lithic materials from local cherts collected from southeastern New Mexico sites.

After we had assembled and studied a type collection of Texas cherts and so called "look-alikes" from New Mexico, we wanted to assess our abilities to identify Texas lithic materials. To help achieve this "Dr. Phillip Shelley of Eastern New Mexico University contributed samples, designed and administered a lithic identification test to Hamilton and Wiseman, working as a team. While we did not ace the test, we were encouraged to continue our study, because our mistakes on the test were entirely in not identifying all of the imported materials. Conversely, all of the examples we attributed to the classic Texas sources were correct" (Wiseman 2002a:81).

This test was administered without the use of ultraviolet light fluorescence analysis (UVFA). Later we incorporated the use of a UV light as another tool for identifying imports.

In the Fox Place report, four main analytic categories were used to identify the presence or absence of imported material types, including: not an import, the material did not meet the requirements for identification as an import; lithics from chert deemed as locally available were placed in the material type category "chert"; look-alike, materials from specific locations in New Mexico that bear a resemblance to the above-mentioned Texas materials; possible import (i.e., possible Edwards, possible Alibates, or possible Tecovas), materials that display attributes of an import, but for whatever reason, cannot with confidence be given a positive designation as one of the above material types; and imported material, for the NM 128 project, this category includes materials that met all criteria discussed below and were identified as and placed in the Material Type Analysis Codes as Edwards, Alibates, or Tecovas.

Methods Used for Identifying Texas Lithic Materials from the NM 128 Sites

The identification of Texas lithic materials is a skill that can be developed and used with a high level of consistency and confidence, employing the following two procedures: use of a type collection that includes a wide variety of Texas and local southeastern New Mexico lithic materials and the experienced application of ultra-violet light analysis (UVLA).

Experience with a Type Collection

A substantial knowledge of the visual and microscopic attributes of imported materials can be gained by assembling a type collection that includes a comprehensive assortment of the Texas cherts in question and by spending the time necessary to become familiar with the wide range of colors, color patterns, and textures represented in the type collection. Samples from our type collection were flaked and some were heat-treated, providing a comprehensive array of visual and material quality attributes.

Our Texas chert type collection was assembled from gifts from individuals and personal collection from source areas, including samples of Edwards chert from 12 counties in west central Texas: Bell, Coryell, Gillespie, Glasscock, Hamilton, Irion, Kerr, Kimble, Menard, Runnels, Sterling, and Taylor. We also have samples of "Georgetown" chert from Williamson County in central Texas. Samples of Alibates dolomite came from Potter County, and Tecovas chert—formerly Quitaque chert—came from Briscoe and Potter counties.

Two sources of written descriptions of Edwards, Alibates and Tecovas include Hillsman (1992) and Banks (1990). Photographic techniques have improved greatly of late, and more recent high-quality images of these materials may be of some value to an analyst. However, when possible, these sources should not be used as a substitute for the use of a comprehensive type collection.

New Mexico "look-alikes" from the type collection include: Edwards-like chert from Chaves County (Rockhouse Canyon, San Andres formation); and Tecovas-like and Alibates-like samples from Chaves (Elkins), DeBaca (Yeso, Fort Sumner), Quay (Ragland, Tucumcari Hills), Roosevelt (Ogallala formation), and Union (Baldy Hill) counties. I did not feel I had enough experience to identify any of the artifacts from NM 128 as one of the "look-alikes" because our type collection had relatively few samples of these materials, and doing so would identify a material as originating from a specific locale. However, these samples were useful as a comparison to help confirm the identification of suspected Texas cherts.

Of particular note is Rockhouse Canyon chert. The source of this chert is approximately 52 km (20 mi) northwest of Roswell. There are five samples of this high-quality chert that range in color from light to medium mottled gray. Some appear fossiliferous, and, unlike most local cherts, will fluoresce a medium-brown color under longwave UV light. Any analyst searching for Edwards chert in southeastern New Mexico should be familiar with this chert.

There is, however, a chert source, new to us that is local to the NM 128 project. On August 22, 2009, Wiseman was informed of and led to an outcrop of chert within 100 km (40 mi) of the project area by Mr. Calvin Smith, director of the Western Heritage Museum at New Mexico Junior College in Hobbs, NM.

This source, labeled "Indian Tank Chert," is on a very low rise immediately southeast of Indian Tank in northwestern Lea County, NM. This chert includes a wide variety of colors and textures. Colors range from black to light gray to tan, and some samples were red. Some examples are translucent with black inclusions and are visually similar to Pedernal chert. The majority of chert/chalcedony is medium to light banded gray in color and semi-translucent to opaque. Textures vary from lustrous (probably weathered) to quite grainy, like limestone. Most are medium grained and difficult to flake. Heat treatment improves flaking, but no color change is noted.

Ultraviolet Light Analysis

The analysis of the chert lithic manufacturing debris from all sites was done in a dark office at the Office of Archaeological Studies, Bataan Building in Santa Fe. The UV light source used was a UVP Model UVGL-58 Mineralight Shortwave and Longwave Multiband Lamp, UV-254/366 nm (nanometer) that can be hand-held or mounted.

Shortwave and longwave ultraviolet light analysis has been used with success for identifying or eliminating lithic materials while searching for Texas cherts and other materials. Hofman, et al. (1991: 292) states: "The use of ultraviolet light is a reliable, expedient, and inexpensive means for better distinguishing several lithic materials that occur in the Plains region and specifically for helping to track the occurrence of Edwards chert in assemblages distant from the source area. While this technique cannot be considered foolproof, it offers researchers, with practice and control specimens, an improved basis for assessing the derivation of lithic materials which may occur in their assemblages."

Gray and tan cherts were examined under longwave (366 nm) UV to look for Edwards chert. Artifacts that had the visual characteristics of Alibates or Tecovas were also separated and examined under shortwave (254 nm) UV light. These latter two materials fluoresced a dark to medium mottled green under shortwave UV, correlating with hue and colors of the material. Fresh surfaces do not fluoresce under longwave UV (Speth and Newlander, 2009:48–9).

Shortwave UV light can quickly burn the eyes or skin. Inexpensive ultraviolet-blocking safety glasses are readily available and should be used at all times while working with shortwave UVL. I also wore gloves to protect my skin when using shortwave UVL.

Local Chert: In regard to familiarity with local southeastern New Mexico materials, I have had the advantage of analyzing tens of thousands of lithics from sites in the Pecos River Valley from Roswell to Carlsbad. Chert cobbles from drainages near the sites were also collected. The vast majority of the local cherts have no response under UV light, including fresh surfaces.

Fresh surfaces of the gray Indian Tank chert had little or no response under longwave or shortwave UVL. Some of the translucent samples fluoresced a pale green under shortwave UVL.

Edwards Chert: It is well documented that Edwards chert consistently fluoresces orange or yellow under longwave UV light (Frederick et al. 1994:14–15).

In the search for Edwards chert from NM 128, the bulk collections of gray or tan cherts were examined using the UV on the longwave setting (366 nm) with the light mounted on its stand, at a distance of 15 cm between the samples and the light source. Artifacts that fluoresced orange or yellow color were separated and examined by hand approximately 5 cm closer to the UV source. A binocular microscope set at 10x and a fiber optic microscope light were used for both microscopic and unaided visual examination.

To provide consistency in the identification of Edwards chert, a core-flake from a known source of Edwards chert was used as a control sample and was in view under the UV light at all times during the analysis. Under longwave UV, this artifact fluoresced a strong medium orange on the weathered surfaces and a bright yellow on the fresh surface. This sample also exhibited the color, fine material quality, and presence of marine fossils that characterized most of the chert classified as Edwards from the project area.

Artifacts from the project area designated Edwards consistently fluoresced an intense medium orange on weathered surfaces and a bright orange-yellow or yellow on fresh surfaces.

Worthy of note are a group of six artifacts of identical material attributes, so much alike they may be from the same core or tool blank, or may even represent a single knapping episode. This chert is somewhat different from the more translucent, very fine-grained medium gray chert that characterized most artifacts identified as Edwards. These six artifacts are made of a chert that is light gray, fine grained, and opaque except on the thinnest edges. This group was classified as Edwards due to its visual compatibility with a sample of known Edwards chert from our type collection and its fluorescent properties, very strong orange on weathered surfaces and bright yellow on fresh surfaces. These six artifacts are all from Block 12 of LA 129214, but were not concentrated in a small area. This chert is unique to the rest of the lithic material collected from the project area.

Alibates and Tecovas Chert: Although Edwards chert is by far the dominant imported material present in the lithic collections from NM 128 (n = 48 Edwards; n = 39 Possible Edwards), Alibates and Tecovas chert artifacts were also identified from the project area (see the lithic analysis section in this report). Artifacts having visual attributes of Alibates and Tecovas were separated from the collections for a closer examination. A small number of lithic artifacts were given a positive identification as Alibates (n = 2) or Tecovas (n = 4). One item identified as Tecovas is a core fragment having the classic visual aspects of Tecovas jasper. It is mostly red with a large area of "mustard yellow" and contains small vugs. The shortwave UVL response was a mottled dark to medium green, consistent with the fluorescent responses from our type collections. There were a substantial number of artifacts of red chert recovered from NM 128. In all probability, Alibates and Tecovas manufacturing debris were present. However, because red chert is known to be locally available, these items were simply labeled "chert."

The Problem of Patination

It has also been well documented that cherts can develop a patina over time due to exposure to various elements of the environment (Frederick et al. 1994). A coating of calcium carbonates may enhance the fluorescent properties of lithic artifacts under UV light and are ubiquitous in the soils of the NM 128 project area. It has also been observed that weathered samples of known Edwards chert without any visible surface deposits consistently develop a patina that tends to inhibit UV response (Frederick et al. 1994).

The most effective way to deal with this problem is to expose a fresh surface and examine it under UV light immediately. This practice will supply the analyst with an accurate assessment of the fluorescent properties of the material.

Projectile Points

Three projectile points from the project were placed in imported categories: two are Edwards chert; the third is Alibates silicified dolomite. The full results of the projectile point analysis can be found elsewhere in this report.

The distal fragment of a projectile point from LA 129214 (Block 13, FS 1320) is made from medium gray, fine-grained fossiliferous chert and is somewhat translucent. Visually and microscopically the fragment exhibits attributes one would expect from Edwards chert.

The identification as Edwards chert is reinforced by UV analysis. Under long wave UVL the original surfaces fluoresced an intense medium orange. A flake was taken from the artifact and the fresh surface was immediately exposed to the UV light. The fresh surface fluoresced bright yellow. This confirmed that the patina produced from environmental exposure inhibited rather than enhanced the UV response, thus meeting all of the criteria for identification as Edwards chert.

A second projectile point from the project area was put into the category of Edwards chert. This artifact is a projectile point fragment from LA 113042 (Block 8, FS 849). It is made from a fine-grained, medium gray chert that is opaque. A fresh surface fluoresced a orange-yellow under long wave UVL.

Also from LA 129214 (Block 2, FS 154), a nearly complete projectile point met the criteria to be assigned as Alibates. This artifact is visually nearly identical to at least one of the samples of Alibates in our type collection. This artifact is of material that is primarily red and purple with pearly white spots and some white banding. Under short wave UVL, both the artifact and the sample from the type collection fluoresced a dark mottled green in the darker areas and a brighter green in the white areas. This projectile point was also compared with Alibates "look-alikes" from New Mexico, reinforcing the identification of Alibates for this artifact.

Possible Category-Positive Identification

The use of the term "possible" as applied to materials imported from Texas sources may be viewed by some as too ambiguous or subjective to be useful in assessing the implications of the material-type data of a lithic assemblage. A further explanation may be useful. In the NM 128 lithic assemblage analysis, material types "Edwards," "Alibates," and "Tecovas" were included as well as "Possible Edwards."

Factors that would downgrade a suspected import to the possible category include: a UV response that was less than ideal; items that had an acceptable UV response, but the quality or morphology of the material was not ideal; or artifacts that met the criteria for inclusion in imported categories but were simply too small to be confidently identified as such. Artifacts placed in the possible Edwards material-type category are a result of proper caution on the part of the analyst.

It is up to the responsible archaeologist to choose how to use this data. If one is familiar with and/or has confidence in the analyst presenting the results of the imported material analysis, especially the "positive" identifications, use of this data can be relatively straightforward. However, the use of the "possible" category may present a researcher with a more difficult choice.

These items are believed to be imports, but cannot confidently be given a positive identification by an analyst using a properly cautious approach. If the quantity and location of imported lithic materials is not an essential part of the overall research, the "possibles" may be ignored.

The positive identifications will allow the researcher to state that intrusives of a certain type were present in the lithic assemblage. However, I believe incorporating the "possibles" into the overall research scheme does give a more accurate representation of the quantity of imports from the project area.

Summary

As a result of past research, personal experience, and the "fine tuning" of the methods used to identify Texas cherts in the NM 128 project sites, I offer the following generalizations:

1. There is no substitute for an extensive type collection of material samples from known source areas. Familiarity with the visual characteristics of Texas cherts should be used in tandem with UVFA;

2. There several variables that impact UVL response. All that glitters is not gold. Simply exposing lithic materials to UVL and relying on a response will not produce consistently reliable data. There are local materials that fluoresce various colors and hues;

3. When using UVFA, fresh surfaces should be exposed and immediately examined whenever possible to eliminate the problem of patination;

4. Longwave UV light should be used to identify Edwards chert;

5. Edwards chert consistently fluoresces orange or yellow under longwave UVL. Therefore, gray or tan cherts that do not fluoresce can readily be eliminated from further consideration as Edwards;

6. Though chert that does not respond to longwave UV light can instantly be eliminated from the Edwards category, chert that fluoresces cannot be instantly considered Edwards. There are a several artifacts from NM 128 that fluoresce suitably, but are of poor material quality and questionable morphology (e.g., shatter from small cobbles with a high percentage of waterworn cortex). These items were simply categorized as "chert";

7. Longwave UVL should not be used to help identify samples of Alibates or Tecovas. Fresh surfaces of these materials consistently do not fluoresce under longwave UVL, but weathered surfaces often develop a patina that also does respond under longwave UVL. Therefore, only shortwave UV light is a reliable tool to identify these materials;

8. One needs to be cautious when dealing with small artifacts. There are red cherts locally available in the NM 128 project area. Items of this material could be mistakenly identified as Tecovas. Assignment of a piece to the Tecovas category should be reserved for larger pieces that also contain the "mustard yellow" color commonly found in Tecovas. The presence of crystalline quartz-filled veins and vugs is also a common indicator of Tecovas chert.

The analysis and implications of the identified imported Texas cherts can be found elsewhere in this report.

19 ⩡ Ground Stone, Lithic, and Ornament Artifact Analysis

Karen Wening

The NM 128 project sites yielded a total of 207 manos and metates, comprised of 109 manos, 83 metates, and 15 indeterminate mano or metate fragments. The complete artifacts consist of 20 manos, four metates, and one slab metate fragment reused as an abrading stone. The largest assemblages were recovered from LA 129214 (n = 143) and LA 113042 (n = 35) with LA 129216 (n = 6), LA 129217 (n = 4), LA 129218 (n = 4), LA 129222 (n = 2), and LA 129300 (n = 11) yielding much smaller numbers. No manos or metates were recovered from LA 129220 (see Miscellaneous Ground Stone for LA 129220 artifacts).

The impact from collection to ground stone assemblages in the project area cannot be overstated, and deserve mention at the outset. Extensive interviews of local residents for the 1986 WIPP survey revealed that ground stone artifacts have been the object of collector activity, becoming popular after projectile points and ceramics were depleted. Ground stone artifacts were also observed in museums and private collections (Earls and Bertram 1987:136,141; Wiseman, personal communication, 2009). The proximity of roads to sites is also a factor that may be especially applicable to the NM 128 project. As a result, site assemblages of all artifact types have been severely impacted, compromising analyses.

Mano and Metate Analysis Methods

The terminology developed by Jenny Adams is used in an effort to support her efforts to standardize ground stone analyses (2002). In particular, these terms are used to describe many mano morphological characteristics so that they are clear. The results of Adams' experiments with wear patterns and stroke type are also applied where possible (1998, 2002). These terms are listed in the analysis methods section. The ground stone assemblage from all seven sites is first discussed as a unit, followed by individual site assemblage descriptions.

Manos and metates are monitored for 20 attributes that focus on material selection, manufacturing methods, artifact morphology, and use-surface characteristics.

The analysis was also designed to provide information on a number of questions regarding these food processing tools. First, a number of variations within the one-hand mano assemblage were observed early in the analysis, and inspired the addition of four attributes related to the use-surfaces. The hopeful prediction was that these attributes would inform on mano manipulation, metate companions, and tool function.

Mano and Metate Analysis Attributes

The Research Design states that standard OAS methods will be used for the NM 128 project ground stone analysis (Moore 2006:111–114). However, a number of attributes were added to this standard based on observations made during the early stages of analysis.

Material Type: All artifacts were monitored for material type, color, and degree of cementation. Any combination of these three characteristics denotes a specific material type. For instance, red, friable sandstone is a specific material type, as is red cemented sandstone. Sandstone containing hematite is additionally specified.

Material Texture: Stone material types were monitored as being fine, medium, or coarse grained, or cryptocrystalline. Grain size is identified with the aid of an American/Canadian Stratigraphic card. Large grained refers to particle sizes larger than 710 microns, medium grained refers to particles between 350 and 710 microns, and fine grained refers to particles 350 microns and smaller.

No large grained materials were recovered

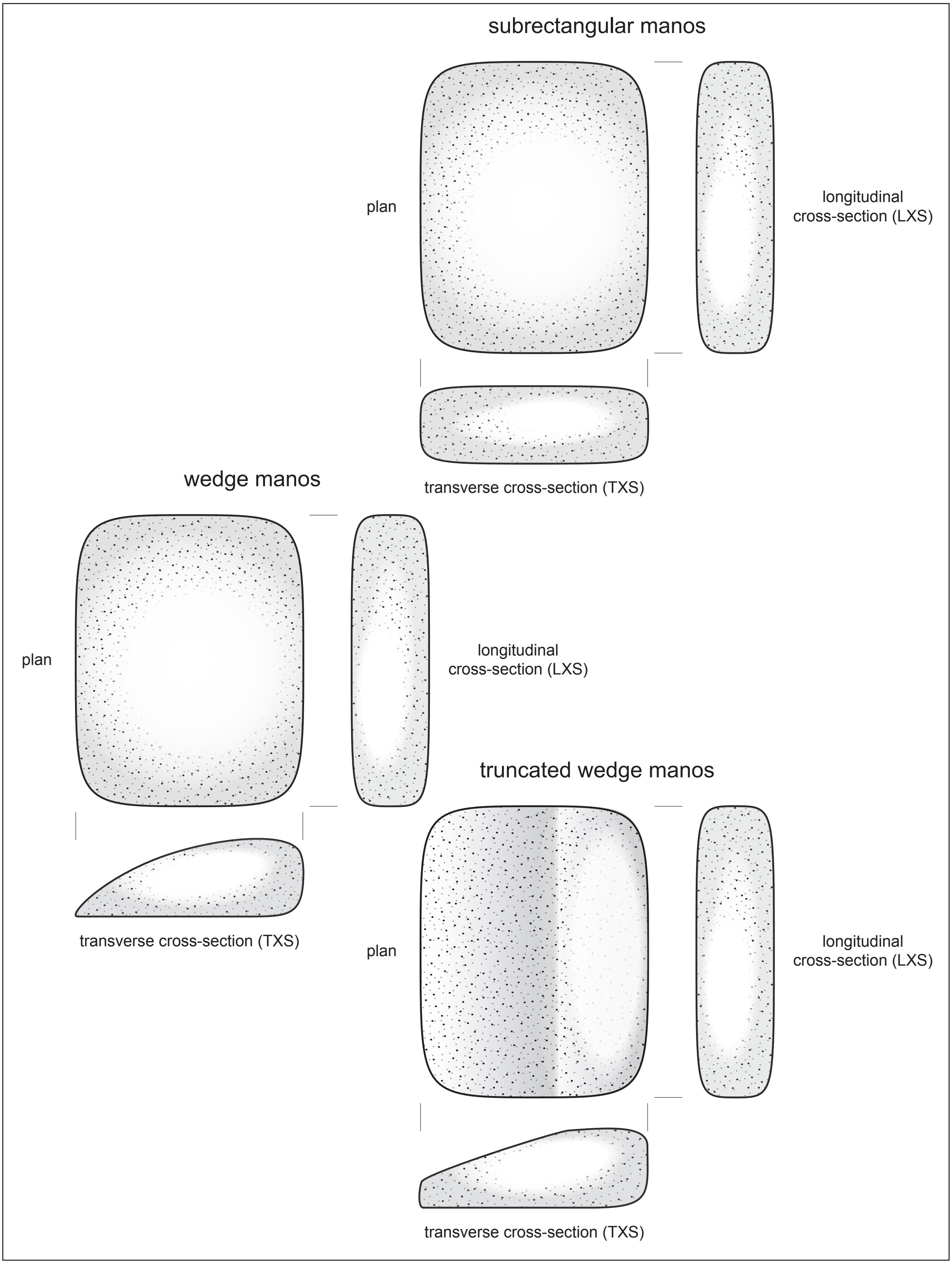

Figure 19.1. Illustration showing Transverse Cross-Section Shape (TXS) and Longitudinal Cross-Section Shape (LXS) on subrectangular, wedge, and truncated wedge manos.

from the project. Quartzite represents the only conchoidally fracturing materials found.

Raw Material Form: Raw material form refers to the form of the ground stone source material. Artifacts were recorded as having been manufactured from a rounded cobble, a flattened cobble, a thick slab (more than 10 cm), a thin slab (5 to 10 cm), or a very thin slab (less than 5 cm). Artifacts displaying manufacturing techniques that completely obscured the raw material form were recorded as indeterminate.

Plan Shape: Plan shape is the outline of the top, or dorsal, view of the artifact. If the artifact is fragmentary, this attribute is indeterminate.

Transverse Cross-Section Shape (TXS): TXS defines the outline shape of the mano or metate across the width axis. For some wedge and truncated wedge-shaped manos in the assemblage, these shapes did not appear to be solely the result of use, but of intentional shaping. This is discussed in detail with the analysis results.

Longitudinal Cross-Section Shape (LXS): LXS is the outline shape of the mano or metate across the length axis. Both TXS and LXS attributes were added to the standard OAS ground stone analysis, as was Use-Surface Contours.

Use-Surface Contours: Use-surface contours are contours recorded for both the transverse (TXC) and longitudinal (LXC) axes for every ground surface. As a result, each use-wear surface has two contour attributes. A mano used on two surfaces would then have four contour attributes (Fig. 19.1); **transverse contour, ventral surface** refers to the width axis contour of the wear surface on the ventral, or working, surface; **longitudinal contour, ventral surface** refers to the long axis contour of the ventral, or working, wear surface; **transverse contour, dorsal surface** refers to the contour of the width axis on the dorsal, or hand-held, wear surface; and **longitudinal contour, dorsal surface** refers to the contour of the long axis on the dorsal, or hand-held, surface.

The more heavily used surface was referred to as the ventral surface, and the more lightly worn surface, the dorsal. In the case of equally worn surfaces, a random assignment was made, except in the case of truncated wedge TXS manos, when the wider surface was designated the ventral surface and the narrower surface the dorsal. The subjective effect of this assignment, along with the reasons for monitoring this attribute, is discussed with the analysis results.

Production input describes the level of manufacturing effort expended on a specific tool. This is defined by the percentage of a tool's surface area that has been shaped. "Fully shaped" refers to 100 percent, "mostly modified" to 50 to 99 percent, and "slightly modified" to less than 50 percent of the surface area. This was applied subjectively to fragments. If a fragment exhibited a high degree of shaping, the artifact was recorded as "mostly modified" even though the missing portions could not be observed. This was done to obtain the maximum information possible from fragmentary artifacts.

Shaping refers to the methods used to shape a ground stone tool. Grinding, flaking, pecking, and combinations of these methods were recorded. Pecking to shape an artifact is differentiated from pecking to re-sharpen a grinding surface, which is recorded under "Wear Surface Rejuvenation." Fragments are analyzed as for production input.

Heat Alteration describes the degree of heat exposure to which an artifact has been exposed. Attributes consist of reddened, crazed, fractured, burned and sooted, and combinations of these attributes.

Adhesions refers to any foreign substance on the artifact such as caliche or pigment. The amount and location of caliche coverage is also included in this attribute, as well as the pigment type and color.

Function records the tool type as a mano or metate. Manos are additionally classified as one- or two-hand, and metates as basin or slab. No trough metates were recovered from the project. All hand-held stones are recorded as manos, regardless of size. All netherstones, or base stones (Adams 2002:98), are recorded as metates. If a tool's function is unidentifiable, as with small fragments, the function is indeterminate. The ground surfaces of these indeterminate fragments are analyzed, however. Reworked and reshaped artifacts with multiple functions are coded individually for all identifiable functions. In some cases, as with reused and/or reshaped fragments, the primary function cannot be fully analyzed because it has been obliterated by the secondary use. In these cases, the primary use is no longer possible, what Adams refers to as "sequential secondary use" (2002:21).

Number of Functions is the number of identifiable functions that an artifact has had.

Number of Wear Surfaces is recorded for every ground stone artifact. For metates, if the base is worked only to shape, then that surface is not analyzed as a wear surface.

Portion describes the artifact condition as a whole piece, an end fragment, a medial fragment, a corner fragment, an internal fragment or as a fragment missing corners only. A flake from a ground stone artifact retaining a small portion of the ground surface is categorized as a ground stone flake. Use-wear surface attributes are analyzed to the furthest extent possible with ground stone flakes.

Wear Surface Rejuvenation is the presence or absence of pecking to re-sharpen the grinding surface. This attribute is recorded for all wear surfaces.

Wear Surface Degree describes the extent of use of each utilized ground stone surface as light, moderate or heavy. While this is an admittedly subjective attribute, an attempt was made to objectify the values. "Light" refers to grinding wear that occurs only on the high points of a surface, leaving unused areas. The boundaries of the use-surface are not well defined. The unmodified raw material texture is still visible after light use. "Moderate" refers to wear that is extensive enough to grind down the entire use-surface, leaving no unused areas. Moderate wear obscures the original raw material texture. "Heavy" refers to wear that completely alters the raw material texture and often results in striated surfaces. Rough materials such as sandstone are worn smooth, and the use-surface contour can become faceted or well delineated. Very fine-grained or conchoidally fracturing material such as quartzite can become polished and striated from heavy use. If a tool was re-sharpened with pecking and some of the unsharpened use-surface remained, then wear degree was assigned based on that.

Wear refers to every type of wear observed on every ground surface. Values consist of grinding, striations, pitting, battering, and polishing. Striations are additionally monitored for location and orientation. Since many unidirectional and bidirectional striations are angled, rather than perpendicular, to the width, striation orientation was recorded as well. However, only two striated artifacts in the assemblage are complete enough to record orientation.

Length in centimeters is recorded for each artifact. If the original long axis of the artifact could be determined, this measurement is recorded as length even though it might not be the longest dimension. If the long axis cannot be identified, the longest dimension is recorded. If metate fragments display parallel striations, this axis is assumed to be the length.

Width in centimeters is recorded for each artifact. As with length, if the entire artifact's length-width axis could be determined, then those dimensions are appropriately recorded. If it is indeterminate, then the width is measured perpendicular to the long axis.

Thickness in centimeters is recorded for each artifact. As with length and width, if the entire artifact's length-width axis could be determined, thickness was taken accordingly. One metate fragment represents an exception, having broken diagonally between two opposing utilized surfaces. The original thickness of the metate would likely have been oriented vertically between these two surfaces, so the measurement was taken along this axis.

Thickness 2 is recorded for manos with a truncated wedge transverse cross section. This measurement is taken at the narrowest point of the wedge where the grinding surfaces terminate. For metates used on two opposing surfaces, this measurement is taken at the thinnest point where the two surfaces oppose.

Weight in grams is recorded for all artifacts. If fragments can be determined to be part of the same artifact, they are weighed together.

Mano Cross-Section Shapes: turtleback refers to a single flat use-surface opposed by a dome-shaped dorsal surface; wedge refers to two opposite-wear surfaces worn to a wedge profile; rectangular refers to two opposing wear surfaces essentially parallel to one another; triangular refers to three adjacent wear surfaces; and diamond refers to four adjacent wear surfaces (Adams 2002:113).

Tool Terminology designed by Adams for ground stone tools is used here (2002:45): the proximal edge is the tool edge closest to the user; the distal edge is the tool edge most distant from the user; the dorsal surface is the side of the tool held in the user's hand; and the ventral surface is the working surface of the tool. The term "sequential secondary use" refers to tools manufactured for a single function and then used for a secondary function that renders the primary function impossible (Adams 2002: 21).

Mano and Metate Material Sources

Twenty-two material types were identified during the mano and metate analysis (Table 19.1). Fourteen are sandstone types defined by color, induration and grain size. One sandstone material color was obscured by sooting. Limestone, dolomite, quartzite and chert comprise the remaining ground stone material types. Quartzite colors are tan, brown, purple and red, and chert is represented by gray only. This relative material-type distribution is mirrored by many ground stone assemblages in southeastern New Mexico (Quaranta 2000:113; Lord and Reynolds 1985:149, 152; Wiseman 2000a:39). Sources for ground stone materials were obtained from *Surface Geology of the Nash Draw Quadrangle*, where area rock exposures are described as "relatively abundant" (Vine 1963:B8). The Late Quaternary Geology Study completed for the NM 128 project by Stephen Hall, geologic maps of the site area compiled by J. Quaranta (2003), and personal communication with Don Tatum (2007) geomorphologist for the Office of Archaeological Studies also contributed source material information. Sandstone may have been readily available based on outcrops near the project. Vine describes the Nash Draw Quadrangle area as "relatively abundant."

Sources East of the Pecos River

Sandstone, dolomite and limestone. Dewey Lake, or Pierce Canyon red beds, contains very fine grained, moderate reddish-orange to moderate reddish-brown and brown sandstones. Sub-angular to sub-rounded clear quartz is the most abundant single mineral grain, and chert and feldspar the next most abundant (Vine 1963:B19, B22). Red sandstone in this formation weathers into blocks 3.8 cm thick and 25.4 cm long, and is sometimes interspersed with thin, white sandstone layers (Kelley 1971:24). Dewey Lake Redbeds outcrop around the north and east margins of Nash Draw, primarily at the west tip of Livingston Ridge where 22 m (75 ft) of the lower part of the formation occurs (Vine 1963:B21; Kelley 1971:24). An even larger vertical exposure of 30 m (100 ft) occurs along Maroon Cliffs. Most red sandstones from NM 128 are well indurated, and may be identical to that found at Macho Dunes, outcropping at the Mississippi Potash Mines along US 62/180 (Quaranta 2000:113).

Santa Rosa Sandstone. The Santa Rosa sandstone formation overlies the Dewey Lake Redbeds. It is crossbedded, pale red to reddish brown, locally pale reddish purple to pale blue green. It is coarser grained than the Dewey Lake Redbeds sandstone. The most exposed outcrops occur in the Maroon Cliffs and Tower Hill areas north of the project area. "Poor" exposures outcrop about 5 miles east of Maroon Cliffs, northeast of the project area (Vine 1963:B27).

Gatuna Formation. The Gatuna formation, possibly older than the Pleistocene (Kelley 1971:31), contains several different types of reddish sandstone that may be the closest source for the western most project sites, LA 113042, LA 129216, and LA 129214. Limestone is also within this formation, outcropping in the Maroon Cliffs north of the project area, and along the north end of Livingston Ridge to the northeast (Vine 1963: Geologic Map). In Pierce Canyon, the Gatuna Formation outcrops as pale red, moderate pink to gray, pale red crossbedded, conglomeratic, pale red to moderate reddish-orange sandstones. The most common color is orange red, with lesser amounts of gray and yellow (Kelley 1971:30). Exposed red cores of Gatuna, Pierce Canyon and Santa Rosa sandstones occur within Nash Draw (Vine 1963:B41). Cores of the Pierce Canyon red beds and Santa Rosa sandstones are primarily exposed on the flanks of Nash Draw, while cores of the Rustler formation outcrop in the center (Vine 1963:B38).

Gatuna formation sandstones are described as medium grained in the study area east of the Pecos River (Vine 1963: B28, B29) and fine grained in the Pecos Valley (Kelley 1971:31). Perhaps closest to the project area are several red beds of "unusually good" medium to coarse grained sandstone (Vine 1963: B30). The best exposures of this formation occur at the intersection of Nimenim Ridge and NM 31 (Vine 1963:B27-B28). Gatuna formation sandstone also outcrops south of Salt Lake and within Pierce Canyon, both south of the project area. At this location it is quite variable, with friable, fine-grained, orangish-red and pale red sandstone. Limestone, a member of the Gatuna formation, appears to be readily available within the project area (Vine 1963:Geologic Map). Large surface outcrops

Table 19.1. Mano and metate type, by material.

MATERIAL TYPE	ONE-HAND MANO	TWO-HAND MANO (LOAF-SHAPED)	ONE-HAND MANO (REWORKED METATE FRAGMENT)	ONE-HAND MANO (REWORKED FROM BIFACIAL METATE FRAGMENT)	MANO, SLAB (NFS)	METATE FRAGMENT (RESHAPED INTO MANO)	COBBLE MANOS	MANO FRAGMENT (REUSED AS ABRADER)	MANO FRAG-MENTS	METATE BASE FRAG-MENT	METATE, BASIN	METATE, SLAB	BASIN METATE (RECIP-ROCAL)	BASIN-SLAB METATE	HAND-HELD METATE	METATE FRAGMENT (REUSED AS ABRADER)	METATE (NFS)	INDETER-MINATE MANO OR METATE FRAG-MENTS	**TOTAL**
Sandstone																			
Red sandstone, indurated	5	–	1	–	–	–	–	–	20	1	2	–	–	1	–	–	36	5	**71**
Red sandstone, friable	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	4	–	**6**
Red hematitic sandstone, indurated	2	–	–	–	–	–	–	–	5	–	2	–	–	–	–	–	5	2	**16**
Red hematitic sandstone, friable	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	**2**
Pink sandstone, indurated	3	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	1	–	**7**
Yellow-brown sandstone, indurated	1	–	–	–	–	1	–	1	2	–	–	2	–	–	–	–	–	2	**9**
Yellow-brown sandstone, friable	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**1**
Light brown sandstone, very indurated	–	–	1	–	–	–	–	–	3	–	–	–	–	–	–	–	3	–	**7**
Light brown sandstone, friable	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	**1**
Brown sandstone, indurated	6	–	1	1	–	–	–	2	15	–	–	–	1	–	–	1	13	3	**43**
Brown sandstone, friable	1	–	1	–	–	–	–	–	1	–	–	1	–	–	–	–	2	1	**7**
White sandstone, indurated	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	2	1	**5**

surround all sites in the project with the exception of LA 129217, LA 129218 and LA 129300.

Rustler Formation. The Rustler formation contains calcareous buff sandstone, very fine-grained gray sandstone, fine textured white limestone, and light gray Culebra dolomite (Vine 1963:B6, B14). Culebra dolomite outcrops south of the project area east of Salt Lake (Vine 1963:Geologic Map).

Sources West of the Pecos River

Quartzite and chert cobbles. Quartzite cobbles may have been obtained from the thick gravel layers of the Carlsbad alluvial basin. Quartzite, chert and granite cobbles may have been obtained from the Black River area approximately 10 miles southwest of the project area (Horberg 1949:468). Quartzite cobbles are also found in Pecos River gravels (Don Tatum, personal communication, 2009).

Tansill Formation. The Tansill formation contains thick beds of dolomite. It outcrops along the Pecos River bed about 2 miles northwest of Carlsbad, and continues north about 10 miles (Kelley 1971:19). Extensive outcrops also begin west of Carlsbad and the Pecos River and continue southwest for more than 10 miles (Kelley 1971:Plate 4).

Sandstone is clearly the material of preference for manos and metates (183/89 percent) that are primarily manufactured from fine grained varieties (n = 171/93 percent), with only seven percent (n = 13) from medium-grained types. Quartzite (n = 6), limestone (n = 15), and dolomite (n = 2) comprise small percentages of the assemblage. Most manos are made from red and brown sandstones (n = 77 and 50, respectively), with lesser amounts of hematitic, yellow-brown, pink, light brown, white and gray sandstones. The vast majority appear to have been manufactured from sandstone slabs, with cobbles comprising the remainder of those whose natural morphology can be identified (Tables 19.2a, 19.2b, 19.2c, and 19.2d). This material-type distribution mirrors that found at the nearby WIPP sites (Earls and Bertram 1987:100).

Manos (N = 109)

The assemblage consists of one-hand manos (n = 28), a slab mano (n = 1), cobble manos (n = 6), manos reshaped from reshaped from metate fragments (n = 8), a two-hand mano (n = 1), a mano fragment reused as an abrader (n = 3), and indeterminate mano fragments (n = 62). The manos were recovered from six sites: LA 129214 (n = 74), LA 113042 (n = 20), LA 129300 (n = 7; LA 129216 (n = 4), LA 129218 (n = 2), and LA 129222 (n = 2). Site assemblages are discussed at the end of this section. One-hand manos range in size from small, palm-sized quartzite cobbles to the more typical one-hand sandstone variety (Table 19.3). Seven of the reshaped metate fragments are one-hand manos and one is of indeterminate size. The mean length for all whole manos is 10.04 cm. The mean length for whole one-hand manos is 9.44 cm.

This is nearly identical to one-hand manos from sites near the project area such as Macho Dunes (9.67 cm; Quaranta 2000:14), the Sunset Archaic Site (9.6 cm; Wiseman 1996a:34) and the Brantley Reservoir (9.8 cm, Katz and Katz 1985a:85). Three WIPP project sites produced a range of one-hand mano length, with means of 10.4 cm, 7.05 cm and 6.96 cm (Lord and Reynolds 1985:150-151). While one-hand manos dominate, some of the larger tools may have been manipulated with two hands for some tasks, as with the Pai tribes of Utah (Euler and Dobyns 1983:253). This is discussed further in the "Mano Wear Surface Contours and Stroke Associations" section below. The two-hand mano may not have been used for food processing due to the red pigment over much of the grinding surface (23 by 11 by 8 cm, 3.5 kg). Eleven additional manos display red pigment stains, comprised of mano fragments (n = 6), manos reshaped from metate fragments (n = 2), a one-hand mano and a cobble mano. Thirty-one manos exhibit evidence of heat exposure (28 percent), most of which are reddened or burned/sooted. Interestingly, only three project sites yielded manos exposed to heat, the vast majority of which were recovered from LA 129214 (n = 25), with lesser number from LA 113042 (n = 4) and LA 129126 (n = 2). Nearly all artifacts exposed to heat are burned or sooted (n = 25/31: 81 percent). Only three from LA 129214 appear to have fractured as a result.

The one-hand mano group displays an interesting combination of shared and contrasting attributes. Most are typically well shaped, symmetrical forms (Tables 19.2a, 19.2b, 19.2c, and 19.d). This mirrors the mano assemblage from the Sunset Archaic Site (Wiseman 1996a:34), but contrasts with those from the Brantley Project that have received little or no shaping modification (Katz and Katz

Table 19.2a. Raw material form, plan shape, production input, and shaping method distribution among manos and metates; raw material form.

RAW MATERIAL FORM	ROUNDED COBBLE	ANGULAR	FLATTENED COBBLE	SLAB (NFS)	SLAB, THIN (5–10 CM)	SLAB, VERY THIN (<5 CM)	INDETER-MINATE	**TOTAL**
Manos								
One-hand mano	11	–	–	2	3	9	3	**28**
Two-hand mano, loaf shaped	1	–	–	–	–	–	–	**1**
One-hand mano reworked from metate fragment	–	–	–	1	–	5	–	**6**
One-hand mano reworked from bifacial metate fragment	–	–	–	–	–	1	–	**1**
Mano, slab, not further specified	–	–	–	–	1	–	–	**1**
Mano fragment reused as abrader	–	–	–	–	–	3	–	**3**
Cobble mano	6	–	–	–	–	–	–	**6**
Mano fragment	4	–	1	8	6	32	11	**62**
Subtotal	22	–	1	11	10	50	14	**108**
Metates								
Metate, basin	1	–	–	1	–	2	–	**4**
Basin metate, reciprocal	–	–	1	–	1	–	–	**2**
Metate, slab	–	–	–	1	2	–	–	**3**
Basin-slab metate	–	–	–	–	–	1	–	**1**
Hand-held metate	–	1	–	–	–	–	–	**1**
Metate fragment reused as abrader	–	–	–	–	–	1	–	**1**
Metate fragment reshaped into mano	–	–	–	–	–	1	–	**1**
Metate base fragment	–	–	–	–	–	1	–	**1**
Metate fragment	–	–	–	3	5	47	15	**70**
Subtotal	–	1	1	4	8	51	15	**80**
Indeterminate mano or metate fragment	1	–	–	1	–	5	8	**15**
Total	**24**	**1**	**2**	**17**	**18**	**108**	**37**	**207**

nfs = not further specified

1985a:84). Among those whose plan shapes can be determined, oval and circular forms dominate (n = 26/48: 54 percent). Sub-rectangular forms, typically with rounded corners, are less frequent (n = 17/48: 35 percent). Most fragmentary manos appear to be one-hand, but this cannot always be conclusively determined.

Manos are evenly distributed among well-shaped and natural forms. Among determinate manos, half have been shaped over at least 50 percent of the surface area (n = 36/76: 50 percent). Pecking is the primary shaping method used, either alone (n = 22) or in combination with flaking (n = 21).

Shaping is typically accomplished by pecking around the entire perimeter, or the ends at a minimum. Wedge cross-section manos are almost invariably shaped on the distal side as well. Slightly modified (n = 20) or natural forms (n = 18) also comprise half of the assemblage. For those manos that are modified on less than half of the surface area, the overall appearance is one of well-formed symmetry. Where natural forms have been utilized, there appears to be a selection for symmetrical

Table 19.2b. Raw material form, plan shape, production input, and shaping method distribution among manos and metates; plan shape.

PLAN SHAPE	CIRCU-LAR	OVAL	OVAL OR CIRCU-LAR	TRUN-CATED OVAL	SUB-RECTANG-ULAR	SUB-RECTANGULAR, ROUNDED CORNERS	RECTANG-ULAR	TRI-ANGULAR	SUB-TRIANGU-LAR	TEAR-DROP	IRREGU-LAR	INDETER-MINATE	**TOTAL**
Manos													
One-hand mano	4	7	4	–	5	1	–	–	–	1	–	6	**28**
Two-hand mano, loaf shaped	–	–	–	–	1	–	–	–	–	–	–	–	**1**
One-hand mano reworked from metate fragment	–	–	–	–	3	–	–	–	1	–	–	2	**6**
One-hand mano reworked from bifacial metate fragment	–	1	–	–	–	–	–	–	–	–	–	–	**1**
Metate fragment reshaped into mano	–	–	–	–	1	–	–	–	–	–	–	–	**1**
Mano, slab, not further specified	–	–	–	–	1	–	–	–	–	–	–	–	**1**
Cobble mano	–	5	–	–	–	–	–	–	–	–	–	1	**6**
Mano fragment reused as abrader	–	–	1	–	–	–	–	–	1	–	1	–	**3**
Mano, not further specified (fragmentary)	–	–	3	1	3	2	–	–	–	–	1	52	**62**
Subtotal	4	13	8	1	14	3	–	–	2	1	2	61	**109**
Metates													
Metates	1	–	–	–	1	–	2	–	4	–	–	–	–
Metate, basin	–	2	–	–	–	–	–	–	–	–	–	2	**4**
Metate, slab	–	–	–	–	–	–	1	–	–	–	–	2	**3**
Basin metate, reciprocal	–	1	–	–	1	–	–	–	–	–	–	–	**2**
Basin-slab metate	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Hand-held metate	–	–	–	–	–	–	–	1	–	–	–	–	**1**
Metate fragment reused as abrader	–	–	–	–	–	–	–	–	1	–	–	–	**1**
Metate base fragment	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Metate, not further specified	–	–	–	–	–	–	–	–	1	–	2	67	**70**
Subtotal	–	3	–	–	1	–	1	1	2	–	2	73	**83**
Indeterminate mano or metate fragment	–	–	–	–	–	–	–	–	–	–	–	15	**15**
Total	**5**	**16**	**8**	**1**	**16**	**3**	**3**	**1**	**8**	**1**	**4**	**149**	**207**

Table 19.2c. Raw material form, plan shape, production input, and shaping method distribution among manos and metates; production input.

PRODUCTION INPUT	INDETER-MINATE	NONE (NATURAL FORM)	SLIGHTLY MODIFIED (<50% AREA)	MOSTLY MODIFIED (0–99% AREA)	FULLY SHAPED	**TOTAL**
Manos						
One-hand mano	2	8	7	9	2	**28**
Two-hand mano, loaf shaped	–	1	–	–	–	**1**
One-hand mano reworked from metate fragment	1	1	2	1	1	**6**
One-hand mano reworked from bifacial metate fragment	–	–	–	1	–	**1**
Mano, slab, not further specified	–	–	1	–	–	**1**
Cobble mano	1	4	–	1	–	**6**
Metate fragment reshaped into mano	–	–	–	1	–	**1**
Mano fragment reused as abrader	–	–	1	2	–	**3**
Mano, not further specified (fragmentary)	29	4	9	17	3	**62**
Subtotal	33	18	20	32	6	**109**
Metates						
Metate, basin	–	–	1	3	–	**4**
Metate, slab	–	–	2	1	–	**3**
Basin metate, reciprocal	–	–	1	1	–	**2**
Basin-slab metate	–	–	1	–	–	**1**
Hand-held metate	–	–	–	1	–	**1**
Metate fragment reused as abrader	–	–	–	1	–	**1**
Metate base fragment	1	–	–	–	–	**1**
Metate, not further specified	60	1	3	6	–	**70**
Subtotal	61	1	8	13	–	**83**
Indeterminate mano or metate fragment	13	–	1	1	–	**15**
Total	**107**	**19**	**29**	**46**	**6**	**207**

shapes. Forms such as these would also require less shaping modification. Tools modified only by wear comprise a small minority.

Several characteristics of the mano and metate assemblage indicate that ground stone raw material and tools were utilized to the maximum extent possible. Multifunctional tools (n = 12), tool fragments reshaped into new tools (n = 8), manos and metates worn bifacially to thin cross sections (n = 14 and n = 34, respectively), and a predominance of moderate to heavily worn use-surfaces (n = 246/319 all used surfaces: 77 percent) all indicate intensive use of both raw material and tools. Some of these characteristics are also reflected in ground stone tools that are not used for food processing (see Miscellaneous Ground stone).

The lack of re-sharpening may be another indication that ground stone raw material sources were limited, and that re-sharpening was practiced less as a means of prolonging tool life (n = 20/319 determinate surfaces: 6 percent). Frequent re-sharpening, while maintaining the grinding surface, also causes the tool to wear out faster (Adams 2002:114). Each of these assemblage traits is discussed in detail in the upcoming section.

Mano Use-Wear Stages and Cross-Section Shapes

Mano cross-section shapes (TXS) are frequently analyzed to gain additional understanding of tool use-life stages. Among prehistoric cultures that were heavily dependent on agriculture, each cross-section shape is often considered a stage in the progression from a new mano to an "exhausted" one. Newly manufactured, sub-rectangular manos are progressively worn into truncated wedge, wedge and diamond forms (Adams 2002:112–113; Stubbs and Stallings 1953:114; Woodbury 1954:76; Bartlett 1933:16).

However, while most of the above forms were observed on NM 128 manos, they appear to be unrelated to use-life stages. No evidence exists for the manufacture of rectangular slab manos that are progressively worn into four-sided, diamond cross-section forms.

Table 19.2d. *Raw material form, plan shape, production input, and shaping method distribution among manos and metates; shaping method.*

SHAPING METHODS	INDETER-MINATE	NONE	GRINDING	FLAKING	PECKING	GRINDING, FLAKING	GRINDING, FLAKING, PECKING	FLAKING, PECKING	GRINDING, PECKING	FLAKING, PECKING, GRINDING	**TOTAL**
Manos											
One-hand mano	2	9	2	2	6	–	1	5	1	–	**28**
Two-hand mano, loaf shaped	–	1	–	–	–	–	–	–	–	–	**1**
One-hand mano reworked from metate fragment	–	1	–	1	2	–	–	2	–	–	**6**
One-hand mano reworked from bifacial metate fragment	–	–	–	–	–	–	–	1	–	–	**1**
Mano, slab, not further specified	–	–	–	–	–	1	–	–	–	–	**1**
Multifunction cobble tool	1	5	–	–	–	–	–	–	–	–	**6**
Mano fragment reused as abrader	–	–	2	–	1	–	–	–	–	–	**3**
Metate fragment reshaped into mano	–	–	–	–	–	–	–	1	–	–	**1**
Mano, not further specified (fragmentary)	18	5	1	7	13	–	2	12	3	1	**62**
Subtotal	21	21	5	10	22	1	3	21	4	1	**109**
Metates											
Metate, basin	–	–	–	–	2	–	–	2	–	–	**4**
Metate, slab	1	–	–	2	–	–	–	–	–	–	**3**
Basin metate, reciprocal	–	–	–	–	1	1	–	–	–	–	**2**
Basin-slab metate	–	–	–	1	–	–	–	–	–	–	**1**
Hand-held metate	–	–	–	–	–	–	–	1	–	–	**1**
Metate fragment reused as abrader	–	–	1	–	–	–	–	–	–	–	**1**
Metate base fragment	–	–	–	–	1	–	–	–	–	–	**1**
Metate, not further specified	56	1	–	7	3	–	2	–	–	–	**70**
Subtotal	57	1	1	10	7	1	2	3	–	–	**83**
Indeterminate, fragmentary	13	1	–	–	1	–	–	–	–	–	**15**
Total	**91**	**23**	**6**	**20**	**30**	**2**	**5**	**25**	**4**	**1**	**207**

The most striking characteristic of the cross-section distribution is the high frequency of truncated wedge forms (Table 19.4). This form accounts for nearly half of all determinate cross-section shapes (n = 34/73: 46 percent). This could be caused by a number of factors. Amateur collection may have affected cross-section distribution. There may also be a preference for wedge-shaped raw materials, intentional shaping unrelated to use-wear or selective maintenance of this form during the tool use-life. Also, the stroke used to manipulate the mano affects cross-section shape (see "Mano Wear Surface Contours and Stroke Associations" section below). All of these factors seem related to the disproportionately high representation of truncated wedge cross sections.

Five different transverse and four longitudinal cross-section shapes were observed during the analysis (Table 19.4). The transverse cross-section (TXS) attribute was determinate for 69 percent (n = 75) of the assemblage, and longitudinal cross section (LXS) was determinate for 59 percent (n = 64). Truncated wedge, sub-rectangular, biconvex, and asymmetrical diamond forms are represented. Indeterminate transverse cross sections account for 31 percent (n = 34). It is possible that the truncated wedge frequency would increase if all manos were complete, as many fragmentary manos display two tangentially oriented surfaces, but are not complete enough for conclusive classification.

However, the TXS for many medial fragments can be identified. This cannot be said for the longitudinal cross section of medial fragments, as both ends are missing. For end fragments, it would be gratifying to assume that the whole mano is symmetrical and classify it as such. However, 11 percent of all manos display longitudinal asymmetry, precluding such an assumption.

Truncated Wedge Manos (n = 34): Adams discusses the importance of treating cross-section shapes as use-life stages rather than a typology (2002:112–113). However, some characteristics of the truncated wedge cross section imply the reverse: that this cross-section shape should be treated as a typology rather than a use-life stage. The truncated wedge cross sections may be a manufactured or maintained form. There are several reasons for this postulation.

First, a portion of the dorsal surface along the proximal edge is not utilized on most truncated wedge manos (Fig. 19.2). Thus, the shape is not entirely caused by use. This unutilized portion is hereafter referred to as the truncation—further discussed in the Mano Wear Surface Contours and Stroke Association section to follow. If the form is maintained during use, it may facilitate the grip Adams refers to "comfort features," roughened areas that may facilitate handling (2002:99).

Table 19.3. Mean dimensions of manos and whole one-hand manos, all sites.

		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)
Manos				
One-hand mano	Mean	9.5	7.5	3.9
	n	14	14	14
	SD	2.9	1.5	1.1
	Median	9.9	7.8	3.8
	Minimum	3.7	4.7	2.4
	Maximum	14.2	9.8	5.7
	Range	10.5	5.1	3.3
Two-hand mano, loaf-shaped	Mean	23.2	11.0	8.1
	n	1	1	1
	SD	–	–	–
	Median	23.2	11.0	8.1
	Minimum	23.2	11.0	8.1
	Maximum	23.2	11.0	8.1
	Range	0.0	0.0	0.0
One-hand mano reworked from metate fragment	Mean	10.5	7.2	3.1
	n	2	2	2
	SD	6.2	4.6	2.2
	Median	10.5	7.2	3.1
	Minimum	6.1	3.9	1.5
	Maximum	14.8	10.4	4.6
	Range	8.7	6.5	3.1
One-hand mano reworked from bifacial metate fragment	Mean	15.6	12.5	4.8
	n	1	1	1
	SD	–	–	–
	Median	15.6	12.5	4.8
	Minimum	15.6	12.5	4.8
	Maximum	15.6	12.5	4.8
	Range	0.0	0.0	0.0
Cobble mano	Mean	7.7	6.3	5.4
	n	5	5	5
	SD	0.5	0.8	0.5
	Median	7.8	5.8	5.2
	Minimum	7.0	5.7	4.9
	Maximum	8.3	7.2	6.2
	Range	1.3	1.5	1.3
Total	Mean	10.0	7.6	4.4
	n	23	23	23
	SD	4.2	2.1	1.5
	Median	9.0	7.5	4.6
	Minimum	3.7	3.9	1.5
	Maximum	23.2	12.5	8.1
	Range	19.5	8.6	6.6

(Table 19.3, continued)

		LENGTH (CM)	WIDTH (CM)	THICK-NESS (CM)
Whole One-Hand Manos				
One-hand mano	Mean	9.5	7.5	3.9
	n	14	14	14
	SD	2.9	1.5	1.1
	Median	9.9	7.8	3.8
	Minimum	3.7	4.7	2.4
	Maximum	14.2	9.8	5.7
	Range	10.5	5.1	3.3
One-hand mano reworked from metate fragment	Mean	10.5	7.2	3.1
	n	2	2	2
	SD	6.2	4.6	2.2
	Median	10.5	7.2	3.1
	Minimum	6.1	3.9	1.5
	Maximum	14.8	10.4	4.6
	Range	8.7	6.5	3.1
One-hand mano reworked from bifacial metate	Mean	15.6	12.5	4.8
	n	1	1	1
	SD	–	–	–
	Median	15.6	12.5	4.8
	Minimum	15.6	12.5	4.8
	Maximum	15.6	12.5	4.8
	Range	0.0	0.0	0.0
Cobble mano	Mean	7.7	6.3	5.4
	n	5	5	5
	SD	0.5	0.8	0.5
	Median	7.8	5.8	5.2
	Minimum	7.0	5.7	4.9
	Maximum	8.3	7.2	6.2
	Range	1.3	1.5	1.3
Total	Mean	9.4	7.4	4.2
	n	22	22	22
	SD	3.1	2.0	1.3
	Median	8.7	7.4	4.5
	Minimum	3.7	3.9	1.5
	Maximum	15.6	12.5	6.2
	Range	11.9	8.6	4.7

On bifacially used manos, there is an unutilized area on both surfaces. It is possible that this area is simply the remnant of original shaping, but equally possible that the wedge form was regularly maintained.

Manos from three excavated WIPP sites also have this same cross-section shape, estimated to be the result of "consistent pressure applied to one side" (Lord and Reynolds 1985:152). An "overall" wedge shape was noted for 11 manos found during the WIPP survey (Earls and Bertram 1987: Appendix C-6). Unlike the WIPP sites, however, NM 128 wedge manos are bifacially utilized. They also differ from the classic wedge use-life stage illustrated by a number of authors in that they have two, rather than three, grinding surfaces (Bartlett 1933:16, Fig. 8a; Woodbury 1954:76; Adams 2002:108, Fig. 5.7 b, g).

The second reason for theorizing that the NM 128 truncated wedge manos are manufactured is their disproportionately high frequency (34/74 determinate manos: 46 percent). If every form in the assemblage is a use-life stage, representation would perhaps be more equal, as illustrated by Adams (2002:108). This was the case with the Brantley Project manos, with rectangular, trapezoidal, triangular and biconvex represented in descending frequencies (Katz 1985a:85).

Brantley's trapezoidal and NM 128's truncated wedge may be similar, but the lack of an illustration of the Brantley manos precludes conclusive comparison. Interestingly, the Macho Dunes site had a minority of "airfoil" mano cross sections, presumed to be the result of "substantial use-wear" (Quaranta 2000:114). Wedge cross-section manos are listed for sites in the WIPP survey, described as the result of wear (Earls and Bertram 1987: Appendix C-6). No illustrations of the shape are available. Possibly similar manos from the WIPP excavations are described as "plano-plano wedge" in cross section, with oval or circular plan shapes (Lord and Reynolds 1985:150–151).

The third reason for suggesting that truncated wedge manos are manufactured is the presence of shaping on both the truncation and the distal edge. More than a third of all wedge manos display shaping along the acute, distal edge (n = 13/34) (Fig. 19.2). If the indeterminate manos are removed from consideration, this percentage rises to 54 percent (n = 13/24). This occurs as unifacial and/or bifacial flaking or pecking, and may have created a cutting edge. It may have also stabilized an edge worn thin and fragile from use, as the majority of manos with this edge modification are bifacially worn. A thicker distal edge might also facilitate handling. There are four wedge manos that could not be definitively categorized for this distal edge shaping attribute. These tools have occasional flake scars along this edge that do not appear to represent shaping. However, they may be use-wear, which was observed on over half of the assemblage.

In addition to distal edge shaping, the majority of wedge manos are well-shaped on the truncation and "back" as well, using flaking, pecking and grinding shaping methods (n = 26/34: 76 percent)

Table 19.4. Mano contour and stroke distribution by transverse cross-section shape, all sites.

SURFACE CONTOUR				MANO TRANSVERSE CROSS-SECTION SHAPE					
TXS* VENTRAL SURFACE	LXS VENTRAL SURFACE	TXS DORSAL SURFACE	LXS DORSAL SURFACE	BI-CONVEX	DOME	SUB-RECTANG-ULAR	WEDGE	ASSYMET-RICAL DIAMOND	**TOTAL**
Convex	convex	convex	convex	15	–	1	10	–	**26**
Convex	convex	convex	flat	1	–	–	–	–	**1**
Convex	convex	convex	indet.**	–	–	–	1	–	**1**
Convex	convex	concave	convex	–	–	–	1	–	**1**
Convex	convex	concave	concave	–	–	–	1	–	**1**
Convex	convex	concave	flat	–	–	–	1	–	**1**
Convex	convex	concave	indet.	–	–	–	1	–	**1**
Convex	convex	convex sinuous facet	convex sinuous facet	1	–	–	–	–	**1**
Convex	convex	flat	flat	1	–	–	2	1	**4**
Convex	convex	flat	irregular	1	–	1	–	–	**2**
Convex	convex	irregular	irregular	–	–	1	–	–	**1**
Convex	convex	N/A***	N/A	–	–	1	–	–	**1**
Convex	flat	convex	convex	1	–	–	1	–	**2**
Convex	flat	concave	concave	–	–	–	1	–	**1**
Convex	flat	flat	flat	–	–	–	2	–	**2**
Convex	flat	indet.	indet.	–	–	–	1	–	**1**
Convex	indet.	convex	indet.	–	–	–	1	–	**1**
Convex	indet.	flat	indet.	1	–	–	–	–	**1**
Convex	irregular	convex	irregular	–	–	1	–	–	**1**
Flat	convex	convex	convex	1	–	–	–	–	**1**
Flat	convex	convex	convex sinuous facet	–	1	–	–	–	**1**
Flat	convex	indet.	indet.	–	–	2	–	–	**2**
Flat	convex	irregular	irregular	–	–	1	–	–	**1**
Flat	flat	convex	convex	1	–	–	–	–	**1**
Flat	flat	concave	concave	–	–	–	1	–	**1**
Flat	flat	flat	flat	–	–	1	1	–	**2**
Flat	flat	indet.	indet.	1	–	–	2	–	**3**
Flat	flat	N/A	N/A	–	1	–	–	–	**1**
Flat	indet.	flat	indet.	–	–	–	2	–	**2**
Indet.	convex	indet.	indet.	–	–	–	1	–	**1**
Indet.	indet.	concave	concave	–	–	1	–	–	**1**
Indet.	indet.	flat	concave	–	–	–	1	–	**1**
Indet.	indet.	indet.	indet.	–	–	2	1	–	**3**
Irregular	irregular	irregular	irregular	1	–	–	–	–	**1**
Irregular	irregular	N/A	N/A	–	–	–	1	–	**1**
N/A	N/A	concave	concave	–	–	–	1	–	**1**
Total				**25**	**2**	**12**	**34**	**1**	**74**

*TXS = transverse cross section; LXS = longitudinal cross section
**indet. = indeterminate
***N/A = not applicable

Figure 19.2. LA 129214, FS 242, mano with wedge TXS and bifacial flaking along distal edge.

(Fig. 19.2). This area is not worn, possibly because of the stroke used. However, because this attribute occurs regardless of use-surface contour, and thus the stroke used, it may be a maintained feature. It is also possible that the pecking on the back and truncation represents wear from crushing or tapping hard materials, but the pecking appears too evenly executed to represent impact.

Fourth, more than half of these manos exhibit wear on the distal edge (n = 14/23, determinate manos: 61 percent). A variety of wear patterns are present, including: rounding (n = 4); rounding and polish (n = 5); shearing (n = 2); shearing and rounding (n = 1); and flaking (n = 2). Ten wedge manos do not display wear on this edge meaning it was not used after it was shaped.

While some of these wear patterns could be incidental to reciprocal grinding wear or caused by gripping the distal edge, the location and degree of wear may indicate that these edges may have a separate function. Rounding wear occurs along the narrow edge, and may or may not be related to handling. In some cases, the rounding and polish on the edge is heavier than on the "flat" use-surface. Polish only occurs with rounding and is never present on angular grains. Shearing wear is perhaps the best indication that these edges were used. The sheared-off sand grains display striations roughly parallel to the tool edge. This may be identical to the abrasion wear described by Adams (2002:30-31). Flaking wear is present as impact scars that occur along the entire edge, and is only visible using 40X magnification. Also significant are the red pigment stains that occur on the distal edge on three manos. Pigment may have been initially reduced with a chopping motion, as the stains are confined to the proximal edge on all three manos.

Finally, there may also be a selection for this shape in the source material. For example, the four manos manufactured from metate fragments all exhibit an identical TXS, suggesting that they may have been selected for reshaping into manos for this reason.

One wedge mano is formed from a bifacially worn metate fragment that has been flaked to shape around the entire perimeter. Reshaped metate fragments invariably exploit the thicker tool edge and adjacent use-surface area that together form a

Figure 19.3. LA 129214, FS 1176, mano with truncated wedge cross section reshaped from a bifacially worn metate fragment.

wedge (**Fig**. 19.3). The Macho Dunes site recovered five such manos reshaped from metate fragments (Quaranta 2000:114). Also, two unmodified sandstone wedge-shaped raw material forms were recovered, another possible indication of selection (LA 129214, FS 1533 and LA 129216, FS 87).

In summary, all of these factors may indicate not only a preference for this form, but that it was maintained throughout its use-life and served as a multifunctional tool. This is further discussed with the Mano Wear Surface Contours and Stroke Associations section.

Biconvex Cross-Section Manos (n = 25): Manos with biconvex cross sections are nearly as variable as the sub-rectangular forms. Biconvex forms are primarily one-hand, unmodified cobbles. Eight biconvex manos appear to have been formed from slab raw material, but extensive shaping and use obscures the raw material form. Sandstone (n = 14), quartzite (n = 4), chert (n = 2), limestone (n = 4) and dolomite (n = 1) are all represented. All of the nine complete biconvex, cross-section manos are cobbles of durable materials such as quartzite, limestone and chert (n = 8/9: 89 percent). Nearly all complete biconvex manos appear to fall within 7 to 8 cm diameter range. The notable exception is the large, heavy two-hand cobble.

Most biconvex surface contours created with a circular or reciprocal stroke in a basin metate (n = 39/45 determinate surfaces: 87 percent), while far fewer appear to be the result of a reciprocal stroke on a slab metate (3/45 determinate surfaces: 1 percent). While the majority of these manos are bifacially worn (n = 19/25: 76 percent), they are not faceted in the manner typical of Anasazi manos, as the raw material is biconvex in many cases. The degree of convexity varies from semi-flattened to sub-spherical.

One biconvex mano displays two surfaces that intersect at a clearly delineated facet around the perimeter, described in detail in Appendix 2 (Fig. 19.4). This tool appears to have been used in a circular or semicircular motion in a basin metate. Extensive use has obliterated all shaping modifications. The faceted forms may be the result of a high degree of use, increased pressure on one end and/or a circular stroke. Multidirectional striations may also indicate a circular stroke, and seven biconvex manos display this wear pattern. Six biconvex manos exhibit bidirectional striations. Striation wear is distributed across material types and raw material forms.

Two biconvex manos retain red stains on the grinding surface, the two-hand cobble and one quartzite cobble, indicating that these tools served in tasks other than food processing.

Sub-rectangular Manos (n = 12): There is little uniformity within this group with the exception of raw material form, which is primarily sandstone slab (n = 9), though a variety of material types and material forms are represented. Five can be assigned one-hand mano status. One is a reshaped metate fragment. Only two small fragments may be new manos. Two sub-rectangular manos are unmodified quartzite and limestone cobbles. These may have contrasted functionally from the sandstone slab manos due to differences in material texture and morphology. Among determinate surfaces and strokes, rocking and flat strokes are nearly equally represented. Most appear to have been used with basin metates. The cross-section shape of these manos does not appear to be functionally related, nor does it represent the first stage of newly manufactured manos.

Dome Cross-section Manos (n = 2): This group is represented by two contrasting manos. One is a complete flattened sandstone cobble that is teardrop in plan shape. It is lightly ground flat on both axes of a single surface, and displays bidirectional striations indicating use of a flat, reciprocal stroke. It appears to have been selected for its natural shape, having received no modification other than use-wear.

The second dome mano is a lateral fragment of pink sandstone that has been ground on two opposing surfaces. One surface is the result of a reciprocal stroke in a basin metate, and the reverse surface is either a circular or reciprocal stroke in a basin metate. This second surface also displays a sinuous facet around the edge (Fig. 19.5). It is fully shaped by pecking, and is heavily worn on both surfaces.

The sinuous facet, in particular, seems indicative of use with a basin metate. This same use-wear surface is also displayed by LA 129214, FS 339, though the cross section is biconvex (see also Appendix 2 for detailed description). These contours may be similar to the "rocker facet" manos found at the Salt Cedar site of the Andrews Lake Locality project in the southern Llano Estacado (Collins 1968:98). However, the absence of illustration precludes definitive comparison. While both of these manos appear to be compatible only with basin metates, there are no complete basin metates from the project, precluding definitive companions.

Asymmetrical Diamond Cross-section Manos n = 1): This mano is heavily worn into a diamond cross section with two well defined facets on each side (Fig. 19.6). The facets are atypical in that they are oriented at a slight angle to the length. Most manos worn into this cross-section shape are symmetrically faceted, as frequently illustrated in Adams 2002:113; Bartlett 1933:17; and Stubbs and Stallings 1953:114. However, the asymmetrical facets of this mano suggest that it was held at an angle to the user, or the metate was angled to the user. In either case, this mano was not manipulated perpendicular to the user and the metate. A reciprocal stroke was used, however. It is the only mano in the assemblage that displays this type of faceting.

Summarizing, NM 128 mano cross-section shapes do not appear to be related to the use-life stages typical of agriculturally based economies. Rather, cross-section forms appear to be more closely linked with the stroke used to manipulate the mano, which is discussed below. While the assemblage has a variety of cross-section shapes, they are not proportionately represented and appear mostly unrelated with the exception of the truncated wedge forms. If new sub-rectangular manos were being manufactured and used to the maximum, each stage would be represented. This is not to suggest that every stage would be equally represented, only that they would be proportionate.

Mano Wear Surface Contours and Stroke Associations

The Brantley Reservoir project ground stone-tool descriptions have become a standard for many southeastern New Mexico projects, with a caution against the use of ground stone tools as chronological indicators (Katz and Katz 2001:Table 2). The Brantley mano typology is frequently referred to in southeastern New Mexico reports (Katz and

Figure 19.4. LA 129214, FS 339, basin mano with biconvex TXS and LXS.

Katz 1985a: 83–86; Leslie 1979:188–192; Lord and Reynolds 1985:149; Earls and Bertram 1987:100). At Brantley, flat one-hand manos and slab metates were associated with Formative 1 and 2 periods. "Convex manos" and oval basin metates were recovered in a Formative 3 context and manos with one or two use-surfaces in the Formative 4 period.

While these tool types and period associations are frequently quoted and mano surface contours are often included, the specific axis of the contour is not described. It is proposed here that monitoring the contour of both axes is important for a number of reasons.

For descriptive purposes alone, the contours of both axes of a single ground surface are worthy of inclusion. But more importantly, several observations made during analysis, as well as research on Adams' experiments, led to the conclusion that the contour of a grinding surface is meaningful only if both axes are examined.

First, research suggests that the transverse axis informs on the stroke used to manipulate the mano (Lancaster 1986:182; Adams 1999, 2002:41, 100, 102–106). Adams also examines the longitudinal contour that results from use with different metate companions. Adams lists the specific wear patterns and contours that result from her experiments with different mano and metate companions. An attempt will be made here to link mano wear surface contours and strokes based on her findings. Each association is listed and discussed below.

A convex TXC is the result of a rocking reciprocal stroke, in which the edge of the mano is lifted on either the forward and/or return stroke (Lancaster 1986:182; Adams 2002: 41, 103–104). During a flat reciprocal stroke, the mano is contact with the metate surface at all times (Adams 2002:103; Lancaster 1986:182), and neither edge is lifted on the forward or backward stroke.

Adams also describes the wear patterns specific to strokes used in a basin metate, provided below (Adams 2002:102–103). These are adaptations from Adams' Figures 5.2, 5.3, 5.4.

Basin Metate Wear Patterns and Stroke Associations: Circular, rocking stroke produces wear facets on parts of the ends and edges, along with

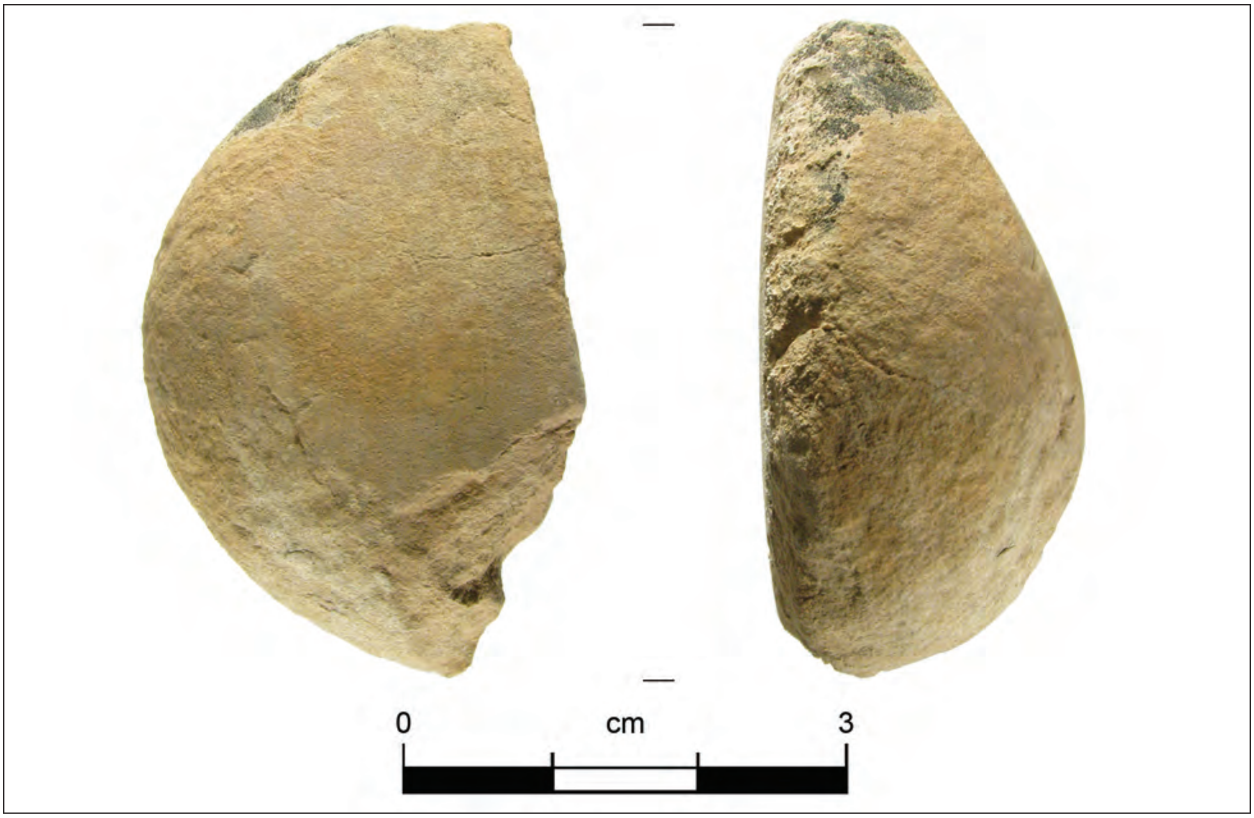

Figure 19.5. LA 129222, FS 223, mano with dome cross section and convex sinuous facet contour.

multidirectional striations, creating a convex TXC; reciprocal, rocking stroke results in wear facets on the edges only, linear striations perpendicular to the width, and a convex TXC; and both circular rocking and reciprocal rocking strokes create wear facets on all ends and edges, linear and multidirectional striations, a convex TXC and a sub-spherical shape Linear or multidirectional striations are present depending on the last stroke used (Adams 2002:102–104).

Lancaster also states that a "beveled cross section" is the result of a reciprocal stroke (1986:182). The transverse convexity that results from a rocking reciprocal stroke is illustrated by Adams (2002; Fig. 5.4), and is mirrored by many of the mano use-surfaces in the NM 128 assemblage. Adams also notes that striation orientation is important in determining stroke type (2002:102–103, 106).

Second, identical mano cross-section shapes often have different contours. The NM 128 contour data suggest that one mano can be manipulated with two different strokes and/or used on two different metates. This also applies to manos in a particular shape category. For instance, not all wedge manos were used on the same metate type, nor were they manipulated with the same stroke.

Finally, the longitudinal axis contour may inform on the type of metate companion used. However, this may be a more subjective determination. For instance, Wiseman observed that "flatness and the degree of convexity (were) not related to intensity of use" at the Sunset Archaic Site (1996a:34). Lancaster states that various cross-section shapes are the result of differential pressure applied to the mano surface and can possibly inform on the companion metate type (1986:1982). Adams' experiments found a relationship between longitudinal contour and metate companion. Markedly convex longitudinal mano contours resulted from use in basin metates, and "slightly convex end-to-end contour(s) resulted from extensive use on slab mutates" (2002:103-106 and Figure 5.6).

All of the above factors suggest that both axes of a mano wear surface should be examined. The link between contour and stroke, the contour variability within mano shape groups, and the possibility that some cross-section forms are shaped suggest that specialization existed within the mano tool group.

Figure 19.6. LA 113042, FS 674, mano with an asymmetrical diamond cross section. Facets are tangential to the length, suggesting the mano was moved forward at an angle the the user.

The resulting contour data provide interesting information on the nature of the tools.

It is important to note here that the majority of NM 128 manos are equally worn on two surfaces (n = 52/72 manos with two wear surfaces: 72 percent). This is significant because the more heavily worn surface was labeled as "ventral" during analysis. The fact that the majority are identically worn helps to remove the subjectivity of identifying the more heavily worn surface as the "ventral" and the less worn surface as the "dorsal".

The contour data are examined in several ways. Perhaps the most informative is the distribution of pair types (Table 19.4). Pair types are the contour combination for each axis of a single surface. For example, if a particular surface is convex on both axes (TXC and LXC), the pair type for that surface would be convex-convex (this term is used to avoid confusion with a biconvex TXS).

Mano pair type frequencies are listed in Table 19.4. The stroke used to create each pair type is postulated based on Adams' and Lancaster's observations. A few notes should be made regarding the treatment of contour data. Whole manos are analyzed for both stroke and metate type. Fragments are analyzed for complete cross sections, if any: for manos with a complete length and incomplete width, only the metate companion type will be postulated, as the complete transverse cross section is missing. Mano end fragments are analyzed only for the stroke, as one or both ends are missing and cannot inform on metate companion type. Also, a surface that is convex on both axes is estimated to be the result of a circular or rocking reciprocal stroke in a basin metate unless striations are present. These strokes will be referred to as circular/rocking reciprocal in the discussion to follow.

If striations are visible either macroscopically or viewed with 40X power, their orientation is considered the primary indicator of stroke type, even if contour information is contradictory. For example, if a wear surface is convex on both axes and displays multidirectional striations, it is recorded as a circular/rocking reciprocal stroke on a basin metate. If bidirectional striations are present on this same convex-convex surface, then a rocking reciprocal stroke on a basin metate is recorded. However, striations were observed on less than one-quarter of all mano use-surfaces (n = 40/180: 22 percent). Most of these striations were present on fragments whose orientation could not be determined. This contrasts with one-hand manos from the Macho Dunes site, 81 percent of which displayed "crescentic or circular" striations (Quaranta 2000:115), and the Mimbres Valley Salado (Lancaster 1986:179).

Discussion of Mano Contour and Stroke Data

Interesting trends appear upon examination of stroke data, some of which are unexpected. Based on the predominance of convex-convex mano surfaces and basin metates observed during analysis, it was expected that rocking strokes would dominate.

While this is the case among determinate manos (n = 93/128: 73 percent), flat strokes comprise a significant percentage among surfaces whose strokes can be determined (n = 35/128: 27 percent). It was also expected that the predominance of convex-convex surfaces would indicate a circular or semicircular stroke in a basin metate. Instead, it may be that these manos were manipulated reciprocally. This conclusion was reached due to the dominance of bidirectional striations on mano surfaces, where striations were present (n = 28/40: 70 percent).

However, another attribute may be more indicative of a circular stroke: manos with asymmetric LXSs, in which one end is thinner than the other (Fig. 19.7). This results in a wedge cross section on both the length and width axes, creating a very thin edge around most of the perimeter.

Eight manos have this shape, suggesting that greater pressure was consistently applied to one end over the other. This shape was most likely created on a basin metate with a semicircular stroke. It seems unlikely that this shape could be created on a slab metate. Presumably, it would be highly inefficient, as well as physically difficult to apply greater pressure to one side of a mano on a slab metate.

If this assumption is correct, at least eight manos in the assemblage were used with a semicircular stroke (n = 8/65 determinate mano LXS: 12 percent).

One additional contour may result from a circular or semicircular stroke: sinuous facets (Figs. 19.7 and 19.8). These manos, described in detail in Appendix 2, have an undulating, faceted surface that is unlikely to have resulted from a flat stroke or a slab metate. Wear on both tools resembles that described for basin manos (Adams 2002, Fig. 5.4). If these speculations are correct, then the reverse would also be true: manos with symmetrical LXS shapes were moved reciprocally (n = 57/65 determinate LXS shapes: 88 percent), either with a flat or rocking stroke.

Another interesting aspect of the mano assemblage is the manner in which use-surfaces are paired on each tool (Table 19.4). Among determinate tools, the majority are identically contoured (n = 32/48: 67 percent). More than one-third display contrasting contours, indicating that different strokes were used for each surface (n = 16/48: 33 percent). The same stroke was probably used to create both surfaces in the identically contoured group. Nearly all of the identical manos are convex-convex on both surfaces, likely as a result of manipulation with a rocking reciprocal stroke on a basin metate (n = 28). Flat-flat contours comprise a very small percentage (n = 4).

Interestingly, bifacial manos used with a flat reciprocal stroke on one side and a rocking reciprocal on the other comprise a significant percentage (n = 12/52 determinate strokes on bifacial manos: 23 percent). This stroke distribution suggests that manos were not only used on both basin and slab metates, but they were moved with rocking and flat strokes.

Within this determinate group, over half of all manos appear to have been multipurpose tools, with each side used to process different materials, or used for a different phase of processing the same material.

More than half of all mano surfaces can be analyzed for metate companion type (Table 19.4; Summary) (n = 116/218 or 53 percent). Most of these appear to have been used bifacially on basin metates (n = 29/43 determinate manos: 67 percent), slab (n = 6/43 or 14 percent), or basin-slab (n = 8/43 or 19 percent). Basin-slab manos appear to have been used on two different metate types: one surface with a basin metate, the other with a slab metate. One basin-slab metate was recovered from LA 129300 and from one of the excavated WIPP sites near Carlsbad, ENM 10230 (Lord and Reynolds 1985:149, 151).

Both of the following mano categories have been included in the previous analysis results. They are discussed separately here due to the morphological distinction and uniformity within each category.

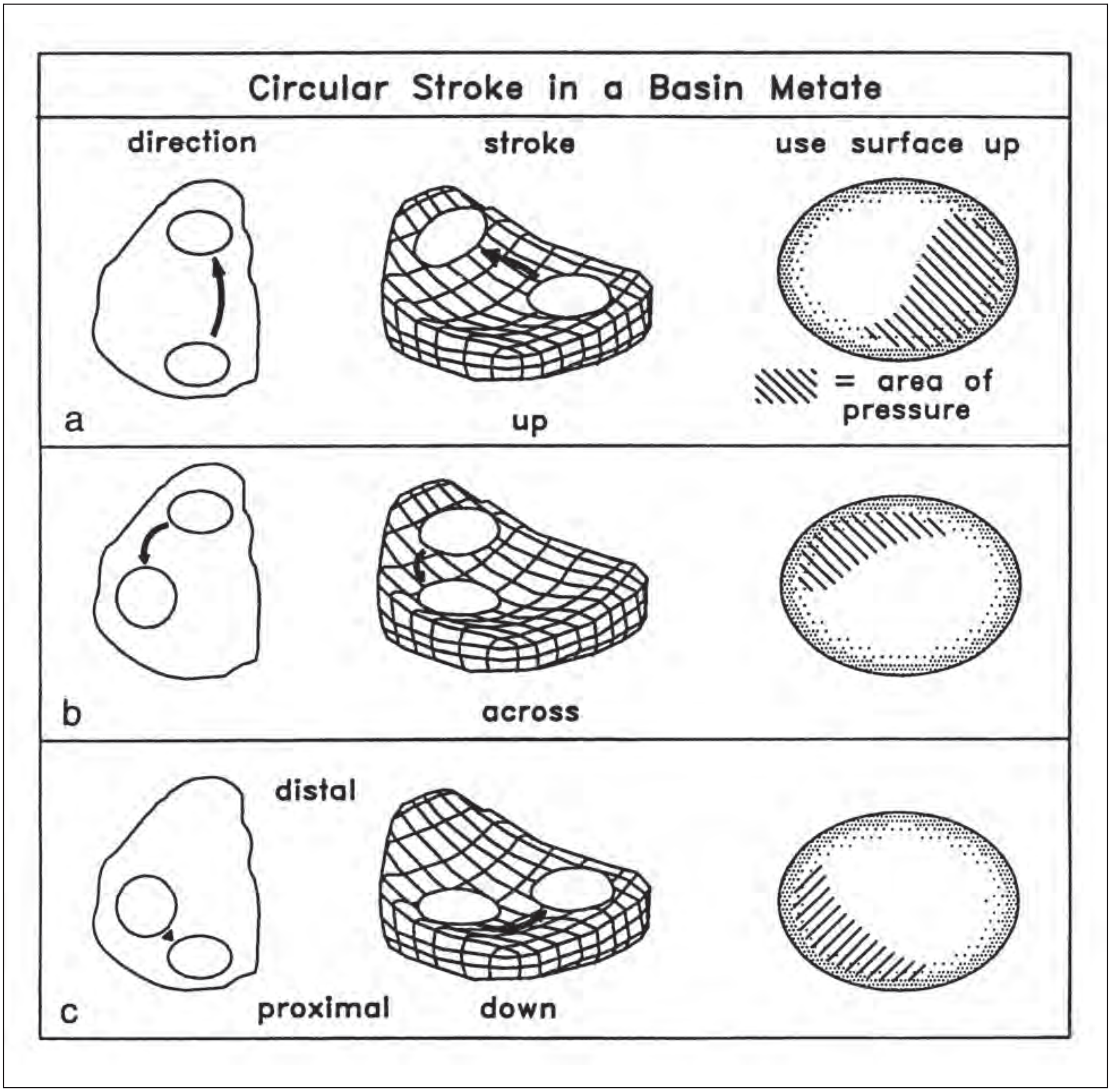

Figure 19.7. Schematic of a circular stroke used in a basin metate. Adapted from Adams (2002, Fig. 4).

Manos Reshaped from Metate Fragments (N = 8)

These tools are one-hand manos that display both mano and metate use-surfaces (Fig. 19.9). All are sandstone. Three are complete and four are fragmentary.

This is likely another indication that wedge cross sections are preferred for manos. This is evidenced by the fact that these tools have been shaped from the same metate fragment. In every case, a wedge-shaped basin edge fragment is chosen for reshaping. One mano differs in that it is formed from a bifacial metate fragment flaked into a mano preform. Both of the concave metate use-surfaces remain, and the artifact was not used as a mano following manufacture.

Most of the mano use-surfaces are convex on both axes. All manos made from metates are shaped by flaking, pecking or both. The remaining two whole specimens are shaped by flaking and pecking. Four are complete enough to measure the thinnest section of the metate use-surface, the thickest of which is the reshaped bifacial metate fragment previously described with the wedge manos (0.4, 0.7,

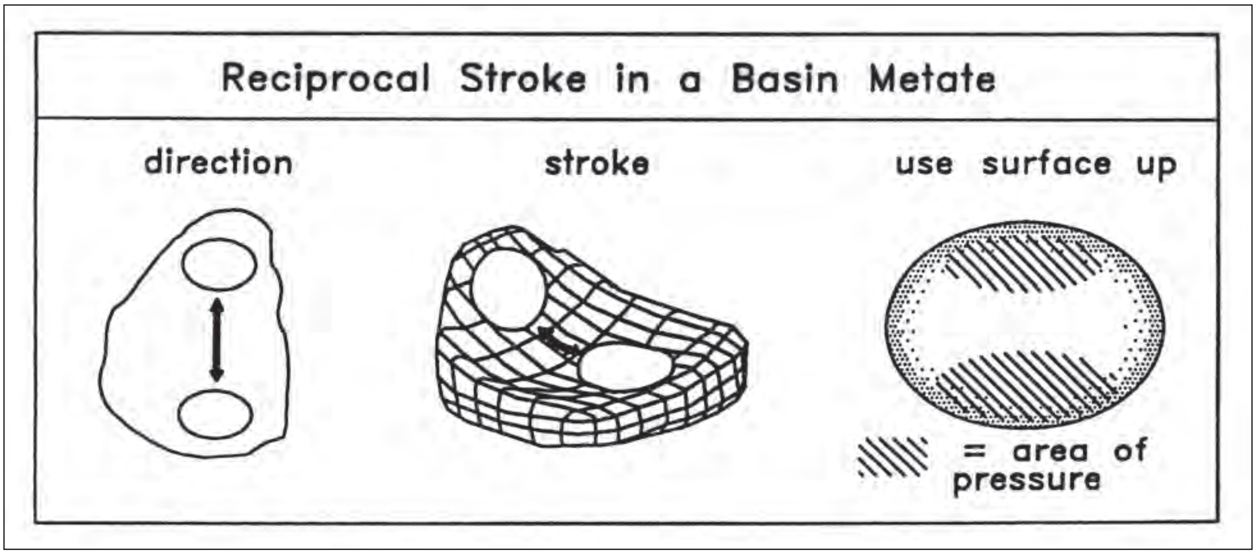

Figure 19.8. Schematic of a reciprocal stroke used in a basin metate. Adapted from Adams (2002, Fig. 4).

0.8, and 2.0 cm). Because of the secondary use as mano for all but one of these artifacts, it is impossible to determine if the metates were bifacial or unifacial prior to breakage and reuse.

One-hand manos reshaped from metate fragments were also found at Macho Dunes near Carlsbad (Quaranta 2000:114). The complete specimen measures 14.8 by 10.4 by 4.6 cm and is further described in Appendix 2.

Multifunction Cobble Manos (N = 6)

These unmodified quartzite (n = 3), sandstone (n = 1) and chert (n = 2) cobble tools display a range of wear patterns, and appear to have been multifunctional tools used for various combinations of grinding, crushing, abrading, hammerstone and pigment reduction activities. Some also appear to have served as cores for raw material. These are described individually in Appendix 2.

All quartzite cobbles display grinding wear, and four have battering wear in addition to grinding. The ground surfaces are flat or convex, ground or smooth, unsharpened cortical surfaces that are sometimes striated. The battering wear is occasionally overlain by light grinding in spots, suggesting that crushing and grinding may have occurred together, or that hammerstone use preceded mano use. Battering wear occurs on one of the quartzite manos as well. One retains red pigment on the ground surface, as well as polished use-surfaces. Red pigment traces were found on the manos from the Sunset Archaic site west of Roswell as well (Wiseman 1996a:34).

The Macho Dunes site, LA 29363, and the Bob Crosby Draw Site, LA 75163 recovered quartzite tools (Quaranta 2000:113; Wiseman 2000a:39). Cobble tools used on a single face were found at nearby LA 98820 (Acklen and Railey 2001:60). All of these site reports refer to these tools as manos. Quartzite hammerstones were recovered from LA 122047 near the project area (Acklen and Railey 2001:50).A hammer/grinder was recovered from LA 98820, a tool displaying both battering and grinding wear (Acklen and Railey 2001:63). The raw material form and material type are not mentioned, but the combination of these two wear types is reminiscent of the NM 128 tools. Interestingly, the reverse material distribution occurs at the Brantley Project sites, where quartzite is used for hammerstones and makes up a majority of manos (Katz and Katz 1985a:84). The authors also describe a wide variety of morphological diversity among the quartzite mano assemblage. Battering and grinding wear may not have co-occurred on this material at Brantley, however, as these two artifacts are described separately. The cryptocrystalline-grained materials have been linked to the processing of wild foods, particularly grass seed, necessitated by the need to prevent seed loss (Stone 1994:682-683, from Greenwald 1990). Quartzite hammerstones, some with grinding wear, were recovered from the ex-

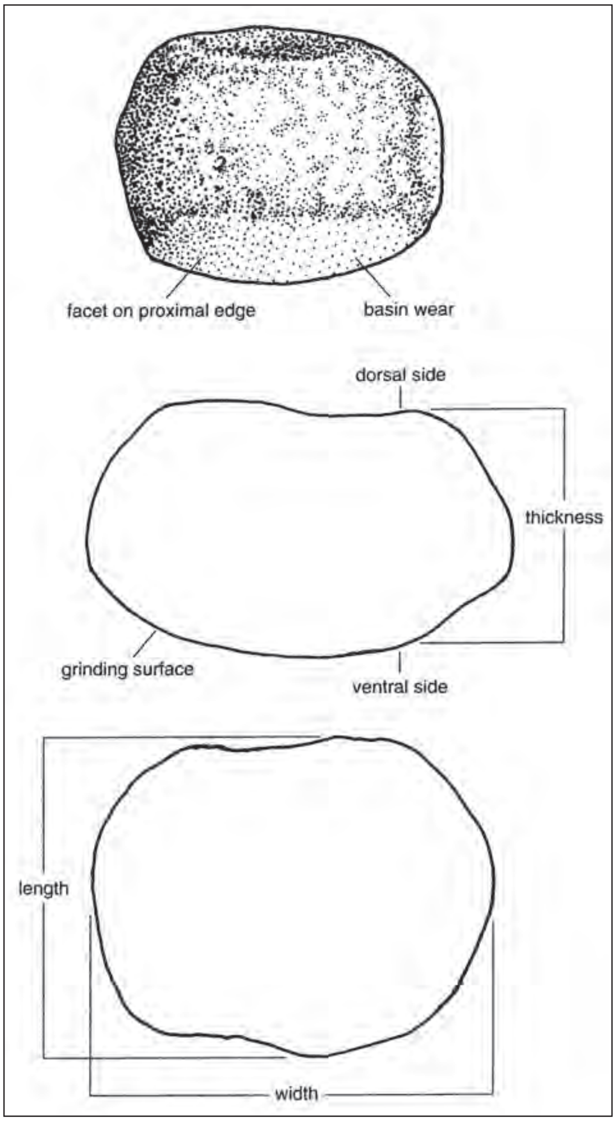

Figure 19.9. Basin mano; note wear facets on proximal and distal edges. Adapted from Adams (2002, Fig. 5.4).

cavated WIPP sites (Lord and Reynolds 1985:152). Quartzite hammerstones were also found at the Bob Crosby Draw Site (Wiseman 2000a:42).

Metates (N = 83)

The metate assemblage is comprised primarily of small edge and interior fragments. Five metates are complete or nearly complete and are described in detail in Appendix 2. Those whose typology could be determined suggest that the original assemblage may have been quite diverse. Basin (n = 6), slab (n = 4), basin-slab (n = 1), hand-held (n = 1), a metate base fragment (n = 1), and indeterminate fragments (n = 70) comprise the assemblage. One slab metate fragment has been reused as an abrader, displaying grinding on one broken edge as well on the original metate use-surface.

Complete metates are small in size (Table 19.5). A variety of natural forms appear to have been utilized, including slabs of varying thickness and cobbles. Slabs (n = 65), cobbles (n = 2), and angular material (n = 1), represent determinate raw material forms. Both cobble metates display little or no use, while most of the slab raw and hematitic sandstones are lightly or moderately worn.

The majority of metates are manufactured from sandstone (n = 81) (Table 19.1). Red, pink and hematitic (n = 53), followed by brown and light brown (n = 22), white (n = 3), yellow-brown (n = 2), and indeterminate color due to sooting (n = 1). Most sandstones are indurated (n = 70/83: 84 percent), with friable materials comprising 16 percent (n = 11) of the total. Dolomite and limestone materials are also present (n = 1 each).

Less than one-third of the metate assemblage can be analyzed for shaping methods (n = 26/83: 31 percent). Flaking and pecking are the primary shaping methods used, as with the mano assemblage. Metates complete enough to display shaping indicate that these artifacts are less well shaped than manos. Flaking to shape has been mostly or completely obliterated by subsequent pecking on most manos; not so with metates. This lack of shaping applies mainly to metate edges, however. Most basin edges and perimeters exhibit smooth, regular contours. Twelve fragments exhibit a shaped metate base on one side and a grinding surface on the other.

Metate-use degree is nearly evenly distributed between moderate and heavy (n = 48 and n = 51, respectively). Most heavily worn surfaces occur on bifacial metates. While most metates display one ground surface, a substantial percentage are bifacially worn (n = 49 and n = 33, respectively), often to a very thin cross section (Table 19.5). Because depth could not be measured for these fragments, thickness was measured to gain an indication of degree of use (Table 19.5). This mean thickness is 1.45 cm, ranging from .1 to 3.6 cm. These thin, bifacially worn, interior-metate fragments are an indication of intensive tool use. It appears that many of these metates were used to the maximum extent possible, their use-life ending when the basin was worn through or broke from fragility.

Grinding surface depth is measurable for the four complete metates. The most deeply worn metate is the bifacial basin that is ground to a 3.0 cm depth. The hand-held metate is also deeply worn to a depth of 1.3 cm. Metates with two opposing grinding surfaces were found at the Salt Cedar site in the Andrews Lake Locality, though the thickness at the center point is not mentioned (Collins 1968:151). Similar use was observed on basin metates from the Sunset Archaic Site, some ground to a depth of 6 cm (Wiseman 1996a:39).

One of the slab metates warrants individual description. It is an edge fragment formed from a thin, yellow-brown sandstone slab that has been bimarginally flaked to shape around the perimeter. The complete artifact appears to have been oval or circular. It is bifacially worn to a 0.6 cm thickness, with most of the use occurring on one partially sooted surface. Only a narrow portion of this grinding surface remains, and it is bordered by a 4.3 cm wide pecked margin.

The pecking appears to be re-sharpening as opposed to shaping. The reverse use-surface is lightly ground (16.6 by 8.3 by 1.6 cm, 1370 grams). The manufacturing techniques and morphology of this artifact are similar to that of the tabular knives from the project. Tabular knife edges are also bimarginally flaked and the broad surfaces ground flat. However, the edge of this metate fragment appears to have been flaked to shape, as the angle is too obtuse for cutting.

Basin metates predominate at many sites in the project area. The Sunset Archaic Site recovered 10 basin metates shaped from slabs, cobbles and boulders (Wiseman 1996a:34). Cobbles were also used for metates in the NM 128 project, though both cobble metates are modified by shaping only. Other sites with a preponderance of basin metates include the Sunset Shelters (Wiseman 1996a:77), two excavated sites in the WIPP project (Lord and Reynolds 1985:150-151), the Bob Crosby Draw Site (Wiseman 2000a:39), and two sites in the Red Lake Tank project near Roswell (Bullock 1999:53). Interestingly, the nearby WIPP survey recorded more slab than basin metates (Earls and Bertram 1987:Appendix C-6).

Complete and Nearly Complete Metates

Open-end Basin Metate, LA 129214, FS 1373: This complete brown sandstone basin metate is roughly flaked to shape around the entire perimeter into an irregular oval form. It is ground reciprocally, as with other project metates, but it differs in that the use-surface extends to the edge at both ends. However, the use-surface is concave on both axes, and appears to have functioned as a basin as far as confining the processed material. It is ground to a depth of 0.8 cm. The base has been flattened by grinding.

This artifact is typical of project metates in terms of rough exterior shaping, basin use-area, and its small size (29.3 by 19.2 by 3.0 cm, 2300 grams). It was recovered from the surface at Grid Unit 487.5N/440.67E.

Small Basin Metate, LA 113042, FS 1032-1: This basin metate is from well-cemented, red hematitic sandstone. Its most remarkable characteristic is that it displays two opposing grinding basins (Fig. 19.10). For this reason, each surface is described separately. It is in two refit pieces. The first basin metate appears to have been larger, and may only be represented on this side by a large corner. The basin is deeply worn to a 3 cm depth, and is bordered by a 9 cm pecked shelf. Although the basin edges are apparent, they are not as well defined as the opposing basin. The complete grinding surface and basin dimensions on this side cannot be determined due to its fragmentary condition.

The metate appears to have been reshaped and reused on the opposite side following breakage. It also broke again during its secondary usage, but appears to have only a corner missing. It is pecked and flaked around the perimeter to a rough oval shape. The basin is a well-defined, elongated oval, worn to a depth of 3.0 cm. Both the full basin width and length can be discerned from the existing portion that appears to be 11 by 25 cm. This narrow basin was probably formed by reciprocal action. The metate is worn quite thin where the two basins oppose, to 0.9 cm. The exterior dimensions are 33 by 16 by 4.7 cm and the weight is 2300 grams. It was recovered from the fill of F. 72, Grid Unit 371.97N/606.57E

Dolomite Cobble Metate, LA 129214, FS 1774: A flattened, unmodified dolomite cobble has been shaped by pecking around most of the perimeter. One surface is naturally convex and serves as the metate base; the opposing surface is naturally concave and is not used. It measures 21.5 by 15.0 by 2.6 cm and weighs 2600 grams. It was recovered from Level 3, Strat 2, at Grid Unit 406.91, 349.90E, Block 19.

Table 19.5. Mean dimensions for whole and fragmentary metates; number and distribution of wear surfaces.

Actual Dimensions for Whole and Nearly Whole Metates						
SITE AND FS NO.	ARTIFACT TYPE	LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	WEIGHT (KG)	BASIN DEPTH (CM)
LA 113042, FS 540	basin metate	22.7	12.3	7.3	3.4	not used
LA 129214, FS 1373	basin metate, open ended	29.3	19.2	3.0	2.3	0.8
LA 129214, FS 1774	basin metate	22.0	15.0	6.3	2.7	0.1
LA 113042, FS 591	hand-held metate	13.5	11.5	3.3	0.5	1.3
LA 113042, FS 1032	basin metate (corner missing, dimensions complete)	32.4	16.0	4.7	2.3	3.0
Mean Dimensions for Whole Metates						
		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	USE SURFACE	WEIGHT (KG)
	Mean	24.0	14.8	4.9	0.9	2.2
	n	5	5	5	4*	5
	SD	7.3	3.1	1.9	0.5	1.1
	Median	22.7	15.0	4.7	1.1	2.3
	Minimum	13.5	11.5	3.0	0.1	0.5
	Maximum	32.4	19.2	7.3	1.3	3.4
	Range	18.9	7.7	4.3	1.2	2.9
	*one metate not used					
Mean Dimensions for Fragmentary Metates, All Sites						
NO. OF WEAR SURFACES		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	USE SURFACE	WEIGHT (KG)
1	Mean	5.8	4.5	1.9	0.8	0.1
	n	43	43	43	2	43
	Std. Deviation	3.2	2.6	1.1	0.3	0.2
	Median	5	3.8	1.7	0.8	0.0
	Minimum	1.1	1.1	0.3	0.6	0.0
	Maximum	14.6	11.3	4.9	1	1.3
	Range	13.5	10.2	4.6	0.4	1.2
2	Mean	6.2	4.6	2.1	1.5	0.2
	n	33	33	33	32	33
	Std. Deviation	3.7	2.5	1.0	1.0	0.4
	Median	5.3	4	1.9	1.2	0.0
	Minimum	1.6	0.3	0.6	0.1	0.0
	Maximum	16.6	10.0	4.2	3.6	2.0
	Range	15.0	9.7	3.6	3.5	2.0
3	Mean	9.4	5.0	2.7	2.7	0.2
	n	1	1	1	1	1
	Std. Deviation	–	–	–	–	–
	Median	9.4	5.0	2.7	2.7	0.2
	Minimum	9.4	5.0	2.7	2.7	0.2
	Maximum	9.4	5.0	2.7	2.7	0.2
	Range	0	0	0	0	0.0
Total	Mean	6.0	4.5	2.0	1.4	0.2
	n	77	77	77	34	77
	Std. Deviation	3.4	2.5	1.1	1.0	0.3
	Median	5.2	4	1.8	1.2	0.0
	Minimum	1.1	0.3	0.3	0.1	0.0
	Maximum	16.6	11.3	4.9	3.6	2.0
	Range	15.5	11	4.6	3.5	2.0

Triangular Hand-held Metate, LA 113042, FS 591: This small triangular metate displays a narrow, deeply concave wear surface that is open at the triangle base and closed at the apex, resembling a small trough. It is formed from white sandstone and is mostly coated with caliche, obscuring most of the wear surface. Its small size probably indicates that it was hand-held, and the narrow basin was probably formed by reciprocal grinding (13.5 by 11.5 by 3.3 cm, 540 grams). It is worn to a depth of 1.3 cm. It was recovered from Level 2, Stratum 2 at Square point 457.16N/518.16E in Block 2.

Sandstone Cobble Metate, LA 113042, FS 540: This metate is modified by shaping only and may be a preform. It is an oval, red sandstone cobble pecked to shape around the sides. No wear is apparent on the item, but caliche may be obscuring wear patterns. The convex base and concave potential working area are unmodified cortical surfaces. It measures 22.7 by 12.3 by 7.3 cm and weighs 3400 grams. It was recovered from Level 1, Strat 1, Block 1, Square 463N/515E.

Indeterminate Mano or Metate Fragments (n = 15: The remaining artifacts from the mano and metate assemblage consist of indeterminate fragments. These fragments were probably part of a mano or metate, but cannot be conclusively assigned based on mean small size and flat grinding surface (3.9 by 2.7 by 2.2 cm, 46 grams). Indeterminate fragments are all less than 9 cm in length, with most ranging from 4 to 5 cm. They are manufactured from sandstone (n = 14) and limestone (n = 1). The majority of fragments have a single ground surface, all of which are flat.

Site Mano and Metate Assemblages

The mano and metate assemblages from each site contrast greatly, particularly in frequency (Table 19.6). Site assemblages may vary due to differences in size and excavation intensity (Schlanger 1990). Most project sites have few ground stone artifacts, with LA 129214 and LA 113042 containing the vast majority of the assemblage (n = 178/207: 86 percent).

East Project Area Sites

LA 129217 (n = 4). Three small, red and one brown sandstone metate fragments comprise the entire assemblage. The largest fragment retains the curved ground edge of a basin metate. The pecked shelf and edge are also present. No grinding or shaping is apparent on the base. It was recovered from Level 2, Strat 1/7 of Square 430N/484E, Block 1. It measures 6.9 by 5.7 by 2.3 cm.

The second fragment appears to be an internal fragment of a basin metate with one concave use-surface and an opposing, shaped flat base. It was found in Level 2, Strat 1/7, Square 480N, 486E, Block 1. It measures 4.5 by 3.4 by 1.8 cm.

The third is an internal, bifacial metate fragment worn to a 2.2 cm thickness (4.7 by 2.2 by 2.2 cm). Both surfaces are heavily used. It was recovered from Level 4, Strat 2/7 of Square 486N, 482E, Block 5.

The brown sandstone artifact is a metate edge fragment that has one slightly concave ground surface. It has been pecked to shape around the outside edge and measures 5.6 by 5.4 by 3.6 cm. It was recovered from the surface at Grid Unit 490.3N/537.46E.

LA 129218 (n = 4). Two mano and two metate fragments represent the assemblage. Both the mano and metate fragments are comprised of one brown and one red sandstone artifact. The red sandstone mano fragment displays two adjacent flat ground surfaces, measures 4.4 by 2.2 by 1.8 cm and was found in Level 1, Strat 7 of Square 528 N, 504E, Block 4. The Brown mano fragment displays one convex ground surface, measures 2.7 by 1.0 by 2.9 cm. It was recovered from Level 2, Strat 7 of Square 526N/506E.

The red sandstone metate fragment displays one moderately worn, irregular grinding surface. It measures 4.8 by 2.3 by 2.8 cm and was recovered from Level 1, Strat1/7 of Square 518 N/502E in Block 2. The brown sandstone metate fragment is bifacially worn, displaying one concave and one flat surface. It measures 2.0 by 1.8 by 1.1 cm. The fragment was recovered from Level 2, Strat 2 of Square 510N/482E.

Two of the three metate fragments are bifacial, suggesting that ground stone tools appear to have received heavy use at these two sites. Nearly all ground stone wear surfaces from LA 129217 and LA 129218 display moderate to heavy use (n = 10/11: 91 percent).

The proximity of these two sites suggests that they were used simultaneously, though the absence

Figure 19.10. LA 113042, FS 1032-1, red hematitic sandstone basin metate with two opposing grinding surfaces.

Table 19.6. Mano, metate, and indeterminate mano or metate fragment distribution by site.

SITE	LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300	TOTAL
Manos								
One-hand mano	4	17	1	–	–	2	4	**28**
Two-hand mano, loaf-shaped	–	1	–	–	–	–	–	**1**
One-hand mano reworked from metate fragment	1	5	–	–	–	–	–	**6**
One-hand reworked from bifacial metate fragment	–	1	–	–	–	–	–	**1**
Metate fragment reshaped into mano	–	1	–	–	–	–	–	**1**
Mano, slab, not further specified	–	1	–	–	–	–	–	**1**
Multifunction cobble mano	2	4	–	–	–	–	–	**6**
Mano fragment reused as abrader	–	1	2	–	–	–	–	**3**
Mano fragment	13	43	1	–	2	–	3	**62**
Subtotal	20	74	4	–	2	2	7	**109**
% of site assemblage	57.1%	51.7%	66.7%	–	50.0%	50.0%	63.6%	**52.7%**
Metates								
Metate, basin	2	1	–	1	–	–	–	**4**
Basin metate, reciprocal	–	2	–	–	–	–	–	**2**
Metate, slab	–	3	–	–	–	–	–	**3**
Basin-slab metate	–	–	–	–	–	–	1	**1**
Hand-held metate	1	–	–	–	–	–	–	**1**
Metate fragment reused as abrader	–	–	1	–	–	–	–	**1**
Metate base fragment	1	–	–	–	–	–	–	**1**
Metate fragment	8	52	1	3	2	1	3	**70**
Subtotal	12	58	2	4	2	1	4	**83**
% of site assemblage	34.3%	40.6%	33.3%	100.0%	50.0%	25.0%	36.4%	**40.1%**
Indeterminate, Fragmentary								
Indeterminate, fragmentary	3	11	–	–	–	1	–	**15**
Indeterminate fragment % of site assemblage	8.6%	7.7%	–	–	–	25.0%	–	**7.2%**
Site total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Table total	**35**	**143**	**6**	**4**	**4**	**4**	**11**	**207**
Site % of total	**16.9%**	**69.1%**	**2.9%**	**1.9%**	**1.9%**	**1.9%**	**5.3%**	**100.0%**

of radiocarbon dates from LA 129217 precludes estimates of concurrent occupation.

Most ground stone fragments have been manufactured from red sandstone that may indicate that they may have been used simultaneously as part of a ground stone tool kit for this particular resource area.

Central Project Area Sites

While LA 129222 and LA 129300 are both located in the central project area, they are not considered to have functioned as a single site. The assemblages from both sites are small and entirely fragmentary.

LA 129222 (n = 4). Two one-hand manos, an internal metate fragment and an indeterminate mano or metate fragment were recovered. Both manos are manufactured from pink sandstone cobbles. The metate fragment is red hematitic sandstone, and the indeterminate fragment is white sandstone.

Both manos are lateral fragments that appear to have been round. The smaller mano is a flattened, unmodified cobble utilized on two opposing convex surfaces (6.3 by 3.3 by 2.0 cm). It was recovered from the surface of Grid Unit 515.04N/458.95E, 5 m south, and 20 m east of Block 4.

The larger mano is a dome-shaped cobble that has been pecked to shape around the edges. It is utilized on two convex surfaces. The dome base is slightly convex on both axes, and the opposing surface is markedly convex, with a well-defined ground facet. The facet curves from the dome top and around the perimeter nearly to the bottom edge. Caliche covers most of the artifact. It was found on the surface at Grid Unit 458N/512.65E in Block 2.

The metate fragment is bifacially worn and was recovered from Level 2, Strat 2 of Square 458N/527E. The indeterminate fragment displays one flat ground surface and was recovered from the surface of Grid Unit 462.15N/512.46E.

LA 129300 (n = 11). Four one-hand manos, three mano fragments, three metate fragments and the basin-slab metate were recovered from LA 129300. One mano is complete and two nearly complete. The whole mano is an unmodified, red sandstone slab that exhibits a natural wedge-shaped cross section. It is lightly ground on the flat natural surface. As mentioned in the wedge mano section above, raw material such as this is one indication of a preference for wedge-shaped cross sections.

One nearly complete mano is formed from an unmodified, flattened, oval limestone cobble that is lightly ground on two flat opposing surfaces. The second nearly complete mano is a red sandstone slab pecked and ground into a biconvex oval. Both sides appear to have been used on a basin metate using a rocking, reciprocal stroke.

Metate fragments are red sandstone (n = 2) and brown sandstone (n = 1). Two metate fragments are of red hematitic sandstone and one of brown sandstone. Two metate fragments are bifacially worn and one is round smooth on one irregular surface.

Ground stone comprises a very small percentage of the artifacts recovered from LA 129222 and LA 129300. However, the presence of both manos and metates at LA 129300 may indicate that this site is not an insignificant resource processing area. The thin, bifacially worn metate fragments suggest that some intensive processing was occurring. Also, the majority of use-surfaces at LA 129300 are heavily worn (n = 12/18 surfaces: 67 percent). Intensive processing may also have occurred at LA 129222, as both manos found at the site were either moderately or heavily worn. Radiocarbon intercept dates indicate the sites were not occupied simultaneously or repeatedly, as was the case at the west-end sites. However, separate periods of intensive, limited plant processing may have occurred at both locations. It is also possible that plant processing occurred as an adjunct to hunting or lithic-reduction activities.

West Project Area Sites

LA 113042 (n = 35). Manos and metates are nearly equally represented at LA 113042 (Table 19.7). The assemblage is comprised of manos (n = 20), metates (n = 12), and indeterminate fragments (n = 3). The vast majority of the assemblage is fragmentary, with seven whole tools represented. The complete artifacts, all of which are described in detail in **Appendix 2**, consist of one-hand manos (n = 2), cobble manos (n = 2), a basin metate (n = 1), the hand-held metate (n = 1), and a one-hand mano reworked from a metate fragment (n = 1). One-third of the six cobble manos were found here, one each of quartzite and gray chert. The majority of the assemblage cannot be definitively categorized for mano, metate, or tool type (n = 25/25: 71 percent), though most fragments appear to have been one-hand manos. Mano cross-section forms are almost exclusively wedge and biconvex.

Some of the more unique ground stone tools were recovered from LA 113042, including the bifacial basin metate, the angled-faceted one-hand mano, the large mano reshaped from a metate fragment, and the triangular hand-held metate. All are described in detail in **Appendix 2**.

LA 129214 (n = 143). The LA 129214 assemblage is distributed between manos (n = 74), metates (n = 58), and indeterminate fragments (n = 11). The majority of manos are too fragmentary to be typed, but one-hand manos dominate among determinate artifacts. The metate assemblage is highly fragmentary as well, consisting primarily of small internal portions (n = 42/52: 81 percent).

Manos and metates are overwhelmingly manufactured from sandstone. Red and hematitic sandstones dominate, with brown, white, gray and indeterminate color due to sooting comprising the remainder in descending order. Limestone, dolomite, quartzite and chert are present in small frequencies. Interestingly, nearly all quartzite manos in the project assemblage were recovered from LA 129214. The same is true for multifunction cobble tools, most of which are quartzite. The vast majority of all mano and metate fragments reshaped into new tools were also found at LA 129214 (n = 7/8: 88 percent).

The overwhelming majority of project metates are found here as well (n = 58/83: 70 percent). Metate forms are more diverse at LA 129214 than at other

Table 19.7. Distribution of whole and fragmentary manos and metates combined, by site.

SITE	WHOLE	FRAGMENT-ARY	TOTAL	% WHOLE	% FRAGMENT-ARY
LA 113042	7	28	**35**	20.0%	80.0%
LA 129214	16	127	**143**	11.2%	88.8%
LA 129216	–	6	**6**	–	100.0%
LA 129217	–	4	**4**	–	100.0%
LA 129218	–	4	**4**	–	100.0%
LA 129222	–	4	**4**	–	100.0%
LA 129300	1	10	**11**	9.1%	90.9%
Total	**24**	**183**	**207**		
Project %	**11.6%**	**88.4%**	**100.0%**		

project sites, with both basin and slab metates represented. The multifunction cobble manos; reshaped and reused fragments; and the preponderance of thin, bifacially utilized fragments all indicate that ground stone tools were intensively used. About 11 percent of the ground stone assemblage is complete (n = 16/143).

LA 129216 (n = 6). The ground stone assemblage from this site consists of a complete one-hand mano (n = 1), mano fragment (n = 1), metate fragment (n = 1), and three fragments reused as abraders (two mano and one metate). These three reshaped fragments may have been part of the same artifact prior to breakage.

The complete mano was recovered from Level 1, Strat 1 of Square 372N/604E. It is manufactured from red hematitic sandstone and is burned and sooted over most of the surface. It is in two refit fragments that form a whole. The ventral surface is convex on both axes, and the dorsal is flat on both axes. It measures 12.4 by 8.8 by 4.3 cm and weighs 500 grams.

The second artifact is a mano edge fragment manufactured from red sandstone. Based on what little remains of the use-surfaces, there is one convex and one flat surface. The flat surface is more heavily utilized than the convex surface. Neither axis is determinate. It was recovered from Level 1, Strat 1 of Square 372N/604E, Block 12. It is also burned and sooted over the entire surface.

The metate fragment is of brown sandstone and is heavily ground on one concave surface. It measures 4.3 by 3.0 by 1.6 cm and was recovered from the fill of Square 479N/547E.

The three reshaped fragments are of identical brown sandstone material and appear to be parts of the same original artifact. All three were recovered from the fill of Square 479N/547E. While all three have been modified following breakage, two are heavily altered. The fragments have been ground into triangular cross sections and the broken edges ground smooth. The narrow apex of the triangle appears to have served as a handgrip while use the opposing, broader surface as an abrader. Two of these broad surfaces are bidirectionally striated. Two fragments display unusual convex/concave faceted surfaces that may only partially represent the original use-surfaces due to the high degree of modification. This could mean that these fragments could be part of a mano or metate.

The metate-like fragment measures 9.9 by 6.7 by 3.8 cm. Those more closely resembling manos measure 10.5 by 8.1 by 3.9 cm and 8.2 by 5.9 by 4 cm.

Site Assemblage Discussion

LA 113042, LA 129214 and LA 129216 are close together at the west end of the project and will be discussed together. It is possible that they were used simultaneously and repeatedly over many occupation periods (Wiseman this report). Because of this relationship, the ground stone assemblage from these three sites might have functioned frequently as a group, with the most intense activity focused at LA 129214. Manos and metates may have been transported between the sites, especially given the small size of many tools. Plant resources from both sites were likely processed using tools from both sites on many occasions.

LA 113042 and LA 129216 appear less intensively occupied than does LA 129214, based on the radiocarbon intercept date distribution. However,

Table 19.8. Manos, metates, miscellaneous ground stone, and tabular knives with red pigment, by site.

SITE	LA 113042	LA 129214	LA 129218	LA 129217	LA 129218	LA 129222	LA 129300	**TOTAL**
Manos and metates	2	10	–	–	–	–	–	**12**
Misc. ground stone	1	1	–	1	–	–	2	**5**
Tabular knives	2	8	–	–	–	1	–	**11**
Total artifacts with red pigment	**5**	**19**	**–**	**1**	**–**	**1**	**2**	**28**
Assemblage Total								
Manos and metates	35	143	6	4	4	4	11	207
Misc. ground stone	20	20	1	3	–	3	9	56
Tabular knives	5	9	–	–	1	1	–	16
Total artifacts	**60**	**172**	**7**	**7**	**5**	**8**	**20**	**279**
Red pigment %	**8.3%**	**11.0%**	**–**	**14.3%**	**–**	**12.5%**	**10.0%**	

it is interesting to note that when LA 113042 is occupied, LA 129214 is also. There is less occupational overlap with LA 129216, though most dates coincide with those of LA 129214. While these sites may not have been used simultaneously on a constant basis, they were very likely to have functioned as one site numerous times throughout their prehistory. Also, there is also greater resemblance in the mano and metate assemblages between these two sites than between any other project sites. Thus, it may be more appropriate to consider the tools from LA 113042 and LA 129214 as a unit, with the preceding analysis results as representative of ground stone processing activities.

While both sites were used fairly intensively, most processing activity occurred at LA 129214, with 69 percent of the project assemblage. Despite the differential use intensity between these sites, there appears to be some overlap in the ground stone related activities taking place at both locations. Clearly, plant processing is occurring at both sites, though a greater diversity of those activities may have been located at LA 129214. This is perhaps best reflected in the frequencies of manos and metates from each site (Table 19.6). The most notable contrast is the greater percentage of metates at LA 129214 as compared to LA 113042 (41 percent and 34 percent, respectively). There is also a wide variety of non-food processing ground stone tools at LA 113042 such as abrading stones, hammerstone/cores, a core-abrader, polishing stones, pestles, paint stones, a shaped disk, and a possible comal (see Miscellaneous Ground stone section). This also suggests not only that plant-processing activities were more concentrated at LA 129214, but that they were the dominant activity.

The increased plant-processing activity at LA 129214 is also demonstrated by the greater occurrence of bifacially worn metate fragments at the site. In addition, they are worn to nearly half the thickness of LA 113042 metates (1.4 cm and 2.1 cm, respectively). Most of the tools used for two or three tasks, such as the mano/core/hammerstone cobbles, were recovered from LA 12914 as well. Both mortar-anvils recovered from the project were found at LA 129214, another possible indication of a greater variety of plant-processing activities (see Miscellaneous Ground stone). Fragmentary mano and metate percentages at LA 129214 are nearly double that of LA 113042, indicating that breakage occurred more often there, presumably from more intensive use (Table 19.7). This is also reflected in the higher frequencies of reshaped fragments at LA 129214.

Other attributes between the two sites are more similar. Artifacts with red pigment, including tabular knives and miscellaneous ground stone, are only slightly higher in frequency and percentage at LA 129214 (Table 19.8). Levels of production input are similar for both sites, and re-sharpening of mano and metate use-surfaces is identical (7 percent each; Table 19.9). The presence of a reshaped bifacial metate fragment at LA 129214 may indicate a higher level of ground stone-tool manufacture was taking place.

The high frequency of ground stone artifacts and multifunctional tools, the wide range of activities represented, and the high percentage of fragments could possibly represent base-camp assemblages. These characteristics, along with the occupation dates, suggest that both sites were a fairly constant, long-term resource location.

Table 19.9. Production input frequencies and percentages, by site.

SITE	LA 113042	LA 129214	LA 129216	LA 129217	LA 129218	LA 129222	LA 129300	TOTAL
Production Input								
Indeterminate	13	83	1	2	4	1	3	**107**
None (natural form)	6	11	–	–	–	–	2	**19**
Slightly modified (<50% area)	4	19	1	1	–	2	2	**29**
Mostly modified (50–99% area)	7	29	4	1	–	1	4	**46**
Fully shaped	5	1	–	–	–	–	–	**6**
Total	35	143	6	4	4	4	11	**207**
Number of determinate surfaces	22	60	5	2	0	3	7	**100**
Percentage of Production Input by Site								
Unmodified or slightly modified among determinate surfaces	10	30	1	1	–	2	4	**48**
Percentage of unmodified or slightly modified among determinate surfaces	45.5%	50.0%	20.0%	50.0%	–	66.7%	57.1%	**48.0%**
Mostly and fully modified	12	30	4	1	0	1	3	**52**
Percentage of mostly and fully modified among determinate surfaces	54.5%	50.0%	80.0%	50.0%	–	33.3%	42.9%	**52.0%**

In Chapter 5 of this report, Wiseman notes that forager sites and base camps have similar archaeological profiles. If foraging groups used the sites frequently over time, the full range of tool use would be represented. Ground stone artifacts would be manufactured, intensively used, maintained, broken, reshaped and finally discarded, very possibly resulting in the NM 128 project assemblage, LA 129214 in particular.

Discussion

The extensive survey completed by TRC Associates for the nearby WIPP project recovered a wide range of ground stone frequencies among the recorded sites (Earls and Bertram 1987: Appendix C-6). Twenty-nine of the 40 sites found during this survey had ground stone artifacts, the vast majority of which were manos and metates. Among the sites with ground stone, assemblages ranged from 1 to 34 tools (Earls and Bertram 1987: Appendix C-6). Sites with low frequencies of manos and metates were assigned varying, though related, functions. Food processing, milling station and camp sites all had less than a dozen ground stone tools, and the single habitation site had 34. Many sites had been used intermittently from AD 200 to 1350 or 1450, and a minority had diagnostic artifacts dating to the Archaic. Milling and food preparation sites are characterized by a combination of ground stone tools and thermal features, or portable ground stone tools, or primarily ground stone artifacts. The single acorn milling camp site, LA 54367, had a limestone anvil with unifacial battering (Earls and Bertram 1987:49–50, 185).

Three WIPP area sites excavated by Chambers Consultants produced a range of ground stone artifacts as well (Lord and Reynolds 1985:150–152). The largest and smallest ground stone assemblages came from two plant collection and processing sites. Interestingly, ENM 10418, a base camp, had 18 manos and metates, fewer than one of the plant-processing sites. The authors believe this site was likely used periodically over a long period, as it was situated in an area with abundant food and ground stone raw material resources (Lord and Reynolds 1985:189–221). Based on the mesquite seeds found in hearths with fire-cracked rock and "basin-shaped charcoal-filled pits," Lord and Reynolds believe that mesquite was a "stable item in the diet" from 880 BC to AD 1190 (Lord and Reynolds 1985:218).

Also close to the NM 128 project area are two sites excavated along the Carlsbad Relief Route, Macho Dunes and Trojan Hill. Macho Dunes, a seasonal camp site, yielded a sizeable assemblage of 33 manos and 32 metate fragments (Quaranta 2000:113–115). No ground stone was recovered from LA 26362, or Trojan Hill, a lithic procurement site. Both the Sunset Archaic and Tintop Cave sites west of Roswell yielded assemblages comparable to NM 128 sites. The Sunset Archaic, LA 58971, a multiple activity Cochise and Chihuahua tradition site, yielded 16 one-hand manos and 10 basin metates (Wiseman 1996a:77, 182). The Sunset Shelters, LA 71167, contained 11 one-hand manos and five basin metates, four of which were portable tools.

The Late Archaic Bob Crosby Draw site also has a small mano and metate assemblage (n = 30) The same is true for the nearby AD 1100 to 1400 River Camp site that did not have ground stone tools, with one possible exception (Wiseman 2000a:37, 60). At the Red Lake Tank project, two of four sites recovered small ground stone assemblages. LA 116503, a Maljamar Phase wild seed gathering and bison procurement site, yielded four one-hand manos and a basin metate fragment. LA 116504, a short-term camp and seed procurement site recovered an overturned basin metate in a hearth (Bullock 1999: 53–54).

The NM 128 mano assemblage is similar to those found at the Salt Cedar Site, one of two excavated sites in the Andrews Lake Locality in west Texas (Collins 1968:98). According to Collins, the Ochoa Phase site dates from AD 1000 to 1500, and is postulated to have been "contemporaneous with the Antelope Creek culture of the northern Llano Estacado" (Collins 1968:120-121). While the site has both Plains and Pueblo characteristics, and in this aspect contrasts with the NM 128 sites, the ground stone assemblage from the Salt Creek site has numerous similarities to this assemblage, and overlaps chronologically as well. The predominance of oval to round, one-hand manos with convex faces and "rocker facet(s)" resemble the NM 128 manos. The assemblages are also similar in the material-type distribution, comprised mainly of sandstone with smaller amounts of limestone and quartzite. Perhaps the primary difference between the two is the higher frequency of unifacial manos at the Andrews Lake sites, as opposed to the predominance of bifacial manos at the NM 128 sites. There is also a complete lack of pits on the NM 128 manos, though only a minority of Andrews Lake finds display this trait.

In general, low ground stone frequencies tend to be characteristics of sites identified as food procurement and/or processing sites. These sites are also commonly utilized repeatedly over long periods, with ground stone tools serving as site furniture. Many aspects of the assemblages suggest a similar pattern occurring on NM 128 sites. While the low occurrence of ground stone from NM 128 sites is reflected in the project area, this is more likely the result of artifact collection than a reflection of the amount of plant-food grinding conducted at the sites.

The mean mano length of 9.44 cm is a strong indicator of a hunter-gatherer subsistence economy. Hard and others demonstrated a strong correlation between mano length and agricultural dependence (1996), emphasizing that "the mean length of a representative sample…should represent agricultural dependence, not simply one or two manos from a group or period" (Hard et al. 1996:124). Later studies used this same data to calculate mano area, concluding that mano area increases with agricultural dependence (Hard et al. 1996:259). It is also interesting to note that Hard expected that environments with the highest availability of wild plant foods and inadequate rainfall for agriculture would remain hunter-gatherer economies, "not shift(ing) to agriculture until very late in their sequence, if at all" (1996:130). The Chihuahuan desert area is included in this environmental category.

Hard uses several cultural examples of "high PB" environments, those with abundant wild foods/inadequate agricultural rainfall. Of these cultural areas, Brantley Reservoir is closest to the project. Brantley maintains a low mean mano length of 9.8 cm from AD 282 to AD 1400, suggesting long-term, hunter-gatherer subsistence (Hard et al. 1996:195–196, Figs. 5-14). As the 9.44 mean length of NM 128 sites is slightly lower and may represent an equally long, if not concurrent, sequence, an identical conclusion might be reached for the project.

Adams (1999, 2002) and Wright (1994) both stress that ground stone-tool morphology is not an indicator of subsistence strategy. The NM 128 mano and metate analysis is geared toward discerning the manner in which these tools were manipulated and paired in an attempt to better understand either the diversity or homogeneity of the assemblage. Ethnographic links to the methods used to process some foods are included, but are not intended to specify subsistence strategy. Instead, the intent is to use the monitored attributes to gain information on processing strategies.

Mano morphology and wear surface attributes suggest that a substantial portion of manos are multifunction tools. Manos compatible with basin-slab metates, manipulated with two different strokes, used both on surfaces and edges and stained with pigment are evidence that these tools were used to process a variety of materials. A single mano may have been used to process different foods, or used for different stages of processing the same food. Wright lists the many uses of a single tool observed in ethnographic studies from hunter-gatherer societies in California (1994:241). Materials as diverse as seeds, acorns, pine nuts, roots, tubers, fruits, beans, bark, and pigments were processed on grinding slabs. Acorns, berries, nuts, and tobacco were processed using mortars (discussed with miscellaneous ground stone artifacts). The diversity of a single tool plus the reduction of one substance on two or more tools in California prehistory could be reflected in southeastern New Mexico as well. In addition to taking advantage of whatever foods and materials were abundant locally in a given year, a wide range of resources was probably exploited, perhaps involving travel to more distant areas. The multipurpose nature of these tools may indicate that a wide variety of foods was being processed that may in turn suggest that a broad geographic range was being exploited.

A variety of strokes are represented within the mano assemblage, with two different strokes occurring on a single mano. On these manos, one surface could be used to crush, the other to grind. Rocking strokes may have been more efficient for grinding smaller, more fragile materials. Flat reciprocal strokes were probably used for harder, more resistant materials. Truncated wedge manos appear to have features that allow for more controlled manipulation.

This may also be the case for manos used with semicircular strokes, and the small quartzite mano/hammerstones. One-hand manos are not, in themselves, indicators of one-hand, circular or rotary motion alone, however. One-hand manos may also be moved with two hands, as with the Pai tribes. Basin, slab and basin-slab are in evidence, all of which are small and possibly portable. Basin metates may have been used for small, fragile materials needing containment, while slab metates were used for more resistant materials, perhaps those processed in greater quantity. They may also have been used for ground stone-tool manufacture, hide processing and pigment grinding. Foods such as mesquite and acorns were probably mashed and pounded, while grass seed was ground into flour. While contour distribution is important in understanding how manos were used, it cannot be the sole indicator of the degree of dependence on wild foods (Lancaster 1986:182). Lancaster concludes that the reciprocally moved, one-hand manos from three Cliff Phase sites in the Mimbres Valley were multipurpose tools (1986:182).

It is interesting to note that one-hand manos are associated less with grinding and more with pounding and crushing among the Havasupai and Walapai tribes (Euler and Dobyns 1983:253). The Pai first use the side of a one-hand mano for pounding cereals into meal. The material is then crushed in a basin metate using a circular motion. Foods such as piñon nuts, jackrabbit meat, roasted yucca and agave fruit and prickly pear cactus fruits are all milled primarily by pounding with the side of the mano as well (Euler and Dobyns 1983:256). Hard materials such as corn were "tapped" before crushing. Crushing was accomplished with a rocking motion, involving little reciprocal movement. Other women of the same tribe used a circular motion in a basin metate to grind seeds.

Adams states that "rotating or rocking one surface against the other" crushes material (2002:42). Wright states that grinding and pounding accomplish fiber removal, particle-size reduction, detoxification, and the addition or subtraction of nutrients (1994:242). In the project area, mesquite and acorns may require such methods, performed with the quartzite manos. Mano and metate wear and morphology suggest that while both grinding and crushing activities were performed, grinding appears to predominate. Processing to a pulp by crushing, pounding and mashing is evidenced by fewer tools. The quartzite tools may have been used in this manner.

Thus, though there are a combination of strokes and tools represented, manos and metates appear to have been used primarily for grinding, which in turn implies a higher relative dependence on flour. This relatively higher dependence can occur whether the processed foods are planted or gathered (Adams 1999:479). As Adams states, ground stone-tool morphology may be related more to the level of dependence on flour than on planted versus gathered foods. Foxhall and Forbes' experiments suggest that the nutritional value of grain is increased by grinding (1982).

At NM 128 sites, perhaps manos were also manufactured to provide a maximum of control over a limited quantity of food rather than less control over larger quantities. Adams posits that larger tools are "not necessarily the most efficient choice for grinding all types of food" (1999:476). Her experiments grinding a variety of food size, texture and hardness on basin, slab and trough metates appear to corroborate this. Possibly the result most interesting to this project is that basin and trough metates were equally highly efficient in processing every type, as material was confined by the basin and trough (1999:485–486).

It is probable that the NM 128 sites most likely functioned as serial-forager sites (Wiseman this report). These sites would have been inhabited for short periods of time to collect specific food resources. Artifact assemblages among serial-forager sites would be similar, attesting to nearly identical activities occurring at the collection sites. The short-term occupations would result in little trash left behind. Because complete artifacts would be removed by collectors first, the high number of fragments may not be representative of the percentage of trash left at the site.

Site furniture might also be a feature of serial-forager locations, prompted by the need to travel as lightly as possible, particularly concerning heavy items such as ground stone. Most ground stone may have functioned as site furniture, remaining on site between collection trips. Ethnographic studies have found that manos and metates have been used and curated over generations within Pai tribes (Euler and Dobyns 1983:256). Site furniture in the form of metates inverted over manos was described by collectors during the WIPP project (Earls and Bertram 1987:141), suggesting many of these artifacts were present in the original ground stone assemblage. Forager site furniture would require both specialized and multipurpose tools suitable for processing a variety of foods in an abundant year. An alternative year might have offered only limited resources, but again, the varied on-site tool kit provides the ideal tool for processing whatever foods are available. This may be particularly true for LA 129214 and LA 113042, with long-term occupation and large ground stone assemblages.

However, these characteristics alone cannot be used to determine the NM 128 project economy as hunter-gatherer, they can only demonstrate the multipurpose and versatile nature of the tools and the variety of methods used to process materials. Numerous Southwest researchers have linked one-hand manos and basin metates with seed processing and hunter-gatherer economies, and two-hand manos and trough metates with corn grinding and agricultural economies. In what is perhaps the Levant equivalent to the Southwest, mortars and pestles have been linked to an acorn and nut dominant economy, and grinding slabs and handstones indicative of a seed-dominant economy (Wright 1994:241). Wright cautions against assigning specific tools with specific foods (1994:241). Both Adams and Wright stress that ground stone-tool morphology is a by-product of use and other post-manufacture modifications, and cannot be used to determine function. However, both authors agree that tool form does inform food processing strategies. At NM 128, there is variety both within and across tool groups. If these tools functioned as site furniture, a foraging group could have the smallest possible assemblage necessary to complete the largest variety of tasks, and it would be ensured of having whatever was necessary to process the most abundant foods present on the site that year.

As previously mentioned, the sites have been heavily collected over time, likely resulting in a disproportionate number of fragmentary artifacts remaining on site. However, it seems highly probable that the assemblage is representative to a considerable extent, and has strong potential to reveal the nature of the complete food processing tool kit from the NM 128 sites. If such a variety of tools is present among uncollected fragments, then the complete assemblage may be even more diverse. In conclusion, the versatility of the mano assemblage appears to fit an intensively used forager-site pattern.

Tabular Knives

One of the most distinctive artifact types from the NM 128 project is the tabular knife. These unique tools are clearly manufactured with a specific task or processing method in mind. While there are morphological differences within this tool group, most are immediately recognizable as tabular knives. Similar artifacts are found throughout the extreme southern desert environs of New Mexico, Arizona, Nevada, Texas and California. In New Mexico, they are typically produced from tabular limestone, flaked into triangular, oval, or biconvex forms and ground flat on the broad surfaces. Edges may have been flaked both to shape and re-sharpen.

Perhaps the most fascinating aspect of these tools is the considerable uniformity that is displayed across different cultures and environments. While materials and manufacturing techniques vary, many attributes are shared. From Chihuahuan to Sonoran desert climates, tabular knives are consistently associated with processing succulent leaf plants. Tabular knives of similar morphology from Arizona and New Mexico west of the Pecos River are typically used to process agave. Because agave does not occur in the project area, these tools may have been used on other leaf succulents, such as yucca. A staggering array of materials is obtained from these plants, often processed primarily with a single tool, the tabular knife.

At the NM 128 project, tabular knives were recovered from four of seven excavated sites. While most of the knives are fragmentary, attributes such as manufacturing techniques, wear patterns and materials can be observed, and are notably consistent. Edge angles, adhesions, and wear patterns were also included in the analysis to inform on function, and enable comparisons with tabular knives from the Hohokam and other areas.

When images, descriptive information and provenience associations are available from the literature, comparisons can be made within southeastern New Mexico and across the Southwest and Western Desert regions of the United States. These comparisons are essential if we are to gain an understanding of the role tabular knives played in extreme desert climate subsistence.

Tabular Knife Analysis

There are four goals of tabular analysis: to provide detailed morphological data; to compare the NM 128 data with similar tools from excavations in New Mexico, Arizona, Nevada, Texas, and California; to examine documented ethnographic use of similar tools used in leaf succulent processing in Mexico; and from this information, to determine the function of these tools to the furthest extent possible.

No standard OAS analysis exists for tabular knives. As a result, the analysis is a combination of chipped stone, ground stone and new attributes. Some of the new attributes, such as *backing,* were defined after reading descriptions of tabular knives in the literature, and others, such as *hafting or grip indentations*, were added based on characteristics observed during analysis.

The tabular knife assemblage is comprised of 19 tools from LA 113042 (n = 5), LA 129214 (n = 12), LA 129218 (n = 1), and LA 129222 (n = 1). Complete tools (n = 3) (Fig. 19.11, LA 129214, FS 1861 and LA 113042, FS 834; LA 129214, FS 1607); end fragments (n = 7) (Fig. 19.12, LA 113042, FS 100 and FS 1016; LA 129214, FS 507 and Fig. 19.13, FS 822, FS 1838, FS 1973, all from LA 129214); medial fragments (n = 3) (Fig. 19.14, LA 113042, FS 118 and LA 129214, FS 1858); and edge fragments (n = 6) (Fig. 19.15, LA 113042, FS 602; LA 129214, FS 1179 and FS 1646, and Fig. 19.16, LA 129214, FS 1948 and FS 1974; LA 129222, FS 360) are represented. Seven fragmentary tools have been used following breakage. Tabular knives are analyzed for 28 attributes.

Material type consists of the stone nomenclature, color and grain size.

Material texture is recorded as cryptocrystalline, fine, medium or coarse grained.

Raw material form refers to the morphology of the raw material from which the tool was manufactured. Values for this attribute are thick slab, more than 10 cm; thin slab, 5 to 10 cm; very thin slab, less than 5 cm; or slab, no further specification.

Plan shape refers to the plan shape of the existing artifact, regardless of condition. Values are oval, sub-rectangular, triangular, irregular, and indeterminate.

Production input refers to the amount of surface area that has been modified to create the tool. Tools are categorized as slightly modified (less than 50 percent of the surface area), mostly modified (more than 50 percent of the surface area), unmodified or indeterminate.

Shaping refers to all methods used to manufacture the tool. Flaking and grinding are the only observed shaping methods. The specific location of each shaping method is also recorded. See the edge shaping and surface shaping section to follow.

Transverse cross-section shape records the tool shape at the width. Four values were observed, comprised of sub-rectangular, biconvex, concave-convex (as with unmodified flakes), and indeterminate.

Longitudinal cross-section shape refers to the lengthwise section shape of the tool. The same values observed for transverse cross-section shapes are recorded for this attribute.

Heat refers to any alteration of the tool due to heat exposure.

Adhesions refer to any foreign material that adheres to the tool surface.

Number of functions is the number of separate functions for which a tool appears to have been used. One function was recorded for tabular knives without red pigment stains. For those with pigment stains, a value of 1+ was assigned, as these tools could have been used for both plant and pigment processing.

Number of modified or worn edges refers to the total number of edges modified by either use or manufacture. Tools displayed 0 to four worn or modified edges.

Function refers to the purpose for which the tool was manufactured. When coding this function, the term agave or mescal knife was not used to avoid restricting tool function to plant processing.

Portion is the condition of the artifact. Values are whole, medial fragment, end fragment, or edge fragment.

Edge shaping refers to manufacturing modification of an edge. Each edge is monitored individually for shaping. Edges are shaped by grinding, bimarginal flaking, and unimarginal flaking. Some edges are unmodified. If an edge is broken and retouched, this was also noted. A separate value was included for edges displaying random flake scars that do not represent retouch. Two edges display several non-adjacent flake scars that do not appear to be the result of retouch; these are recorded as such.

Edge wear is monitored individually for each edge. Values observed consist of rounding and striations. The orientation of the striations to the edge was also recorded. If an edge was broken and used, this was recorded as well. Unutilized edges were recorded as such.

Surface shaping records the methods used to shape the broad, flat surfaces of the tabular knives. Many tools are ground on one or both broad surfaces. This could be the result of shaping or use.

Backing refers to an edge that has been modified by flaking or grinding to facilitate handling. While this was often difficult to distinguish from use-wear, possibly backed edges were recorded as such.

Backing edge number is the edge number assigned to a possibly backed edge.

Hafting indentations or grip areas record shallow indentations that may have facilitated handling or hafting are flaked into the edges of some tools. The observed number of these indentations ranged from 0–2.

Length, width and thickness in centimeters were recorded for each tool.

Length condition, width condition and thickness condition lists each dimension as complete or fragmentary.

Weight in grams is monitored for each tool.

Weight condition refers to the weight as complete or fragmentary, depending on the tool condition.

NM 128 Tabular Knife Descriptions and Manufacturing Techniques

Generally, NM 128 tabular knives are large, thin, triangular or ovate forms. They are manufactured from light yellow tabular limestone (n = 16), brown sandstone (n = 2), and yellow-brown sandstone (n = 1).

Most tools are flaked to shape on the edges and ground flat on one or both of the broad surfaces. The presence of red stains, probably red hematite, on some tabular knives is one of the most notable features. Most tabular knives display hematite on one or more edges (n = 11/19: 58 percent). The stains extend a few millimeters from the edge, but never beyond, suggesting that hematite was being reduced using the tool edge in a tapping or chopping motion. No mention of this material on tabular knives was encountered in the literature. No tabular knives displayed evidence of exposure to heat.

The three complete specimens from the project are triangular (n = 1), oval (n = 1), and sub-rectangular (n = 1) in plan. The large number of triangular shaped fragments (n = 7) may indicate that those knives were triangular or leaf shaped in complete condition, or that they were hafted. This possible hafting method is discussed below. Broken knife fragments are often reworked or reused on a broken edge.

Knives are produced either from very thin, tabular limestone or large, unmodified flakes. The flakes appear to have been removed from the limestone raw material, as all are thin and relatively flat. Nearly all tabular knives are sub-rectangular in cross section as a result of the raw material form rather than modification. Only those formed from large unmodified flakes differ from this, displaying a convex-concave cross section.

Nine tabular knives display at least two shaped edges (Table 19.10). This frequency of modified edges may be low due because most tools are fragmentary, displaying one or more broken edges.

Bimarginal retouch is the primary edge-shaping method among the 29 modified edges (n = 14). Unimarginal retouch and edges shaped by grinding are nearly equally represented (n = 9 and n = 6, respectively). One-quarter of all edges are modified by wear only (n = 17/68: 25 percent), most of which have been used following breakage (15/17: 88 percent). This demonstrates that broken tools are most likely to be reused without modification. The used broken edges also indicate that most tabular knives are being used to the maximum extent possible, as is the case with manos and metates.

Of the 15 knives with modified edges, most are shaped on two edges (n = 9), while fewer are shaped on one (n = 4) or three edges (n = 2). Three tools display unmodified edges but are ground on the broad surfaces. One tool is unmodified on both the edges and the broad surface, but displays red stains on the edges. More than half of the tabular knives are ground (n = 13/19: 68 percent) on at least one broad surface, either from shaping or use. Tools ground on one or two surfaces are nearly equally represented (n = 7 and n = 6, respectively). Of all methods used to shape, flaking and grinding predominate (n = 9), while flaking alone (n = 4) and grinding alone (n = 5) are less frequent (one tool unshaped).

Edge angles display a considerable range, particularly between flaked and ground edges, but are primarily steep (Table 19.11). Flaking modification in general is somewhat irregular and also results in a preponderance of more sinuous, steep angles. Unimarginally flaked edges are the most obtuse, while bimarginally flaked edges are the most acute. The mean angle of edges shaped by grinding alone is the most acute. Broken, used edges are obtuse or nearly obtuse. While edges that appear suitable for cutting are present (n = 5/19: 17 percent, less than or equal to 35 degrees), they represent a much smaller percentage of the edge assemblage than do more obtusely angled edges (n = 24/29: 83 percent, greater than or equal to 36 degrees).

This preference for steep edges may be further substantiated by the number of broken, used edges (n = 17), nearly all of which are obtuse or nearly obtuse (15/17: 88 percent). The range of edge angles displayed by the NM 128 tools contrasts with those of the Salt-Gila Aqueduct project in Arizona (SGA), all of which fell within an unspecified, 10-degree range associated with cutting (Bernard-Shaw 1983: 427).

Over half of all tool edges display wear either in the form of rounding (n = 28), striations (n = 5) or striations and rounding (n = 8) (Table 19.10). Determining wear on limestone tools is admittedly subjective, as rainwater acts as a natural acid on limestone, slowly dissolving the material. Since most of the tabular knives from the NM 128 sites were found on the surface, they were subjected to this deterioration for long periods of time. This results in rounding of flake scars and tool edges. Therefore, it is possible that some tool edges that were recorded as used may have been rounded by rainwater dissolution. However, the fact that nearly all tools with rounded edges display red pigment offers more conclusive evidence that this wear is the result of use rather than rainwater dissolution.

A more objective indicator of wear is the presence of pigment on 58 percent (n = 11/19) of tabular knives. Wear striations observed on tool edges consist of parallel, perpendicular and randomly oriented to the working edges, along with various combinations of these orientations.

The tools that are shaped by grinding alone display striations parallel and perpendicular to the edge; one tool additionally displays random striations. As with the rounded edge, it is unclear if these striated edges result from manufacture or use. It is interesting to note that striations of a particular orientation were linked with grinding manufacturing methods among tabular knives from the SGA project (Bernard-Shaw 1983:395).

SGA tools display striations parallel to the working edge and perpendicular to the adjacent edge. SGA tools differ with those from NM 128 in that the majority are manufactured by grinding from a "siliceous, tabular volcanic intrusive" material (Bernard-Shaw 1983:431, 427).

While tabular knife materials and manufacturing methods from the two projects differ,

Table 19.10. Tabular knife data.

Edge Modification Distribution, All Sites							
EDGE MODIFICATION TYPE	EDGE 2	EDGE 3	EDGE 4	**TOTAL**	**TOTAL**	FREQUENCY	%
Bimarginally flaked	4	–	–	**14**			
Unimarginally flaked	1	2	–	**6**			
Unimarginal with <25% bimarginal	1	–	–	**1**			
Broken and unimarginally retouched	1	1	–	**2**			
Edge shaped by grinding only	3	–	–	**5**			
Edge shaped by grinding only, portion broken	–	–	1	**1**	**all modified edges**	29	42.6%
None	4	2	2	**11**			
Broken, not reshaped	5	13	9	**28**	**all unmodified edges**	39	57.4%
Total	**19**	**18**	**12**	**68**	**total determinate edges**	**68**	**100.0%**
Edge Modification Summary							
EDGE MODIFICATION TYPE	%						
All unimarginal retouch	31.0%						
All bimarginal retouch	48.0%						
All grinding	21.0%						
Total	**100.0%**						
Surface Shaping							
SURFACE MODIFICATION	SURFACE 2	**TOTAL**	%				
No surface shaping	12	**19**	50.0%				
Ground on broad surface	7	**19**	50.0%				
Total	**19**	**38**	**100.0%**				
Edge Wear Distribution by Edge Number							
WEAR TYPE	EDGE 2	EDGE 3	EDGE 4	**TOTAL**	**TOTAL**	FRE-QUENCY	%
Rounding	5	2	1	**14**			
High points slightly rounded	–	–	–	**1**			
Heavy rounding	3	5	–	**10**			
Rounding, oily polish	1	–	–	**1**			
Pigment and rounding	1	–	–	**1**			
Reused, rounded broken edge	–	–	1	**1**			
Striations perpendicular and parallel to edge	–	–	–	**1**			
Striations parallel to edge	1	–	1	**3**			
Striations perpendicular, parallel, and random to edge	1	–	–	**1**			
Striae parallel to edge and rounding	–	–	–	**1**			
Striations perpendicular to edge, rounding	1	–	–	**1**			

(Table 19.10, continued)

Striations angled to edge and rounding	–	–	2	**4**			
Unifacial flaking	1	–	–	**2**	**all utilized edges**	43	64.2%
NA (edge not present on tool)	–	1	7	**9**			
Unutilized	5	9	7	**24**	**all unused/NA edges**	24	35.8%
Total	**19**	**17**	**19**	**74**		**67**	**100.0%**
Edge Wear Summary							
EDGE WEAR SUMMARY	%						
All rounding-only wear	65.0%						
All striation-only wear	12.0%						
All rounding and striation wear	19.0%						
All flaking wear	4.0%						
Total	**100.0%**						

grinding manufacture has resulted in striated surfaces on two of the NM 128 knife edges. Grinding of the broad surfaces may have been performed to reduce friction and drag and permit "repeated deep cutting action with a minimum of effort" (Crabtree 1974:2).

The three complete tools from NM 128 vary morphologically. The first complete tool is perhaps the most formally manufactured in the assemblage. It is bifacially reduced to a biconvex, sub-triangular form, and is sub-rectangular in cross section (Fig. 19.11, FS 1861.

Two shallow indentations are flaked into two edges; one into a lengthwise edge, one into the short edge, possibly to facilitate handling. Red stains are present along both lengthwise edges. The shortest edge displays pigment on the corner only.

The second complete tabular knife is formed from a large, thin, unmodified oval shaped flake that is concave-convex in cross section (Fig. 19.11, FS 834). The flake is complete, displaying both hinged and feather termination. The feather termination that forms one of the lateral edges is unifacially worn along approximately 8 cm of the length. Red stains are present along the acute edge. Neither broad surface is ground. One steeply angled lateral edge formed by a dorsal flake scar may have served as a handgrip.

The third complete tool is formed from an unmodified piece of limestone or gypsum (Fig. 19.11, FS 1607). It is sub-rectangular in plan and cross section, and the edges are worn smooth from erosion. No edge wear is evident, but one of the flat surfaces is lightly ground, randomly striated, and bears red stains.

Mean and actual dimensions and weight for all tabular knives are listed in Table 19.12. Due to the fragmentary nature of the assemblage, it is difficult to make generalizations concerning tool size. Thickness is complete for all tools, and the mean clearly indicates that thin tabular material is being selected. Length and width means are both in the 10 cm range, though some fragments appear to be from tools over 15 cm long.

Edge Backing and Hafting Options

Tabular knives may have been handheld or hafted. Handheld tools may have been prepared for handling by "backing" or grinding one edge to dull it. For example, a "backed" edge was ground or flaked to a steep angle to prevent cuts or abrasions to the user's hand. Seven tools may have been prepared to facilitate handling, displaying steeply angled edges (n = 2), (Fig. 19.11, FS 834, and Fig. 19.14, FS 118); ground lateral edges (n = 4) (Fig. 19.12, FS 507), (Fig. 19.13, FS 1973); or flaked and ground edges (n = 1; Fig. 19.13, FS 822).

Six of the NM 128 tabular knives are triangular end fragments. All display two modified edges and one broken edge, suggesting they are fragments of triangular or ovate knives. There is also the possi-

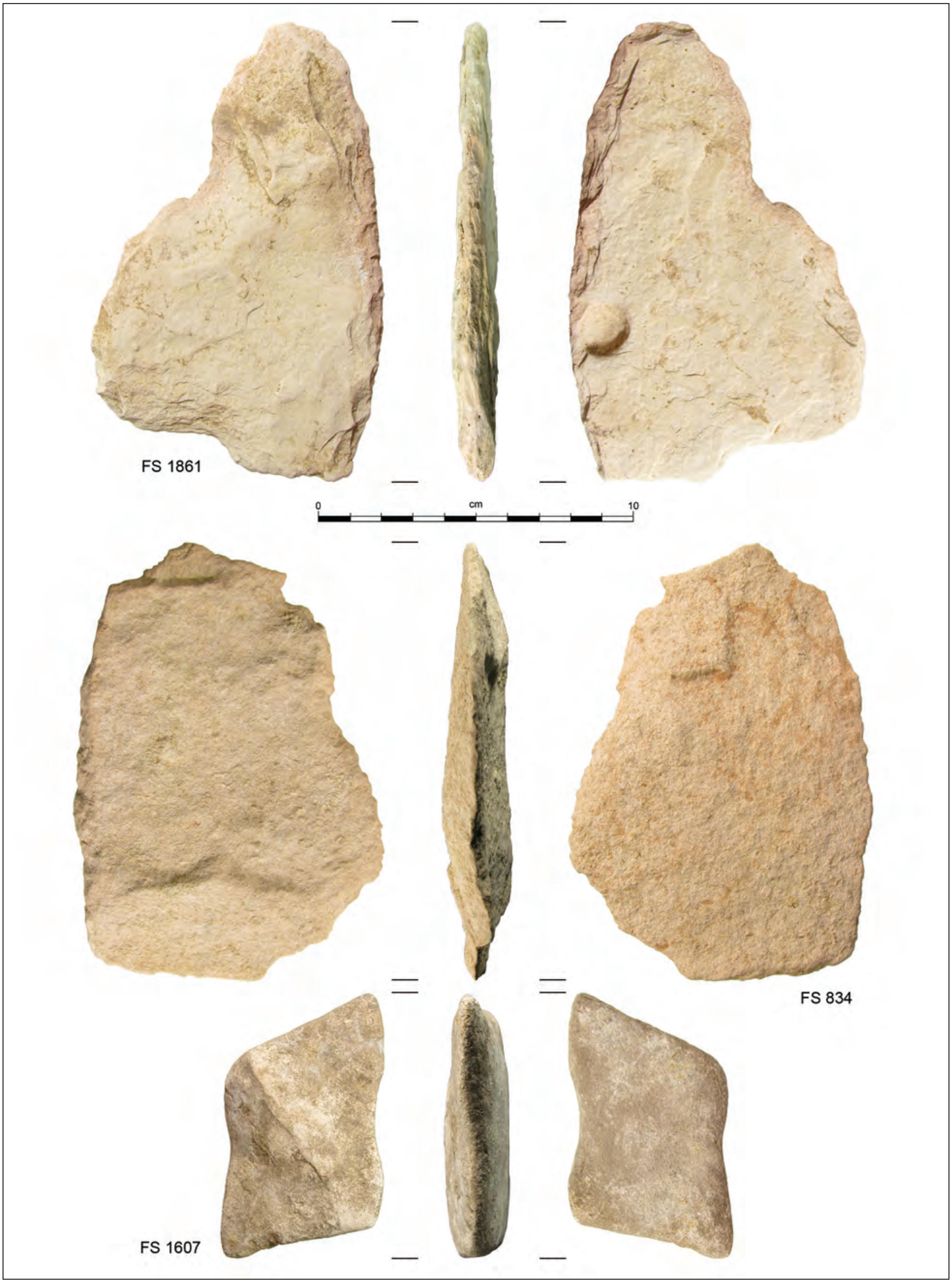

Figure 19.11. LA 113042, FS 1861; LA 129214, FS 834 and FS 1607; whole tabular knives.

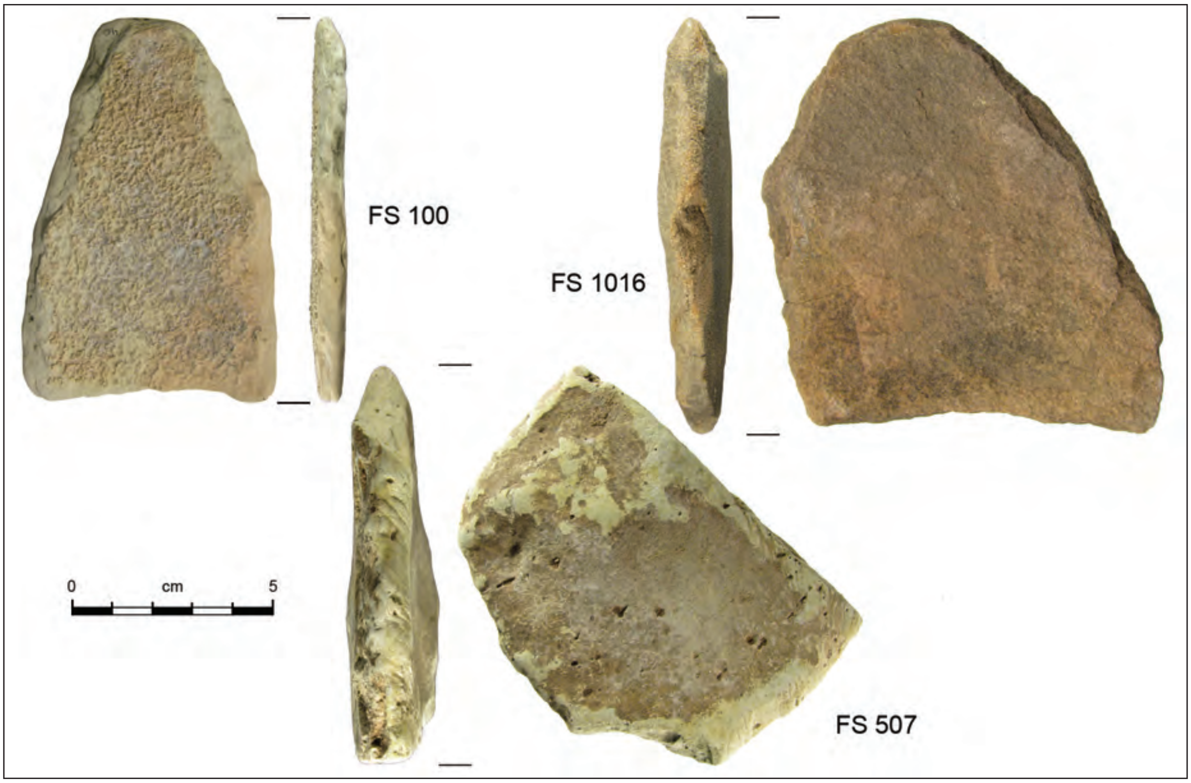

Figure 19.12. LA 113042, FS 100 and 1016, and LA 129214, FS 507, tabular knife end fragments.

bility that the broken edge of these fragments were inserted into slotted handles. Heizer provides a comprehensive list of such knives (1970) that were found at Medicine Cave, Arizona (Bartlett 1934:18); near Mesa House Ruin, Nevada (Harrington 1942:67); Shumla Caves, Texas (Martin 1933:80-82); Hinds Cave (Sobolik 1996a); near Overton, Nevada (Heizer 1970); and Honanki, Arizona (Fewkes 1898:571). The triangular flaked chert or ground basalt blades are set into grooved wooden handles and set with pitch mastic. Hafted knives such as these are also ethnographically documented for the Havasupai tribe (Spier 1928:105). However, the Maricopa tribe uses a "short knife" to harvest mescal (Spier 1933:55; Castetter et al.1938:52).

Iron blades are also hafted in this manner (i.e., Paiute Cave, Nevada, Harrington 1930:119, Figure 11). A variation on the above hafting method is found in Texas at Clear Fork (Ray 1941) and Carved Rock Shelter (Smith 1938:231). Biconvex, oval blades are inserted at the midpoint into a grooved handle and secured with sticks to strengthen or solidify the setting. Limestone is not mentioned as a material type for any of the above tools. Analysis of the hafted stone blades from the Hinds Cave revealed agave calcium oxalate crystals and fiber particle residue on tool edges, indicating that the rounded blades were used in agave processing (Sobolik 1996a:463, 466).

The NM 128 triangular knife fragments were examined for wear that may have resulted from such hafting. None of these fragments display wear or mastic deposits that may indicate that they were hafted in this particular manner. It should also be mentioned that an obtuse, broken edge may be difficult to haft without modification.

Similar Illustrated Tabular Knives

While tabular knives are not considered uncommon in southeastern New Mexico and southern Arizona, descriptions and images are less common. Interestingly, most illustrated tools are morphologically similar to the NM 128 tools, though size and material sometimes differ. The vast majority of tabular knife occurrences are from states other than New Mexico, with most examples cited from Hohokam sites in Arizona, and lesser numbers from Nevada and California. The paucity of reported tabular knives in New Mexico may owe to several

Table 19.11. Tabular knife edge angle means in degree, all edges combined.

All Modified Edges	
Mean	42.5
Median	40.0
n	29
Standard Deviation	9.4
Minimum	30.0
Maximum	63.0
Range	33.0
Bimarginally-shaped Edges Only	
Mean	45.9
Median	42.5
n	14
Standard Deviation	12.0
Minimum	30.0
Maximum	72.0
Range	42.0
Unimarginally-shaped Edges Only	
Mean	58.7
Median	52.0
n	9
Standard Deviation	21.0
Minimum	39.0
Maximum	94.0
Range	55.0
Edges Shaped by Grinding Only	
Mean	39.0
Median	35.5
n	6
Standard Deviation	9.4
Minimum	30.0
Maximum	54.0
Range	24.0
Broken and Used Edges	
Mean	71.1
Median	76.0
n	17
Standard Deviation	17.6
Minimum	30.0
Maximum	95.0
Range	65.0
All Flaked Edges	
Mean	50.9
Median	48.0
n	23
Standard Deviation	16.9
Minimum	30.0
Maximum	94.0
Range	64.0

n = count

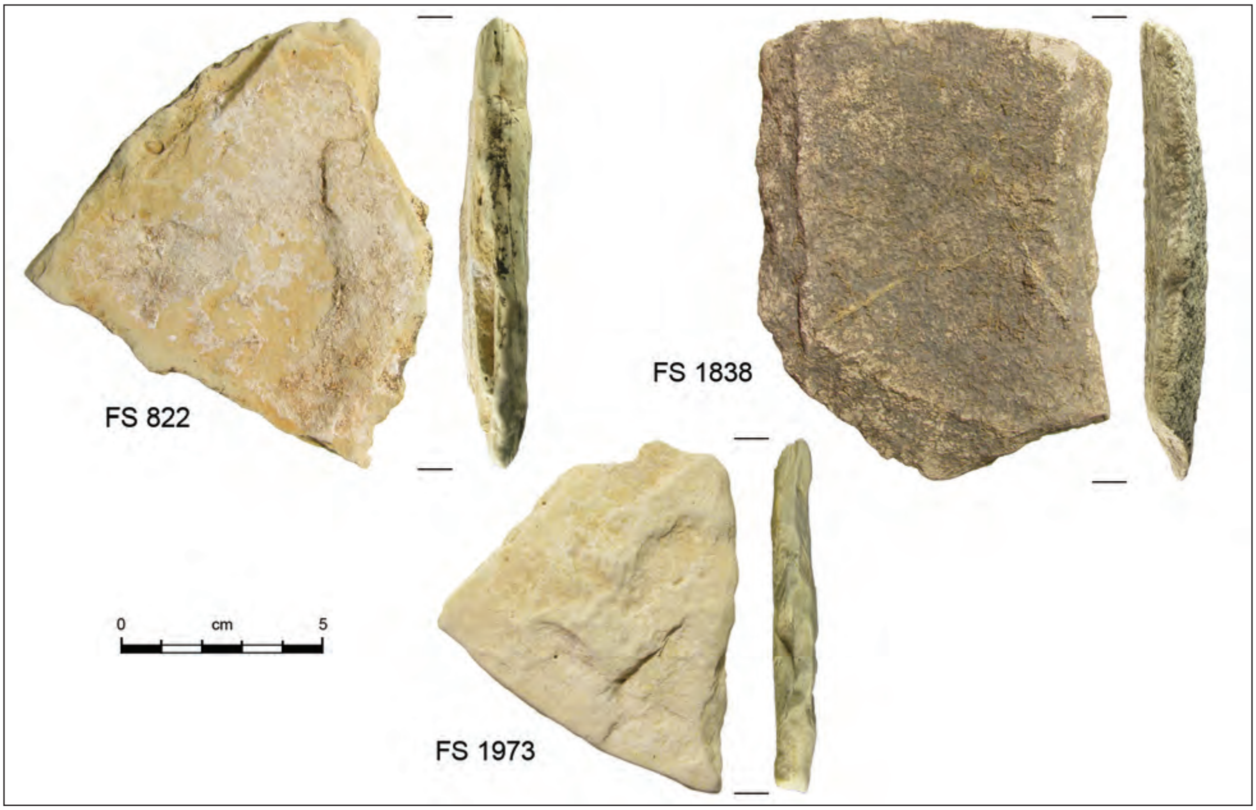

Figure 19.13. LA 129214, FS 822, FS 1838, and FS 1973; tabular knife end fragments.

factors. These tools are often included with lithic tool analysis, and not separately described. In some reports, the occurrence is noted, but descriptions and frequencies omitted. The less showy nature of these tools may also result in their relatively obscure status in literature.

Most of the tabular knives reported from New Mexico were recovered from the NexGen/Core Project sites (Jones et al. 2010a). Both the limestone material and manufacture of illustrated tabular knives from the NexGen/Core Project are identical to the NM 128 tools, though size differs in some cases. Of the six illustrated tools, half are equal in size to the NM 128 tools, and half appear to be approximately 25 to 30 percent larger (equally sized tools: Kearns 2010a:536-538, Fig. 41.37, top image; Fig. 41.38, both images, larger tools; Fig. 41.36, both images; Fig. 41.37, lower image).

In general, the illustrated NexGen/Core knives are better shaped than the NM 128 tools, with the minimally shaped knives bearing the closest resemblance (Kearns 2010a:Fig. 41.37, top image; Fig. 41.38, lower image). Interestingly, Kearns describes the Archaic tabular knives as "indicative of an apparent practical, efficient design with a long history of use" (Kearns 2010a:533). The two illustrated Archaic tools from LA 130727 are very well shaped. The more crudely manufactured tools appear to be Formative, based on Kearns' statement that most tabular knives from the site are from this period. This may indicate that the tabular knives from LA 113042 and LA 129214 are associated with the Formative, rather than the Archaic, occupation of these sites.

The provenience distribution of the NexGen/Core and NM 128 tabular knives is similar as well. Most of the New Mexico NexGen/Core Project knives were recovered from a single site, LA 130727 (n = 20). This is identical to NM 128, with LA 113042 and 129214 yielding the majority of tabular knives (n = 17/19: 89 percent). Many NexGen/Core tabular knives were found associated with ring middens, including a possible cache of three tools within the ring midden (Kearns 2010a:504). Within these "bulk succulent processing" features, agave remains were common, suggesting strong association of tabular knives with this activity during both Archaic and Formative times (Kearns 2010a: 504, 552–553, 558).

Figure 19.14. LA 113042, FS 118, and LA 129214, FS1858; tabular knife medial fragments.

Kearns also states that "the processing and cooking of desert succulents was the primary activity during the Archaic occupation" (2010a:558).

Other NexGen/Core tabular knives include a sandstone tool recovered from the surface of LA 132494, a Late Archaic and Eastern Jornada Mogollon camp and food processing locale (Wheaton 2010b:155). One limestone tabular knife was found at LA 132517, where roasting facilities indicated succulent leaf processing (LaFond and Sinkey 2010:376). At LA 132518, a tabular knife was found in association with Middle to Late Archaic and Jornada Mogollon burned rock ring midden (Fiske 2010a:418). This tool was manufactured from a welded tuff spall (Fiske 2010b:1119), distinguishing it from the limestone from which most tools are made. The Jones Spring Draw Area of Critical Concern also yielded one tool from the surface (Jones and Wheaton 2010c:1136). One tabular knife was found at LA 144921, a multicomponent Archaic camp and early Pithouse Mogollon farming locale west of Deming, NM (Kearns 2010b:1297). LA 129562 also yielded one tabular knife in non-feature deposits (McClure-Cannon and Moreland 2010:1413). This tool is atypical in that it is manufactured from tabular orthoquartzite. It displays bimarginal retouch and measures 7.8 by 6.4 by 1.6 cm (McClure-Cannon and Moreland 2010:Figure 98.15). Most of the tabular knives recovered from the AT&T project are single occurrences at a minority of sites. Though most of these sites are listed as roasting and/or processing locales, the majority of tabular knives are not found associated with features.

Other New Mexico examples include limestone tabular knives from the Brantley Dam and Reservoir project (Katz and Katz 1985a:62). While illustrations are not available, descriptions appear very similar to the NM 128 tools. They are formed from tabular limestone and bimarginally flaked. Edge-wear analysis suggested that the tools were used in wood chopping. LA 18161 (ENM 10418) in the nearby WIPP area of southeast New Mexico, also recovered a limestone tabular knife, but the provenience is not cited (Lord and Reynolds 1985:151).

The Texas portion of the AT&T project also recovered tabular knives from four sites. Interestingly, tabular knives were found in both residential, hearth and/or roasting locale contexts (Wheaton

Table 19.12. Tabular knife actual and mean dimensions.

SITE	FS NO.	TOOL CONDITION	LENGTH (CM)	LENGTH CONDITION	WIDTH (CM)	WIDTH CONDITION	THICKNESS (CM)	THICKNESS CONDITION	WEIGHT (G)	WEIGHT CONDITION
Actual Dimensions										
LA 113042	834	whole	13.3	complete	9.4	complete	1.3	complete	169.0	complete
LA 129214	1607	whole	7.3	complete	5.1	complete	1.4	complete	790.0	complete
LA 129214	1861	whole	13.3	complete	9.0	complete	1.3	complete	179.0	complete
LA 129218	52	end fragment	7.5	fragmentary	5.7	complete	1.81	complete	91.0	fragmentary
LA 113042	100	end fragment	9.2	fragmentary	6.3	complete	0.8	complete	73.0	fragmentary
LA 129214	507	end fragment	9.6	fragmentary	7.0	complete	1.7	complete	149.0	fragmentary
LA 129214	822	end fragment	9.5	fragmentary	9.5	complete	1.3	complete	140.0	fragmentary
LA 113042	1016	end fragment	12.0	fragmentary	8.8	complete	1.1	complete	158.0	fragmentary
LA 129214	1838	end fragment	11.0	fragmentary	8.6	complete	1.2	complete	154.0	fragmentary
LA 129214	1973	end fragment	7.5	fragmentary	8.1	fragmentary	1.1	complete	72.0	fragmentary
LA 113042	118	medial fragment	6.2	fragmentary	8.3	complete	1.4	complete	105.0	fragmentary
LA 129214	691	medial fragment	10.7	fragmentary	8.5	fragmentary	1.3	complete	133.0	fragmentary
LA 129214	1858	medial fragment	8.4	fragmentary	4.0	fragmentary	1.0	complete	391.0	fragmentary
LA 129214	1179	edge fragment	12.3	fragmentary	7.5	fragmentary	1.3	complete	111.0	fragmentary
LA 129214	1646	edge fragment	6.4	fragmentary	5.7	fragmentary	1.4	complete	55.0	fragmentary
LA 129214	1974	edge fragment	6.9	fragmentary	6.8	fragmentary	1.4	complete	63.0	fragmentary
LA 129222	360	reused edge fragment	6.9	fragmentary	6.9	complete	0.7	complete	450.0	fragmentary
LA 113042	602	reused edge fragment	6.1	fragmentary	4.7	fragmentary	1.2	complete	570.0	fragmentary
LA 129214	1948	reused edge fragment	6.0	complete	4.1	complete	1.3	complete	40.0	complete
Mean Dimensions										
Mean	–	–	11.3	–	7.4	–	7.1	–	–	–
Median	–	–	7.1	–	7.7	–	7.0	–	–	–
SD	–	–	3.5	–	1.8	–	1.8	–	–	–
Minimum	–	–	7.3	–	4.1	–	4.0	–	–	–
Maximum	–	–	13.3	–	9.5	–	9.5	–	–	–
Range	–	–	6.0	–	5.4	–	5.5	–	–	–
n	–	–	4	–	12	–	19	–	–	–

SD = Standard Deviation, n = count

2010b:324; LaFond and Fiske 2009:403; Fiske 2010a:501, 506, 508; Wheaton 2010b:583). Roasting locales were present in residential areas, suggesting a succulent processing function for tabular knives in both the New Mexico and Texas sites.

Tabular knives from the Hohokam Marana Community sites are of similar size, tabular fracture material, minimal modification, thin cross section and sub-rectangular to rounded plan shape (Fish et al. 1992:Fig. 7.12).

Three tabular knives from Hohokam sites near Tucson are illustrated in Fish et al. (1985a:Fig. 2, two lower images). The scale on this illustration is unclear, so size comparisons are indefinite. However, two of these knives are morphologically similar to the NM 128 knives. If the illustrated scale represents 10 cm, one knife measures approximately 24 cm in length, and the other about 15 cm in length. The larger knife strongly resembles a tabular knife from LA 129214 in the flaking method used to shape the tool (Fig. 19.11, FS 1861). The smaller tool appears to be a minimally modified flake with possible hafting notches, resembling LA 113942, FS 834.

Two of the three illustrated knives from the Tumamoc Hill sites near Tucson are comparable in size and unmodified flake morphology; the other contrasts in that it is well shaped by grinding (Masse 1979:153, 173, Fig. 4b, 4c).

The same is true of illustrated tabular knives from La Ciudad (Kisselburg 1987:Fig. 5.2a, 5.2c). The dissimilar tools are slightly larger, manufactured from schist by grinding only. One La Cuidad knife, however, appears similar in size, morphology and manufacturing method (Kisselburg 1987:Fig. 5.2b). A rhyolite tabular knife from the Baca Float Site south of Tucson, Arizona, displays a thicker, backed edge and a thin, working edge (Doyel 1977:Fig. 28, bottom image). It is shaped by percussion and the working edge is ground. High polish is evident on the working edge. This acute working edge is a common characteristic of Hohokam knives throughout Arizona, one shared by most of the NM 128 tools. Hohokam tabular knives are typically flaked to shape and the working edge ground to an acute angle (Fish et al. 1985a:107). Though most project tools display both these manufacturing methods, grinding is typically restricted to flat surfaces and rarely used to shape the edges (n = 6/26: 2 percent of all modified edges). These illustrations imply many functional similarities among tabular knives in the Southwest. However, there are significant differences as well, as the archaeological contexts of each imply.

Tabular knives are ubiquitous in Hohokam sites in south-central Arizona and are frequently associated with agave cultivation and processing. They are often recovered near agricultural features such as rock pile fields where agave cultivation is thought to have taken place (Fish et al. 1992:13 and 1985a: 107; Crown 1987:152, Nabhan 1992:3). They are also recovered in agricultural terraces and mescal pits, in which the processed agave heart is roasted (Baldwin 1950:52; Fish et al. 1985b:107–108; Bernard-Shaw 1983:Table 11.1.18).

Other agave-related functions assigned to tabular knives from the Hohokam culture include textile production (Crown and Fish 1987:807), fiber extraction, scraping pulp from leaves and cutting the leaves from the heart (Kisselburg 1987:183 and 1987:160, 162). At the Hohokam site La Cuidad, where large numbers were recovered, tabular knives are classified into fleshing or cutting tools. Those used for fleshing agave leaves have slightly convex edges, and those used for cutting the leaves from the heart and trimming the spines from the leaves have concave or serrated edges (Kisselburg 1987:183).

A schist agave knife was found in association with chipped stone tools from bioturbated midden deposits alongside Pleistocene Lake Cochise in southeastern Arizona (Woosley and Waters 1990:363). No description or image of this tool is provided, but a post-1000 BC date was assigned to all materials recovered from the midden, including the agave knife. A beginning date of AD 500 is given for agave knives in southern Arizona.

Several flaked, bipointed, biconvex limestone artifacts were also observed in private collections that derived from WIPP project sites (Earls and Bertram 1987:141), and a "crescentic shaped tabular limestone slab" that may have been flaked was recovered at the WIPP core area excavations (Lord and Reynolds 1985:149). Both of these tools may be similar in morphology and function to the NM 128 tabular knives.

It should also be noted that the term "agave knife" or "mescal knife" is used for tools that contrast greatly with the limestone tabular knives of New Mexico. The hafted mescal knives from Medicine Cave, Shumla Caves, Carved Rock Shelter and

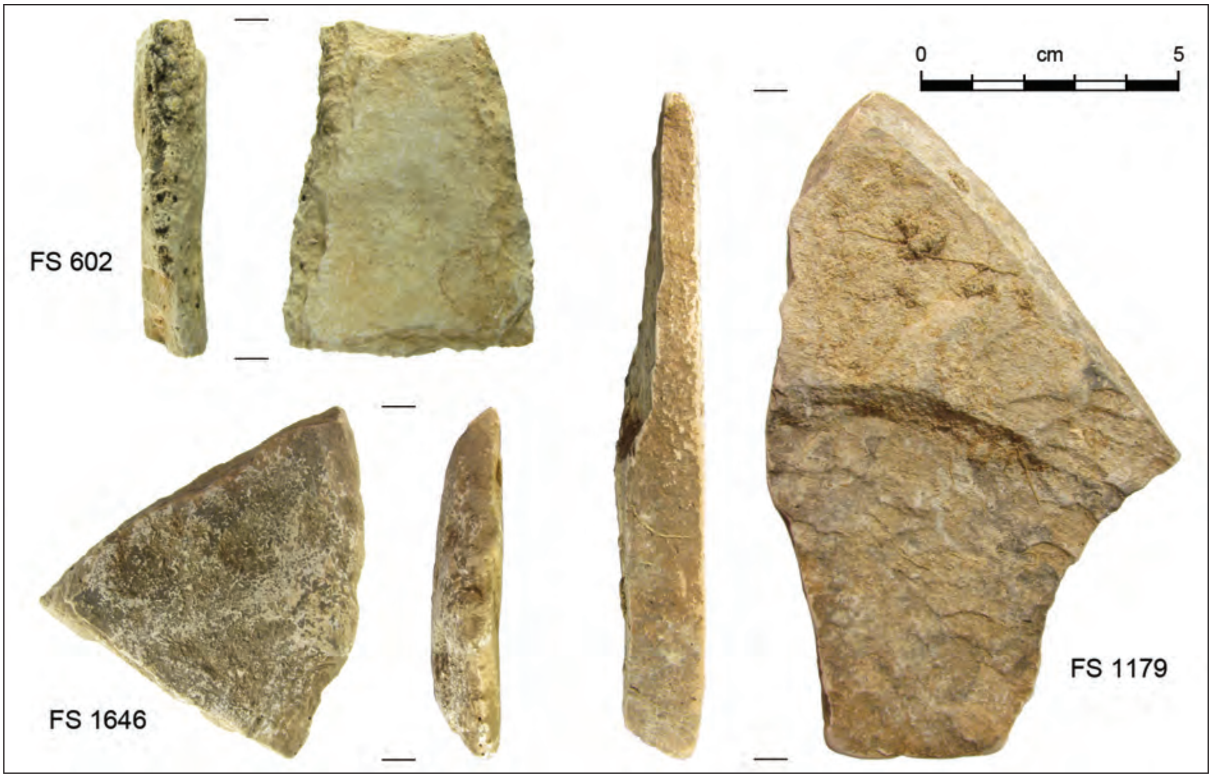

Figure 19.15. LA 113042, FS 602; and LA 129214, FS 1179 and FS 1646; tabular knife edge fragments.

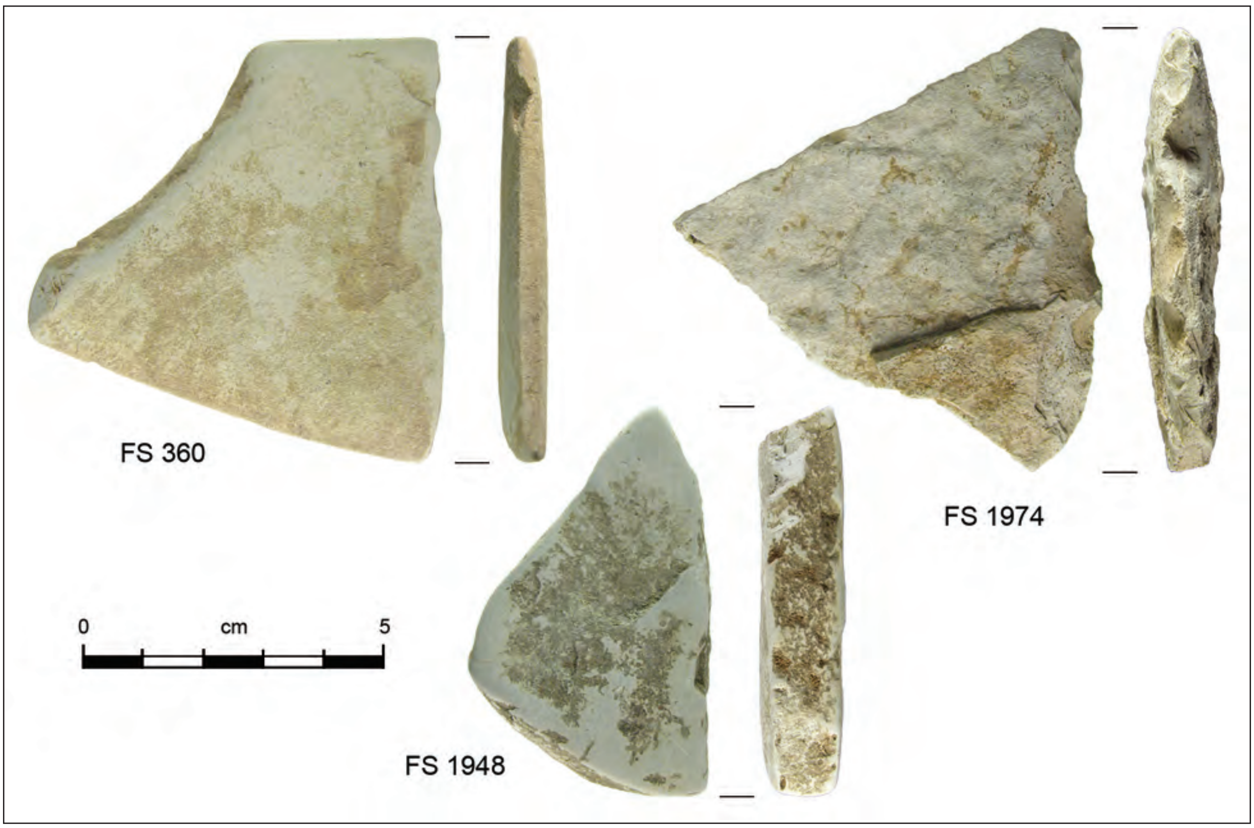

Figure 19.16. LA 129214, FS 1948 and FS 1974; LA 129222, FS 360; tabular knife edge fragments.

various locations in Nevada are manufactured from chert and are considerably smaller than the NM 128 tabular knives (Heizer 1970). "Agave/sotol knives" from Granado Cave in the Guadalupe Mountains consist of unmodified flakes backed for hafting with marginal retouch or a natural break (Dockall and Shafer 2001:186–188). All Granado Cave tools are utilized on un-retouched edges, with most edges displaying polish and scarring wear. They are manufactured from siliceous materials such as chert, and are considerably smaller, ranging from 4.12 to 6.99 cm in length. Interestingly, most of the tools found at Granado Cave were found in a ring midden, and all are thought to have been used in cutting and processing leaf succulents.

Functional Associations

Ethnographic and archaeological contexts of tabular knives are numerous and varied, and may suggest possible functions for the NM 128 knives. Two factors became apparent while examining functional options for these artifacts: the tools used to process succulent plants vary considerably, and the many individual tasks accomplished with tabular knives to process these plants.

An ethnographic study of agave processing by the Otomi community of Orizabita in Highland Central Mexico is perhaps the most detailed and extensive conducted (Parsons and Parsons 1990). Both the astounding variety of uses of this leaf succulent, and the highly specialized tool kit employed, could have implications for the NM 128 tabular knife assemblage. One of the primary contributions of the Parsons study is "a demonstration that there is a distinctive artifact assemblage that renders maguey sap and fiber production highly visible in the pre-Hispanic archaeological record" (Parsons and Parsons 1990:6).

Although many modern iron implements are used for the agave farming and harvesting process, the tools used to sever and pulp the leaves bear some resemblance to southwest desert tabular knives. One such tool is the tajadera, an iron cutting blade with a long wooden handle that is used to remove large or difficult leaves (Parsons and Parsons 1990: 28, Plate 22). Maguey scrapers consist of crescentic blades hafted onto short handles (Parsons and Parsons 1990: Plate 32, 33, 34). These tools are made to withstand "the forceful punching, gouging and chopping movements (used) to cut through the bases of leaves and dig out the tough basal portions of leaves in awkward locations in the middle of the plant"(Parsons and Parsons 1990:34, 35, Plate 32).

Scraping tools are also used to pulp leaves for fiber extraction. It is interesting to note that leaves are pulped in two different conditions: freshly cut and partially decomposed by heating and exposure to moisture (Parsons and Parsons 1990:145–146). The same scraping tool is used for both tasks, consisting of an iron blade set in a wooden handle. These tools, though larger, bear striking similarity to the hafted mescal knives described by Heizer (Parsons and Parsons 1990:148, Plate 118). The Parsons also note recovery of a 40 cm long, prehistoric hoe-like tabular basalt tool from a Postclassic site in the Valley of Mexico that they believe may have functioned as a maguey scraper (1990:Fig.15). This theory appears to have been borne out through experimental use (1990:175). It should also be noted here that the agave leaves are placed on a wooden board during the scraping process. If a similar surface was used prehistorically, tool edges may tend to round, rather than flake. While these large agave plants clearly differ from yucca, they are both processed for fiber, most likely with morphologically similar tools.

An ethnographic study of the Pima of southern Arizona and northern Mexico cites use of a very similar tool for a non-plant-processing task. The material, size and manufacture of these knives strongly resemble the NM 128 tools (Di Peso 1956:447, Plate 123a). Interestingly, the larger of these fleshing tools were ground to shape from limestone and sandstone materials and ranged in length from 11 to 17 cm. Smaller fleshing knives were flaked from diorite, quartz and felsite, with length ranging from 6 to 12 cm. Tabular knives of contrasting material and manufacture were used to harvest mescal (Di Peso 1956:453, Plate 125). Large, flint tabular knives from the eastern Mediterranean Levant are thought to have been used for cutting and butchering and display manufacture similar to southeastern New Mexico tools (Rosen 1983:80, Fig. 4).

Tabular knives are most often demonstrated to be associated with agave processing, based on ethnographic studies and archaeological contexts in the American Southwest. While agave is not found in the project area, and is not documented there prehistorically (Wiseman this report), its link with tabular knives in the Southwest necessitates mention of its many uses and the tools used for processing. Many forms of food, fiber, clothing, medicine, armor, paint, soap, basket water-proofing, and toys were wrought from the plant. Castetter and others mention knives used to trim the leaves from the plant crown in the Southwest (1938:28, 46, 48–49, 52).

While the process of harvesting agave is quite uniform, the tools used for this task vary. Also, it appears that two different tools are used for leaf removal. Interestingly, it is possible that the tools that most resemble those of NM 128 were used closest to the project area, such as the "broad stone knife" used by the Mescalero Apache. Also, "quids, fiber, net and sandal material" thought to be agave or sotol are ubiquitous in southeastern New Mexico (Castetter et al. 1938:37). Quids of *A. lechuguilla* were found in abundance in the Guadalupe Mountains and Big Bend area of Texas.

Mescal hatchets are frequently used by the Mescalero Apache for leaf removal, described as "a semi-circular stone blade of granite or diorite with the handle an extension of the stone itself" (Castetter et al. 1938:48-49; Castetter and Opler 1936:35-36). The mescal hatchet may be identical to T-shaped knives from the Hohokam culture (Fish et al. 1985b:Fig. 2, top image). It was employed by many tribes in Arizona, as well as the Mescalero Apache, who are closest to the project area. Also contrasting with the project tabular knives is the tool used by the Walapai, a flaked obsidian or quartz blade inserted vertically into a wooden handle. The Havasupai used a "broad stone blade set in a slot midway in the length of a short handle 30 cm long" (Castetter et al. 1938:52). This tool may be similar to the T-shaped stone knife sometimes used by the Hohokam (Fish et al. 1985b:Fig. 2, top image).

Comprehensive ethnographic and archaeological evidence has been compiled for tools used to process yucca and agave fibers for basketmaking in southern California (Hector 2006). A wide range of tools and archaeological features are described as part of the fiber production process, including stone scrapers, stone hammers and anvils. Hector believes that many of the tools associated with fiber processing are often unrecognized, such as hammerstones used to pound pulp from the leaves, and pebbles used to remove spines. Other tools associated with yucca fiber production may not survive in the archaeological record, such as cactus spine awls. Yucca leaves are also often roasted to facilitate pulp removal.

Southern California ethnographic studies and use-wear experiments suggest that agave pulping was accomplished with steep edged scraper planes rather than tabular knives (Salls 1985:99). It has also been suggested, based on use-wear experiments, that the scraper planes first used to process agave were later used to process yucca when agave disappeared from the coastal plains due to a shift to more xeric conditions in southern California (Kowta 1969:52–53, referenced in Salls 1985:99,101). The same process, as well as the same tool, is thought to have been used for both plants.

It is interesting to note that tools described as scraper planes and tabular knives are associated with similar plant-processing activities. This may have some bearing on the NM 128 sites. Hybrid yucca remains (*Y. campestris*) were recovered from a number of features at LA 113042 and was the dominant plant species at the nearby Los Medanos WIPP study area (Martin 1980:107,109, 110, 113, 114, 116, 117, Figure 3.24). Carbonized yucca remains are also the dominant species at LA 129214. Nearly all tabular knives were recovered from these two sites, suggesting the possibility that these tools were used to process yucca. While this plant is not likely to have been used for food it is an excellent source for fiber and is found in the project area (McBride and Toll this report). It is interesting to note that the method used to process yucca was similar to agave (Bell and Castetter 1941:19). It should also be noted that the high frequency of tabular knives at LA 129214 and LA 113042 could be due to occupational intensity and/or longevity, rather than the result of intensive on-site yucca processing. Sampling error could also play a role in this high tool frequency.

Tabular knives are also assigned functions other than agave processing, though far less frequently. One of the Tumamoc Hill knives was found in several pieces within a "large concentration of agricultural rock piles" (Masse 1979:162). Agave is not included in the list of cultigens for Tumamoc Hill, but the tabular knives are thought to have been used to shell corn. Basalt "edged scrapers" were recovered from the surface of the Otomi/Toltec Civic and Ceremonial Center of Huamango in north-central Mexico (Folan 1989:486). These tools appear to have been formed from large, thin, minimally modified flakes and used for yucca fiber extraction among the modern Otomi tribe of Mexico (Folan 1989:486).

Other functions are also postulated for these tools. Schist tabular knives are among the "ornate goods" that may have been manufactured specifically for Hohokam burials (McGuire 2004:35). Escalante Ruin, a Hohokam platform mound site in the SGA project, has an unusually high frequency of these tabular knives that Teague suggests is either related to trade or an emphasis on activities associated with the tools (Teague 1984:214–215). Bernard-Shaw suggests that the Hohokam traded both the finished tools and raw material throughout the Southwest (1983:433). This is based on the homogeneity of both the SGA raw material and finished tools, plus the discovery of caches of tabular knife raw material found at Red Bow Cliff Dwelling in Arizona and Escalante Ruins in Colorado.

Returning to agave processing, perhaps the most functionally conclusive tabular knife study is that conducted by Bernard-Shaw for Hohokam sites of the Salt-Gila Aqueduct (SGA) project in Arizona (1983). An experimental use-wear study and subsequent residue analysis revealed calcium oxalate crystals similar to those found in agave tissues on tabular knives from the SGA project, confirming their use in agave processing (Bernard-Shaw 1983; 1990). She also discovered that wear patterns and residue on the SGA knives suggest "a combination of multiple episodes of use or variable types of uses" indicative of plant-processing tasks (Bernard-Shaw 1983:439–440). Her use-wear experiments follow the agave process used by the Mexican Otomi tribe (Bernard-Shaw 1990).

The Otomi employ two processes to extract agave fibers: raw leaf and cooked leaf. Both methods involve pounding the leaf against a flat stone prior to scraping the pulp from the leaves with the agave knife. The contact of the knife against this stone during pulping creates wear in the form of an increasingly acute edge (Bernard-Shaw 1990:189). Interestingly, she observes that lechuguilla plants are closer in size to the agave processed prehistorically.

While the SGA tabular knife assemblage is technologically uniform, specializations exist within the tool group. Each knife is assigned to cutting, multiuse or indeterminate-function categories (Bernard-Shaw 1983:427). The proliferation of acute edges indicates a preponderance of cutting and sawing activities, a conclusion that was borne out by use-wear experiments (Bernard-Shaw 1983:395). The Hohokam igneous materials primarily exhibit edge flaking wear, while the NM 128 limestone materials primarily display edge rounding with lesser amounts of flaking.

The difference in wear patterns between rhyolite and limestone may be caused by a number of factors. First, manufacturing techniques appear to have a direct effect on observable wear. Most of the SGA knives were ground to shape, emphasizing the unifacial or bifacial "discontinuous scalar scars" that resulted from cutting and sawing use (Bernard-Shaw 1983:395). This flaking wear coupled with "oblique abrasive striations" led to the conclusion that the SGA tools were knives associated with plant processing (Bernard-Shaw 1983:427). Interestingly, this wear was primarily restricted to one face after the tool was hafted, allowing it to be worked more effectively at an angle. The edges of NM 128 knives, in contrast, are shaped by unimarginal or bimarginal flaking that, comparatively, may obscure flake wear. Edge flaking could result from manufacture or wear. This was also noted for bifaces in the chipped stone assemblage (Jim Moore, personal communication, 2010).

Second, it is also possible that different materials may display contrasting wear patterns. This factor affected the SGA wear analysis. Rhyolite knives could be examined for use-wear, but the schist knives posed a challenge due to the inability of the material to fracture conchoidally and its reflective nature (Bernard-Shaw 1983:395-396). The different hardness of the two materials undoubtedly affects the degree and type of edge wear with rhyolite rating 6 to 6 1/2 and limestone rating 3 to 4 (Chesterman 1979:684, 720). It may be that a rhyolite edge has a greater tendency to flake during use, while a softer limestone edge is more likely to round. This is less applicable to the tabular knives manufactured from conchoidally fracturing limestone, however.

In the rock piles and roasting pits of one Marana Community site, rhyolite debitage was overwhelmingly chosen for use in agave cultivation and processing, either for edge sharpness or the ability of the material to hold an edge longer (Van Buren et al. 1992:6–7). Described as "relatively massive," these rhyolite tool edges appear resistant to perpendicular stress such as pulping.

Use-wear studies conducted with three types of rhyolite offer interesting information regarding the wear produced by scraping and cutting agave leaves (Foix and Bradley 1985). Tools of three edge angle categories (26–35, 46–55, and 66–76 degrees) were manufactured from Thunderbird rhyolite from west Texas, Mexican rhyolite and Organ Mountain rhyolite.

Agave leaves were laid on agave stalks rather than wood or stone surfaces in an effort to avoid edge damage from contact with a hard material. All three tool types were considered equally effective at pulping agave leaves.

The most interesting result of the use-wear study, however, is the absence of macroscopic and microscopic edge wear displayed by the tools following use (Foix and Bradley 1985:116). While an edge of rhyolite is likely more durable than one of limestone, the absence of wear in this study may indicate that pulping leaf succulents may generally produce less wear as compared to more heavy duty tasks, and may partially explain the preponderance of rounding wear on NM 128 knife edges.

Regional differences in manufacturing techniques and material of tabular knives may also be related to contrasting resources and function. The SGA Hohokam tools are manufactured from rhyolite and schist and display remarkable uniformity of manufacture (Bernard-Shaw 1983:433).

It is thought that the Hohokam mass-produced these tools using materials from a specific, possibly somewhat remote, source obtained through trade or travel. These characteristics, plus the discovery of caches of tabular material at several locations, led to the theory that they were manufactured at specific locations for trade both within the Hohokam culture and throughout the Southwest (Doyel 1991:257; Bernard-Shaw 1983:433–434). This aspect of Hohokam tabular knife manufacture is similar to the Levant, but stands in stark contrast to southeastern New Mexico, where trade has not been suggested.

It is widely accepted that tabular knives are associated with agave processing for the Hohokam. They were a mixed hunter-gatherer/farming population, cultivating agave extensively in large, rock-mulched fields and exploiting resources from "a gradient of differentiated habitats…from mountain peak to floodplain" (Fish and Nabhan 1991:31). This range of environments could be accessed within a range of 6 to 30 miles.

The extent of agave cultivation is perhaps best illustrated from the Hohokam Marana Community project, where estimates of 102,000 plants may have been grown simultaneously in large mid-bajada fields, with 10,200 plants harvested annually (Fish, Fish and Madsden 1992:16). While the farming component of the Hohokam society stands in stark contrast to that of NM 128, there are some similarities with the hunter-gatherer aspect. NM 128 occupants may have been exploiting resources from as many as three vegetative communities (McBride and Toll this report). Travel beyond the project area would expand these resources.

Though New Mexico tabular knives display considerable uniformity in material and manufacture, their role may differ from those of the Hohokam. The NM 128 site occupants were hunter-gatherers exploiting a wide range of resources. Tabular knives in this type of economy appear to have been manufactured from what was immediately available.

Raw material size may also have influenced this material choice, as limestone is one of few locally available materials from which tools of this size could be made (Jim Moore, personal communication, 2010). They may also have been multifunctional rather than task-specific. While these major differences in subsistence are essential in determining the function of tabular knives, it is also important to restate the similarity of the tools from these two very diverse populations. The presence of red pigment on a majority of NM 128 tabular knives suggests a function related to ochre reduction using these tools.

It is also important to note that nearly all pigment stained knives were found at LA 129214 (8/11: 73 percent), where the majority of red ochre materials were recovered (54/83: 65 percent). Red ochre occurs naturally in the project area, and would not be anomalous at any site, highlighting the dominance of the material at LA 129214. This is due in part to the large site assemblage. For this reason, it is significant that the vast majority of ochres and pigment stained knives occur together at LA 129214.

And finally, after this section had been written, the results of the special biological analyses became available (Cummings et al., this report). Two tabular knives, one each from LA 113042 (FS 1016) and LA 129214 (FS 1861), revealed the presence of acorn residues on their edges, suggesting that these artifacts were used to reduce acorns to a powdery or mushy form for consumption or storage.

Summary

Tabular knives are found in New Mexico, Arizona and Mexico and share many morphological traits. Ethnographic studies, agricultural feature associations, use-wear experiments and residue analyses strongly link these tools with succulent leaf processing for food and fiber. Perhaps the best example of the many ways in which these plants are used comes from archaeological and ethnographic studies of Mexico's Cihuatecpan culture in the Teotihuacan Valley, where exploitation of agave enables survival and expansion into an otherwise uninhabitable area (Evans 1990:117, 128–129). The Cihuatecpan cultivated and processed this plant for food, beverage, medicine, fiber, building material, fuel, crafts and fertilizer (ashes), using basalt scrapers to pulp leaves for fiber (Evans 1990:128). Writing in 1570, Dr. Francisco Hernandez describes the "almost innumerable uses" of agave in central highland Mexico (Parsons and Parsons 1990:272, 276). The NM 128 tools may have been used to process yucca within the project area, *A. parryi*, *A. palmeri* and *A. lechuguilla* west of the Pecos River. The presence of red stains and a variety of wear patterns may also indicate a multifunctional role for these tools.

Why is a virtually identical tool appearing in a variety of cultures with completely different economies? Bernard-Shaw may offer the best explanation, "Ethnographic accounts repeatedly discuss plant processing by Native American populations, with or without the aid of tabular knives…As a result, the absence of this type of tool within specific regions throughout a broad area of central Arizona does not prove absence of these kinds of plant-processing activities. Rather, the occurrence of the tool within particular regions probably indicates the use of specific exploitation techniques."

While the various species of agave cultivated and exploited by the Hohokam are not found in the project area, "specific exploitation techniques" may have been used. Tasks such as animal fleshing or yucca fiber processing may have been accomplished with the use of these tools; both are fleshing tasks. Yucca leaves also served multitudinous additional functions such as paint brushes, hair brushes, masks, tablets, dolls, toys, prayer sticks, basketry, sandals, cordage, and matting (Bell and Castetter 1941), all of which would have required severing and pulping the leaves. Also, agave species are found west of the Pecos River and the Guadalupe foothills, offering the possibility that tabular knives were manufactured at the NM 128 sites, transported to the resource area to sever agave leaves from the heart, or used to pulp the leaves to extract the fiber. This would contrast with the burned rock ring midden context within which many tabular knives have been recovered, however. As was previously mentioned, tabular knives were found stored among the rocks of succulent-leaf roasting features in both New Mexico and Arizona.

Two interesting factors emerge from the above tool occurrences: the variety of tasks associated with just one tool, the tabular knife; and the variety of tools associated with just one task, fibrous plant/succulent leaf processing. However, it would likely be erroneous to limit these tools to this specific task, particularly because the ethnobotanical remains recovered from the project indicate that a wide variety of species were probably exploited. While processing of succulent leaf plants is clearly the strongest association with these tools, ethnographic and archaeological contexts from several western states also indicate that they may have had multiple functions. Residue analysis of two tabular knives from NM 128 echoes this cautionary note, yielding acorn residue from their cutting edges. Others apparently were used to chop or smash red ochre bits to powder, presumably for use as paint or pigment. Just what was painted red we cannot say, but human body panting is one possibility.

Miscellaneous Artifacts

The miscellaneous artifact assemblage consists of 54 artifacts from LA 129214 (n = 27), LA 113042 (n = 16), LA 129300 (n = 5), LA 129217 (n = 3), and LA 129222 (n = 3). No miscellaneous artifacts were recovered from LA 129216 or LA 129218. Indeterminate fragments comprise nearly half of the assemblage (n = 26/54: 47 percent), with abrading stones the next most numerous artifact (n = 9) (Table 19.13). Most miscellaneous artifacts are fragmentary (n = 38/54: 70 percent). The vast majority of whole tools are abrading stones (n = 4/14: 29 percent). Most whole artifacts in the miscellaneous category utilize cobble raw material (n = 16/54: 30 percent). In addition to being the predominant raw material, cobbles also represent the broadest array of tool use, with single and multiple functions occurring. As a result, the miscellaneous artifact group is an extremely variable assemblage.

Miscellaneous Artifact Analysis Attributes

In accordance with the research design for the NM 128 project, the standard OAS methods were used to analyze miscellaneous artifacts (Moore 2006:111–114), with the addition of one optional attribute, ground surface contour. All artifacts that could not be conclusively identified as a mano, metate, mineral, or tabular knife are included in this category.

Fragments with concave use-surfaces were analyzed as metates, and those with convex use-surfaces as manos. As a result, the majority of indeterminate fragments have flat ground surfaces that could not be assigned mano or metate status. However, exceptions exist. Several ground stone fragments display convex surfaces and are included in this assemblage because they are use-surface spalls or extremely small in size and cannot be definitively assigned less than 2 cm in length.

Miscellaneous artifact analysis attributes were designed to provide full descriptive information and assign function, if possible. Another goal of the analysis is to gain as much functional information as possible from the detailed examination of use-surface wear patterns. Values were added to attributes in the course of analysis to address these goals, particularly to the function and wear pattern categories.

Many tools in the assemblage appear to be multifunctional based on the presence of multiple, often overlain, wear patterns. The relationship between these patterns was examined in an effort to determine the sequence of these functions, or, at a minimum, the most recent.

Analysis Attributes

Material type: All artifacts were monitored for material type, color, and degree of induration. Any combination of these three characteristics denotes a specific material type.

Material texture: Lithic material types were monitored as being fine, medium, coarse grained or cryptocrystalline. Grain size is identified with the aid of an American/Canadian Stratigraphic card. Large grained refers to particle sizes larger than 710 microns, medium grained refers to particles between 350 and 710 microns, and fine grained refers to particles 350 microns and smaller.

Raw material form refers to the form of the tool source material. Artifacts were recorded as having been manufactured from a rounded cobble; a flattened cobble; a thick slab, more than 10 cm; a thin slab, 5 to 10 cm; a very thin slab, less than 5 cm; or thinly bedded, less than 1 cm.

Plan shape is the outline of the top, or dorsal, view of the artifact. If the artifact is fragmentary, this attribute is indeterminate.

Transverse cross-section shape (TXS) defines the outline shape of the artifact across the width axis.

Longitudinal cross-section shape (LXS) is the outline shape of the artifact across the length axis. Both *TXS* and *LXS* attributes were added to the standard OAS ground stone analysis.

Use-surface contour refers to the overall use-surface contour. Individual axes were not recorded as for manos and metates.

Production input describes the level of manufacturing effort expended on a specific tool. Artifacts are described according to percentage categories of modified surface area. While the vast majority of miscellaneous artifacts are either unmodified or indeterminate, some artifacts have been shaped. The exceptions are “fully shaped” (100 percent), and “slightly modified” (less than 50 percent of the surface area).

Shaping refers to the methods used to shape a ground stone tool. As with Production Input, most miscellaneous artifacts are unshaped or indeterminate. Grinding, flaking, pecking, and combinations of these methods were recorded for a minority of artifacts. Pecking methods used to shape an artifact are differentiated from pecking methods used to re-sharpen a grinding surface, which are recorded under Wear Surface Rejuvenation. Fragments, are also analyzed as for production input.

Heat alteration describes the degree heat exposure an artifact has received. Attributes consist of reddened, crazed, fractured, burned and sooted, and combinations of these attributes.

Adhesions refer to any foreign substance on the

Table 19.13. Miscellaneous artifact material distribution, by artifact type.

ARTIFACT TYPE	ABRADING STONE	ABRADED CUTTING EDGE TOOL	PESTLE	SHAPED DISK	MANUPORT	MORTAR-ANVIL	PIGMENT GRINDING STONE	COBBLE CORE-ABRADER	HAMMERSTONE/ CORE	HANDSTONE/ CORE/ HAMMERSTONE	PAINT STONE/ ABRADER	SHAPED STONE	BURNED SLAB	INDETERMINATE FRAGMENT	**TOTAL**
Sandstone															
Red sandstone, consolidated	–	–	–	–	–	–	–	–	–	–	–	–	–	8	**8**
Red sandstone, friable	–	–	–	–	–	–	1	–	–	–	–	–	–	3	**4**
Red hematitic sandstone, consolidated	1	–	–	–	–	–	–	–	–	–	–	–	–	–	**1**
Red hematitic sandstone, friable	–	–	–	–	–	–	–	–	–	–	–	–	–	2	**2**
Light brown sandstone, consolidated	–	–	–	–	–	–	–	–	–	–	–	1		–	**1**
Brown sandstone, consolidated	2	–	–	–	–	–	–	–	–	–	–	–	1	5	**8**
Brown sandstone, friable	–	–	–	–	–	–	1	–	–	–	–	–	–	1	**2**
Yellow-brown sandstone, consolidated	1	–	–	–	–	–	–	–	–	–	–	1	–	1	**3**
Yellow-brown sandstone, friable	1	1	–	–	–	–	–	–	–	–	–	–	–	–	**2**
White sandstone, consolidated	1	–	–	–	–	–	–	–	–	–	–	–	–	2	**3**
Subtotal	6	1	–	–	–	–	2	–	–	–	–	2	1	22	**34**

(Table 19.13, continued)

ARTIFACT TYPE	ABRAD-ING STONE	ABRADED CUTTING EDGE TOOL	PESTLE	SHAPED DISK	MANU-PORT	MORTAR-ANVIL	PIGMENT GRINDING STONE	COBBLE CORE-ABRAD-ER	HAMMER-STONE/ CORE	HAND-STONE/ CORE/ HAMMER-STONE	PAINT STONE/ ABRAD-ER	SHAPED STONE	BURNED SLAB	INDETER-MINATE FRAG-MENT	**TOTAL**
Quartzite															
Tan quartzite	–	–	–	–	–	–	–	1	–	–	–	–	–	–	**1**
Black quartzite	–	–	–	–	–	–	–	–	–	–	–	1	–	–	**1**
Gray quartzite	1	–	–	–	–	–	–	–	–	–	–	–	–	–	**1**
Brown quartzite	1	–	1	–	–	–	–	–	1	–	–	–	–	1	**4**
Purple quartzite	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Gray quartzite w/hematitic inclusions	–	–	–	–	–	–	–	–	–	–	1	–	–	–	**1**
Subtotal	2	–	1	–	–	–	–	1	1	–	1	1	–	2	**9**
Chert															
Chert/ sandstone adjoined	–	–	–	–	1	–	–	–	–	–	–	–	–	–	**1**
Red chert	–	–	–	–	–	–	–	–	–	1	–	–	–	–	**1**
Subtotal	–	–	–	–	1	–	–	–	–	1	–	–	–	–	**2**
Limestone															
Limestone	2	–	–	1	–	2	–	–	–	–	–	–	–	2	**7**
Limestone, fossiliferous	–	–	–	–	–	–	–	–	1	–	–	–	–	–	**1**
Subtotal	2	–	–	1	–	2	–	–	1	–	–	–	–	2	**8**
Granite															
Granite	–	–	–	–	–	–	–	1	–	–	–	–	–	–	**1**
Total	10	1	1	1	1	2	2	2	2	1	1	3	1	26	**54**

artifact such as caliche or red stains that may be red hematitic pigment. The amount and location of caliche coverage is also included in this attribute, as well as the pigment type and color.

Function records the tool type and function. If the tool function cannot be defined, as with small fragments, the function is indeterminate. The ground surfaces of these indeterminate fragments are analyzed, however. Reworked and reshaped artifacts with multiple functions are coded individually for all identifiable functions.

Number of functions refers to the number of identifiable functions for each tool.

Number of wear surfaces is recorded for every artifact.

Portion describes the artifact condition as whole, end fragment, medial fragment, corner fragment, internal fragment, and corner or corners only missing. A flake from a ground stone artifact retaining a small portion of the ground surface is categorized as a ground stone flake. Use-wear surface attributes are analyzed to the furthest extent possible with ground stone flakes.

Wear surface rejuvenation is the presence or absence of pecking to re-sharpen the grinding surface. This attribute is recorded for all wear surfaces.

Wear surface degree describes the extent of use of each utilized ground stone surface as light, moderate or heavy. While this is an admittedly subjective attribute, an attempt was made to objectify the values. "Light" refers to grinding wear that occurs only on the high points of a surface, leaving unused areas. The boundaries of the use-surface are not well defined. The unmodified raw material texture is still visible after light use. "Moderate" refers to wear that is extensive enough to grind down the entire use-surface, leaving no unused areas. Moderate wear obscures the original raw material texture. "Heavy" refers to wear that completely alters the raw material texture and often results in striated surfaces. Rough materials such as sandstone are worn smooth, and the use-surface contour can become faceted or well delineated. Very fine-grained or conchoidally fracturing material such as quartzite can become polished and striated from heavy use. If a tool was re-sharpened with pecking and some of the unsharpened use-surface remained wear degree was assigned based on that.

Wear records every type of wear pattern observed on each ground surface. Attributes consist of grinding, striations, deep scratching, pitting, battering, impact scars, and polishing. Striations are additionally analyzed as bidirectional or multidirectional.

Length in centimeters is recorded for each artifact. In the case of fragments, if the original long axis of the artifact could be determined, this measurement is recorded even if it is not the longest dimension. If not, the longest dimension is recorded.

Width in centimeters is recorded for each artifact. As with length, if the whole artifact length-width axis could be determined, then those dimensions are appropriately recorded. If it is indeterminate, then the width is measured perpendicular to the long axis.

Thickness in centimeters is recorded for each artifact. As with length and width, if the whole artifact length-width axis could be determined, thickness was taken accordingly.

Weight in grams is recorded for all artifacts. If fragments can be determined to be part of the same artifact, they are weighed together.

Miscellaneous Artifact Material Sources

Most of the material types found in the mano and metate assemblage are also present in the Miscellaneous Artifact group. The reader is referred there for sandstone, quartzite and limestone material descriptions and sources. Materials unique to the Miscellaneous Artifact assemblage are granite and some colors of chert and quartzite.

Sources for Miscellaneous Artifacts are listed under material-type categories rather than geologic formations because some types are available in multiple formations east and west of the Pecos River. Also, some sources are described in the literature only as "conglomerate layers" outcropping in specific locations and are not listed as members of a particular formation.

Sources East of the Pecos River

Sandstone (n = 34). Ten sandstone types were encountered during analysis. These sandstone types consist of red, consolidated (n = 8), red friable (n = 4), red hematitic consolidated (n = 1), red hematitic friable (n=2), yellow-brown consolidated (n = 3), yellow-brown friable n = 2), light brown consolidated (n = 1), brown friable (n = 2), brown consolidated (n = 8), and white consolidated (n = 3).

Chert (n = 2). Materials are comprised of red (n = 1) and chert/sandstone adjoined (n = 1). The latter material is an unusual concretion that will be further described in the manuport category. Chert cobble sources may be located both east and west of the Pecos River.

East of the river, they occur in the Santa Rosa formation in outcrops north and northeast of the project area near Maroon Cliffs (Vine 1963:B27). Conglomerate lenses of this formation include variously colored chert pebbles up to several centimeters in diameter (Vine 1963:B25, B26, B29), which would include some artifacts in this assemblage. Others may be larger than the cobbles available within this formation. Chert pebbles are also found in a conglomerate layer of the Gatuna Formation about 8 km (5 mi) directly north of the project area (Vine 1963:B29, B30). Although cobble size is not mentioned, this material is described as "abundant" in the San Andres formation outcropping in the southern Guadalupe Mountains (Kelley 1971:10, 13).

West of the Pecos River, chert pebbles are the primary constituent of the conglomerate layer within Yucca and Slaughter Canyons (Horberg 1949:400).

Sources West of the Pecos River

Quartzite (n = 9). Cobble sources are provided in the mano and metate analysis section, and appear to be available only from sources west of the Pecos River. Eight quartzite types are recognized within the miscellaneous artifact assemblage. Brown (n = 4), tan (n = 1), red (n = 1), purple (n = 1), gray (n = 1), black (n = 1), and gray with hematitic inclusions (n = 1) are represented. Quartzite may also have been obtained from the same sources as chert in siliceous gravels west of the Pecos.

Granite (n = 1). Granite is listed with a group of siliceous pebbles that occur within conglomerate layers along the lower Black River (8 km) 5 miles south of the project area and along the Pecos River to the west (Horberg 1949:400).

Analysis Results

Tools are categorized into 14 functions. In order of frequency, these functions consist of indeterminate fragments (n = 26), abrading stone (n = 10), shaped stones (n = 3), mortar/anvil (n = 2), pigment grinding stone (n = 2), hammerstone-core (n = 2), cobble core/abrader (n = 2), burned slab (n = 1), abraded cutting edge tool (n = 1), pestle (n = 1), shaped disk (n = 1), manuport (n = 1), and handstone/core/hammerstone (n = 1).

The miscellaneous artifact assemblage is primarily comprised of fine grained materials (n = 48/54: 89 percent), with medium grained (n = 3), cryptocrystalline (n = 2) and large grained (n = 1) present in lesser amounts. Sandstone is almost exclusively fine grained (n = 31/34: 91 percent), with lesser amounts of medium-grained artifacts (n = 3/34: 9 percent). Quartzite materials are fine (n = 8) and cryptocrystalline (n = 1) in texture. All display conchoidal fracture due to the silica cementation. All cherts are cryptocrystalline with one unusual exception. This artifact is chert and sandstone adjoined, and as a result displays two material textures, the chert is cryptocrystalline and the sandstone is fine grained. All limestone materials are fine grained. The single granite artifact represents the only large grained material.

Among artifacts whose raw material form can be determined, unmodified cobbles and slabs are equally represented (n = 16/52: 31 percent) (Table 19.14). Raw material form could not be identified for two fragmentary artifacts. While most cobbles are quartzite (n = 7/16: 44 percent), other materials such as chert, limestone, granite, and sandstone are also present in this form. Slabs of varying thickness also comprise a significant portion (n = 16/52: 31 percent). Slabs are almost exclusively sandstone (n = 13/16: 81 percent), with lesser amounts of limestone (n = 3).

Most of the miscellaneous artifacts cannot be analyzed for the production input attribute due to their fragmentary nature (n = 29/54: 54 percent). Of the 25 artifacts that can be analyzed for this attribute, most use unmodified, natural forms. (n = 16/25: 64 percent). Artifacts displaying over 50 percent surface modification (n = 5) and less than 50 percent surface modification (n = 4) are minimally represented. No fully formed artifacts occur in this assemblage.

Most miscellaneous artifacts cannot be analyzed for the plan-shape attribute due to their fragmentary condition (n = 30/54: 56 percent). Oval or circular plan shapes are the most frequent determinate type (n = 15/54: 28 percent), primarily as a result of the high percentage of cobbles in the as-

Table 19.14. Miscellaneous raw material form, plan shape, production input, and shaping distribution, by artifact type.

ARTIFACT TYPE	ABRAD-ING STONE	ABRADED CUTTING EDGE TOOL	PESTLE	SHAPED DISK	MANU-PORT	MORTAR-ANVIL	PIGMENT	COBBLE	HAMMER-STONE/ CORE	HAND-STONE/ CORE/ HAMMER-STONE	PAINT STONE/ ABRAD-ER	SHAPED STONES	BURNED SLAB	INDETER-MINATE FRAG-MENTS	**TOTAL**
Raw Material Form															
Indeterminate	–	–	–	–	–	–	1	–	–	–	–	1	–	17	**19**
Rounded cobble	5	–	1	–	–	–	1	2	2	1	1	–	–	1	**14**
Angular	1	–	–	–	–	–	–	–	–	–	–	–	–	1	**2**
Flattened cobble	1	–	–	–	–	1	–	–	–	–	–	–	–	–	**2**
Slab, not further specified	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Slab, thin (5–10 cm)	–	–	–	–	–	1	–	–	–	–	–	–	–	–	**1**
Slab, very thin (<5 cm)	3	1	–	1	–	–	–	–	–	–	–	1	1	6	**13**
Thin bedded (<1 cm thick)	–	–	–	–	–	–	–	–	–	–	–	1	–	–	**1**
Sandstone concretion/ chert	–	–	–	–	1	–	–	–	–	–	–	–	–	–	**1**
Total	**10**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**26**	**54**
Plan Shape															
Indeterminate	2	1	–	–	–	–	1	–	–	–	–	2	1	23	**30**
Circular	–	–	–	1	–	1	–	–	–	–	–	–	–	–	**2**
Oval	4	–	1	–	–	1	–	2	1	–	1	–	–	–	**10**
Oval or circular	1	–	–	–	–	–	–	–	1	1	–	–	–	–	**3**
Subrectang-ular	3	–	–	–	–	–	1	–	–	–	–	–	–	–	**4**
Rectangular	–	–	–	–	–	–	–	–	–	–	–	–	–	2	**2**
Subtriangular	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
Triangular	–	–	–	–	–	–	–	–	–	–	–	1	–	–	**1**
Pyramid	–	–	–	–	1	–	–	–	–	–	–	–	–	–	**1**
Total	**10**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**26**	**54**

(Table 19.14, continued)

ARTIFACT TYPE	ABRAD-ING STONE	ABRADED CUTTING EDGE TOOL	PESTLE	SHAPED DISK	MANU-PORT	MORTAR-ANVIL	PIGMENT	COBBLE	HAMMER-STONE/ CORE	HAND-STONE/ CORE/ HAMMER-STONE	PAINT STONE/ ABRAD-ER	SHAPED STONES	BURNED SLAB	INDETER-MINATE FRAG-MENTS	**TOTAL**
Production Input															
Indeterminate	2	–	–	–	–	–	1	–	–	–	–	–	1	25	**29**
None (natural form)	7	–	1	–	1	–	1	1	2	1	1	–	–	1	**16**
Slightly modified (<50% area)	1	–	–	–	–	1	–	–	–	–	–	2	–	–	**4**
Mostly modified (50–99% area)	–	1	–	1	–	1	–	1	–	–	–	1	–	–	**5**
Total	**10**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**26**	**54**
Shaping Distribution															
Indeterminate	2	–	–	–	–	–	1	–	–	–	–	–	1	25	**29**
None	7	–	1	–	1	–	1	–	2	–	1	–	–	–	**13**
Grinding	–	1	–	–	–	–	–	–	–	–	–	2	–	–	**3**
Flaking	–	–	–	–	–	–	–	1	–	1	–	–	–	–	**2**
Pecking	1	–	–	1	–	–	–	–	–	–	–	–	–	1	**3**
Grinding, flaking	–	–	–	–	–	–	–	1	–	–	–	1	–	–	**2**
Flaking, pecking	–	–	–	–	–	2	–	–	–	–	–	–	–	–	**2**
Total	**10**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**26**	**54**

semblage. Geometric forms are represented by rectangular, sub-rectangular, pyramid and triangular forms (n = 9/54: 16 percent).

Most miscellaneous artifacts are too fragmentary to be analyzed for shaping modification (n = 29/54: 54 percent). Of the 25 artifacts analyzed for this attribute, most are unmodified (n = 13/25: 52 percent). Within the shaped artifact group, flaking is the most commonly employed method, usually in combination with grinding or pecking. Grinding and pecking are nearly equally represented (Table 19.14).

Exposure to heat occurred on nearly one-quarter of the miscellaneous artifacts (n = 13/54: 24 percent), comprised of seven indeterminate fragments, three abrading stones, the burned slab, a mortar-anvil and the pigment grinding stone. Most artifacts exposed to heat are fragmentary (n = 11/13: 85 percent). Only the comal and one abrading stone are whole within the heat exposed category.

Five artifacts display red stains, most likely hematite pigment. They consist of a pigment grinding stone, a polishing stone, a pestle, and two indeterminate fragments. These artifacts are described in more detail in their respective sections.

Most use-surface contours are flat (n = 45), with lesser numbers displaying convex use-surfaces (n = 23) (Table 19.15). The single concave use-surface is a mortar-anvil. Several artifacts display unusual contour characteristics, such as the cone-shaped "handle" of the chert/sandstone concretion. Use occurs on the rounded edge of three artifacts with contrasting function: the abraded edge cutting tool; a shaped slab fragment whose edge was employed for abrading; and a fragmentary chert cobble that was used on the broken edge.

Functional Categories

Abrading stones (n = 10) are primarily ground stone fragments that have been reused on broken edges, or small abrasive cobbles used on cortical surfaces and broken edges. Abraders are of fine- to medium-grained sandstones (n = 6), dome-shaped limestone cobbles (n = 2) or quartzite cobble fragments (n = 2). Four abraders appear to have functioned first as a mano or metate, but breakage and secondary use have obliterated original tool morphology.

The four whole abraders vary in morphology. One is a small, complete dome-shaped sandstone cobble that has been abraded on the flat surface, overlapping onto the domed surface. The bidirectional striations on both surfaces are identically oriented (7.5 by 5.1 by 3.6 cm). The second is an irregular, angular sandstone fragment that appears to have been held upright and lightly ground on a flat edge (6.1 by 4.3 by 3.4 cm). The third whole abrader may be a reused bifacial metate fragment, but the small size and internal portion precludes definitive classification, so this artifact is included with the miscellaneous category. It is also ground on a flat edge (5.7 by 3.8 by 2.0 cm). The fourth whole abrader is a small, sub-pyramidal quartzite cobble that appears to have been gripped at the apex and ground on the broader, convex-surfaced base. The use-surface displays random striations (5.2 by 1.9 by 2.3 cm).

All abraders formed from fragments display grinding wear that either overlaps or is confined to broken surfaces and edges. This indicates that the more abrasive surface is being selected for use, regardless of material type. Both quartzite abraders display grinding wear that extends from the use-surface over the adjacent broken edges. This is also the case with one limestone cobble. Abrader use-surfaces display both random and bidirectional striations (n = 2 each).

Interestingly, wear is light on most abraders; only two display moderate wear and none have received heavy use. This suggests that they are expedient tools formed from fragments and natural forms intended for short-term use.

The distribution of abraders among project sites differs significantly from that of most artifact categories. Four abraders, all formed from cobbles, are from LA 129300, a site from which very little ground stone was recovered. The remaining abraders were found at LA 129214 (n = 4) and LA 113042 (n = 2). Three of the four abraders from LA 129214 are burned and sooted.

Abraded Cutting Edge Tool (n = 1). This artifact is a medial tool fragment that has been manufactured entirely by grinding. It is reminiscent of the NM 128 tabular knife morphology and manufacturing techniques, but is much smaller in size. It is of fine-grained, yellow-brown sandstone and displays two lateral edges, one of which is ground to 33 degrees. The second lateral edge appears to have been ground to a rounded form, possibly to facilitate handling. It appears to have been trian-

Table 19.15. Miscellaneous artifact use-surface contour distribution.

	GROUND SURFACE CONTOURS*						
ARTIFACT TYPE	FLAT	CONVEX	ROUNDED EDGE	CONVEX PERIMETER	CONCAVE	ROUNDED HANDLE	**TOTAL**
Abrading stone	9	9	1	–	–	–	**19**
Abraded cutting edge tool	–	–	2	–	–	–	**2**
Pestle	–	–	–	1	–	–	**1**
Shaped disk	2	–	–	–	–	–	**2**
Manuport	1	–	–	–	–	1	**2**
Mortar-anvil	–	–	–	–	1	–	**1**
Pigment grinding stone	2	1	–	–	–	–	**3**
Cobble core-abrader	1	1	–	–	–	–	**2**
Hammerstone/core	–	2	–	–	–	–	**2**
Handstone/core/ hammerstone	–	2	–	–	–	–	**2**
Paint stone/abrader	–	2	–	–	–	–	**2**
Shaped stones	4	1	1	–	–	–	**6**
Burned slab	1	–	–	–	–	–	**1**
Indeterminate, fragmentary	27	7	–	–	–	–	**34**
Total use surfaces	**47**	**25**	**4**	**1**	**1**	**1**	**79**
Surface %	59.5%	31.6%	5.1%	1.3%	1.3%	1.3%	100.0%

*includes all use surfaces for each artifact

gular, as both edges are tangentially oriented. Only the width and thickness are complete, as both the proximal and distal ends are broken (4.4 and 0.62 cm). It was recovered from the surface of LA 113042, Grid Unit 523.94N/534.43E.

Pestle (n = 1). This oval, brown quartzite cobble displays battering wear and red stains on one end. It is oval in plan and biconvex in both cross-section shapes. No modification other than wear is present. It measures 5.8 by 3.5 by 2.3 cm and weighs 68 grams. It was recovered from the surface of LA 113042 at Grid Unit 502.32N/511.36E. Pestles recovered from southeastern New Mexico sites vary considerably in morphology. A possible pestle recovered from the Fox Place (LA 68188) southwest of Roswell is shaped by pecking and grinding into a "columnar-rectangular" form (Wiseman 2002a:48). A shaped, conical limestone fragment with battering wear on one end was recovered from the nearby WIPP core area excavations, thought to be a possible pestle as well (Lord and Reynolds 1985:149). A pestle was also recovered from LA 54377 in the nearby WIPP area. It is a complete, bifacially shaped, fine-grained sandstone artifact that also displays a biconvex cross section (Earls and Bertram 1987:64, Appendix C-6).

Shaped Disk (n = 1). This sub-circular limestone artifact has been ground to shape on two opposing surfaces and the perimeter. None of the shaped surfaces have been smoothed, resulting in an unfinished appearance. It measures 3.3 by 3.3 by .86 cm and weighs 93 grams. It was recovered from Level 2, Stratum 2 of 2 by 2 m Square 502N/606E.

Manuport (n = 1). This unusual artifact is a chert/sandstone concretion that appears to be modified only by wear (Fig. 19.17). The disk-shaped chert portion displays polish-wear on the flat surface. It is naturally adhered to a rounded, cone-shaped sandstone concretion that is also smooth and polished, possibly from handling. The polishing wear on the chert portion of the artifact suggests use as a polishing stone, but these artifacts are somewhat uncommon in southeastern New Mexico literature. At WIPP core area excavations a pebble with polish and grinding wear was recovered, though the material and size are not mentioned (Lord and Reynolds 1985:149). Small polishing stones were also recovered from the Boothill Site north of Maljamar (Corley 1957: not paginated). As pottery was not manufactured at the NM 128 project sites, this artifact was probably transported to the site for its unusual natural form.

Mortar/Anvil Tools (n = 2). The complete mortar-anvil is manufactured from a limestone slab that has been roughly flaked into an oval shape. The entire perimeter, base and working surface are flaked to shape. The small concavity on one surface appears to be pitted from use as an anvil or mortar. The entire surface, including the concavity, is burned and sooted. No grinding wear is present. It measures 22 by 18.5 by 6.5 cm and weighs 3400 grams. It was recovered from the fill of feature 156, Block 12, Square point 506.84N/461.76E. An anvil was recovered from nearby LA 99820, though descriptions are not available (Acklen and Railey 2001:30, 63).

The second mortar-anvil is a limestone slab manufactured by flaking and pecking into a circular shape. It is mostly complete, with about one-third missing from the edge. A small, shallow, circular basin has been shaped into the center of one surface. It is lightly ground, with pitting wear also present inside the basin. The convex base is lightly ground to shape. It measures 18.8 by 12.5 by 4.0 cm and weighs 1950 grams, and was recovered from Level 1, Strat 1 of Block 13, Square 473N/511E.

Pigment grinding stones (n = 1). Both of these artifacts retain a high degree of red pigment stains. The first is a whole, small, rounded sandstone cobble that is biconvex in both transverse and longitudinal cross section. It is ground lightly on two opposing surfaces, both of which retain red stains. Perhaps the most interesting characteristic is the shape of the stone, which is ergonomically suited for use between thumb and forefinger. It measures 5.0 by 3.5 by 2.4 cm and was recovered from LA 129217, Block 5 in Square 488N/480E.

The second pigment grinding stone is a small angular brown sandstone fragment that appears to be a piece of a much larger ground stone tool, as evidenced by a flat, heavily ground and striated surface. Interestingly, the broken edges display heavy red pigment stains, as though the piece was dipped in paint. Red paint may also have seeped down into the sandstone from the ground surface. Most of the piece is lightly sooted, including the ground surface. It was recovered from LA 129214, Block 12 in Square 485N/439E (3.0 by 3.2 by 2.4 cm, 18 grams).

Cobble Core/Abraders (n = 2). A large granite cobble appears to have been used first as a core and then as an abrader. It displays numerous flake scars that have been removed in opposite directions from a single platform. Three flake scars form a somewhat flattened, roughly textured surface that has been abraded. The raised flake-scar ridges are ground and randomly striated, indicating grinding use following flake removal. It is possible that the core was abandoned following several hinged flakes, at which point the cobble was used as an abrader (8.6 by 7.9 by 7.1 cm, 605 grams). It was found at on the surface at LA 113042, Grid Unit 500.62N/ 582.27E.

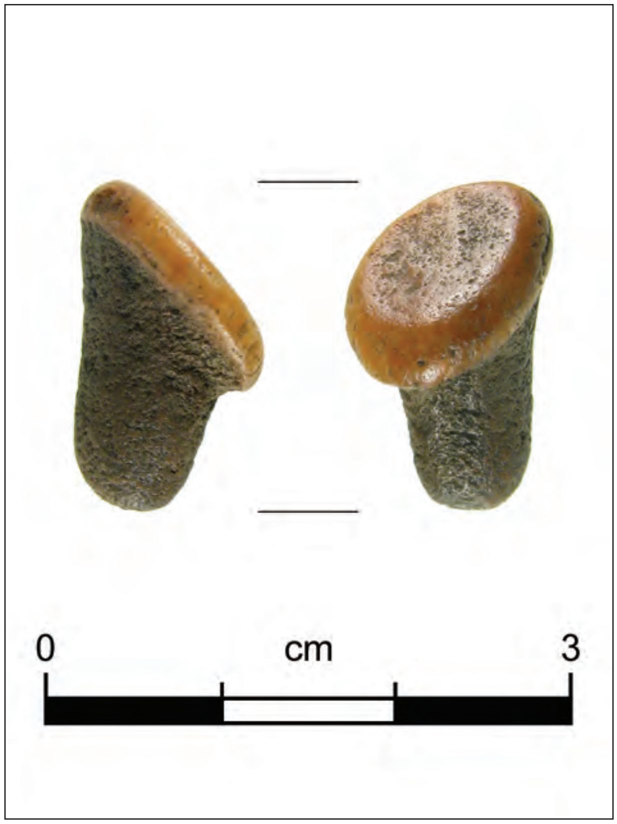

Figure 19.17. LA 129214, FS 1462, concretion used as polishing stone.

The second artifact in this category is a small, oval, tan quartzite cobble that functioned as a small abrader and a core. It was first used as a handstone, displaying one heavily ground, slightly convex, cortical surface. Following use as a handstone, it must have served as a core. Flakes have been removed in opposite directions from a single platform. It measures 7.7 by 4.8 by 4.1 cm and was recovered from LA 113042, Square 467N/513E, Level 1.

Hammerstone/Cores (n = 2). In accordance with the NM 128 Chipped Stone Analysis, cores are identified as "nodules of raw material that were modified by having debitage removed from them," and are categorized by "the direction of removals" (Moore this report). Both are cobbles that display flake scars and battering wear. The first is a large, sub-spherical limestone cobble. It is a bidirectional core exhibiting three flake scars removed in opposite directions from a single platform. Approximately 70 percent of the cortex remains. Battering wear from hammerstone use is present on approximately half of the perimeter. The flake scars are also overlain by light battering wear, far less than the cortical perimeter. It measures 10 by 9.1 by 7.8 cm and weighs 973 grams. It was recovered from the surface of Grid Unit 569.37N/602.30E at LA 113042.

The brown quartzite cobble displays a single flake scar that appears to have split the cobble in half. Battering wear is concentrated along the edge formed by the intersection of the flake scar and the cortical surface. Two small flake scars along this edge appear to be hammerstone spalls, and one small area appears to have been lightly ground as well. The grinding wear on a cortical cobble surface is very similar to NM 128 cobble manos. It measures 5.8 by 3.6 by 3.1 cm and was recovered from Level 1, Stratum 1 of Square 469N/513E at LA 113042.

Because of the few flake scars and high percentage of cortex, both of these artifacts may represent primary core reduction that involves "initial core platform preparation and removal of the cortical surface" (Moore 2003:137). In addition to hammerstone use, they may have served in the shaping of ground stone. It is unlikely that they were used to re-sharpen mano and metate use-surfaces, as little evidence of re-sharpening exists within that assemblage.

Handstone/Core/Hammerstone (n = 1). This artifact is formed from an oval or round, flattened, red chert cobble. It was first used as a handstone, as evidenced by the heavily ground and striated cortical surfaces. The cobble was then reduced as a core. At least four flake scars have been removed around the perimeter. This flaking created a square, wedge-shaped end that appears to have been used in pecking activities. The flake scars have created an ergonomic form that fits thumb and forefinger comfortably. This end may have been used to shape manos and metates, as pecking is a very commonly used mano-shaping method and few tools display re-sharpened surfaces.

The unmodified cobble end is battered as if from use as a hammerstone, which appears to have occurred when the tool was a handstone. This could also have occurred in conjunction with the battering at the pointed end (Fig. 19.18).

All of the above core tools appear similar to those found at LA 130727. Two tools are thought to have functioned as cores, scraper planes, choppers and pecking stones to shape and sharpen manos and metates. One of these tools was recycled into an "angular abrader" that displayed "abraded facets over battered edges and corners," (Kearns 2010a: 526, Fig. 41.32). It may have been used to pulp or mash, tasks that may have occurred at the NM 128 sites. It is more likely that this tool was used to shape manos and metates, as pecking is a commonly used tool-manufacturing method.

Paint Stone/Abrader (n = 1). This artifact is a small, oval, unmodified quartzite cobble with abundant red hematite inclusions. It may have been brought to the site for later reduction into paint. However, the hematite inclusions do not appear sufficient for paint production, so it may be best classified as a manuport (6.7 by 3.4 by 1.7 cm, 62 grams). It was recovered from LA 113042, Square 374N/602E, Level 4, Stratum 2.

Burned Slab (n = 1). This artifact is highly fragmented, recovered in 14 pieces. It is a thin brown sandstone slab that is fire reddened on one surface. No evidence of shaping is present, and the complete shape is indeterminate. The partially refit artifact measures 7.6 by 6.0 by .80 cm. It was recovered from the surface of LA 113042 at Grid Unit 531.21N/533.54E.

Shaped Stones (n = 3). All three shaped stones are extremely small, tabular fragments that are ground on one or both flat surfaces. They are black quartzite, light brown sandstone and yellow-brown sandstone. One surface of the yellow-brown fragment is ground nearly to a polish. None of these fragments display edge shaping. The quartzite and light brown sandstone fragments were recovered proximate to one another at LA 129214, 436N/480E and the other from Square 437N/480E, both in Level 2, Stratum 2. The third was found in LA 129217 in Level 2 of Square 528N/500E.

Indeterminate Fragments (n = 26). The vast majority of indeterminate fragments are small sandstone pieces that have been ground flat on one or two surfaces. Quartzite comprises a small percentage. Quartzite use-surfaces are typically convex, owing

Figure 19.18. LA 113042, FS 601, cobble tool used as a handstone, core, and hammerstone.

to the cobble raw material. Indeterminate fragments rarely exceed 5 cm in length (Table 19.16). Most indeterminate fragments originate from LA 129214 (n = 17) and LA 113042 (n = 6) (Table 19.17).

Summary

While most miscellaneous artifacts were recovered from LA 129214, the greatest variety was found at LA 113042 (Table 19.17). Nine functionally distinct artifact types were recovered there, comprising virtually all tool types. All of the multifunctional or reshaped tool types were found at LA 113042 as well. The miscellaneous artifact assemblage suggests that a greater variety of activities were taking place at LA 113042 as opposed to LA 129214. This is particularly significant considering that the larger assemblages were recovered from LA 129214. Tools unique to the assemblage such as the abraded cutting edge tool, burned slab, pestle, shaped disk, core-abraders, handstone/core/hammerstone, and hammerstone-core were found at LA 113042. In addition, LA 129300 yielded a disproportionately high percentage of the miscellaneous assemblage, though it is comprised almost exclusively of abrading stones.

The determinate-function tools within this assemblage suggest efficient use of raw material. If indeterminate fragments are removed from the miscellaneous assemblage, 44 tools remain whose function can be assigned with some certainty. Within this tool group, 15 tools are either multifunctional or reshaped fragments put to secondary use. This represents more than one-third of the determinate miscellaneous artifact assemblage, indicating efficient use of tools and tool fragments. Quartzite cobbles, in particular, typically display evidence of multiple functions, indicated by wear patterns, morphology and pigment stains. This material may be of some value in terms of maximizing tool use, as the nearest source is several miles away on the banks of the Pecos River.

All of the above characteristics mirror those indicated by the mano and metate assemblage, and possibly the tabular knife assemblage as well. Maximal use of raw material, tools, and tool fragments is a consistent feature of the artifact assemblages of NM 128 project sites.

Table 19.16. Mean whole dimension and weight for miscellaneous artifacts.

ARTIFACT TYPE		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	WEIGHT (KG)
Abrading stone	Mean	6.1	3.6	3.1	0.1
	n	4.0	4.0	4.0	4.0
	SD*	1.0	1.3	1.1	0.1
	Minimum	5.2	1.9	2.0	0.0
	Maximum	7.5	5.1	4.3	0.2
	Range	2.3	3.2	2.3	0.2
Pestle	Mean	5.8	3.5	2.3	0.1
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	5.8	3.5	2.3	0.1
	Maximum	5.8	3.5	2.3	0.1
	Range	0.0	0.0	0.0	0.0
Shaped disk	Mean	3.3	3.3	0.9	0.1
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	3.3	3.3	0.9	0.1
	Maximum	3.3	3.3	0.9	0.1
	Range	0.0	0.0	0.0	0.0
Manuport	Mean	1.8	1.4	1.0	0.0
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	1.8	1.4	1.0	0.0
	Maximum	1.8	1.4	1.0	0.0
	Range	0.0	0.0	0.0	0.0
Mortar-anvil	Mean	22.0	18.5	6.5	3.4
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	22.0	18.5	6.5	3.4
	Maximum	22.0	18.5	6.5	3.4
	Range	0.0	0.0	0.0	0.0
Pigment grinding stone	Mean	5.0	3.5	2.4	0.1
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	5.0	3.5	2.4	0.1
	Maximum	5.0	3.5	2.4	0.1
	Range	0.0	0.0	0.0	0.0
Cobble core-abrader	Mean	8.2	6.4	5.6	0.4
	n	2	2	2	2
	SD	0.6	2.2	2.1	0.3
	Minimum	7.7	4.8	4.1	0.2
	Maximum	8.6	7.9	7.1	0.6
	Range	0.9	3.1	3.0	0.4
Hammerstone/core	Mean	10.0	9.1	7.8	1.0
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	10.0	9.1	7.8	1.0
	Maximum	10.0	9.1	7.8	1.0
	Range	0.0	0.0	0.0	0.0

(*Table 19.16, continued*)

ARTIFACT TYPE		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	WEIGHT (KG)
Handstone/core/ hammerstone	Mean	6.3	5.2	2.9	0.1
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	6.3	5.2	2.9	0.1
	Maximum	6.3	5.2	2.9	0.1
	Range	0.0	0.0	0.0	0.0
Paint stone/abrader	Mean	6.7	3.4	1.7	0.1
	n	1	1	1	1
	SD	–	–	–	–
	Minimum	6.7	3.4	1.7	0.1
	Maximum	6.7	3.4	1.7	0.1
	Range	0.0	0.0	0.0	0.0
Total	**Mean**	**7.3**	**5.3**	**3.5**	**0.4**
	n	**14**	**14**	**14**	**14.0**
	SD	**4.7**	**4.3**	**2.2**	**0.9**
	Minimum	**1.8**	**1.4**	**0.9**	**0.0**
	Maximum	**22.0**	**18.5**	**7.8**	**3.4**
	Range	**20.2**	**17.1**	**6.9**	**3.4**

*SD = Standard Deviation. n = count

Ornaments

A small number of ornaments were recovered from four NM 128 project sites: LA 113042 (n = 4); LA 129214 (n = 1); LA 129222 (n = 1); and LA 129300 (n = 1) (Table 19.18).

Stone Bead: This artifact is a heavily eroded crinoid stem section. The erosion has eliminated any cultural modification that may have taken place. The rough, uneven texture suggests, however, that the bead was never modified. It may be a manuport, but the extremely small size may argue against this, suggesting that it was present in site sediments. It measures 3.9 by 3.5 by 1.2 cm. It was recovered from LA 129222 in Level 1, Stratum 1 of Square 460N/511E.

Quartzite Pendant: This fragmentary ornament is ground to shape from a tabular piece of gray quartzite. This material identification is tentative, as caliche deposits obscure most of the surface. It is broken across the width and length through the drill hole (Fig. 19.19). The proximal end is damaged by two small flakes that have spalled off from the pendant edge.

The pendant displays two opposing, flat, parallel surfaces. The edges are ground thin and blunted slightly by light grinding. The flat surfaces are also ground, displaying bidirectional striations.

The suspension drill hole is biconical. It has been drilled almost entirely through from one side, with the reverse hole drilled only enough to break through to the first hole. Due to the caliche deposits, wear inside the drill hole is indeterminate. The single shaped edge curves outward from the drilled end, suggesting an oval- or tab-shaped ornament. It may also have been rather large, possibly as wide as 5 cm (3.2 by 2.6 by .7 cm). The pendant was recovered from LA 129300 in Level 2, Stratum 2 of Square 517N/511E.

Worked Pendant Fragment: This artifact is refit from two fragments. A possible pendant fragment is manufactured from freshwater mussel shell (Fig. 19.20). It appears to be an end fragment that has been ground on the end and sides and broken across the width. The bivalve interior displays 29 lines incised perpendicular to the edge. These lines are dispersed across both artifact fragments, but are more tightly clustered on the right piece, which displays 13 lines. The left fragment exhibits six incised lines. The incisions are shallow and extend 3 to 5 mm inward from the edge.

Viewing the piece under the microscope, it appears that there was an attempt to cut several of the lines on the right fragment further into the piece, but the curvature of the shell prohibited a continuous cut. There also appear to be two abandoned lines, as they were cut only a millimeter into the edge. The pendant measures 2.8 by 1.6 by 0.7 cm and was recovered from LA 129214, Block 6, Square 475N/535E, Stratum 2, Level 2.

Table 19.17. Miscellaneous artifact distribution, by site and block.

BLOCK NO.	ABRADING STONE	ABRADED CUTTING EDGE TOOL	PESTLE	SHAPED DISK	MANU-PORT	MORTAR-ANVIL	PIGMENT GRINDING STONE	COBBLE CORE-ABRADER	HAMMER-STONE/ CORE	HANDSTONE/ CORE/ HAMMER-STONE	PAINT STONE/ ABRADER	SHAPED STONES	BURNED SLAB	INDETER-MINATE FRAG-MENTS	**TOTAL**
LA 113042															
0	1	1	1	–	–	–	–	1	1	–	–	–	1	2	**8**
1	1	–	–	–	–	–	–	1	1	–	–	–	–	1	**4**
2	–	–	–	–	–	–	–	–	–	1	–	–	–	1	**2**
10	–	–	–	1	–	–	–	–	–	–	–	–	–	–	**1**
12	–	–	–	–	–	–	–	–	–	–	1	–	–	–	**1**
LA 129214															
6	1	–	–	–	–	–	–	–	–	–	–	–	–	5	**6**
7	–	–	–	–	1	–	–	–	–	–	–	–	–	–	**1**
8	–	–	–	–	–	–	–	–	–	–	–	–	–	2	**2**
9	–	–	–	–	–	1	–	–	–	–	–	–	–	2	**3**
12	1	–	–	–	–	–	1	–	–	–	–	–	–	–	**2**
13	–	–	–	–	–	1	–	–	–	–	–	–	–	–	**1**
16	2	–	–	–	–	–	–	–	–	–	–	2	–	7	**11**
19	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
LA 129217															
0	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
3	–	–	–	–	–	–	–	–	–	–	–	1	–	–	**1**
5	–	–	–	–	–	–	1	–	–	–	–	–	–	–	**1**
LA 129222															
2	–	–	–	–	–	–	–	–	–	–	–	–	–	3	**3**
LA 129300															
0	1	–	–	–	–	–	–	–	–	–	–	–	–	–	**1**
5	2	–	–	–	–	–	–	–	–	–	–	–	–	–	**2**
7	–	–	–	–	–	–	–	–	–	–	–	–	–	1	**1**
13	1	–	–	–	–	–	–	–	–	–	–	–	–	–	**1**
Total	**10**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**26**	**54**

Figure 19.19. LA 129300, FS 242, quartzite pendant.

Figure 19.20. LA 129214, FS 585, mussell shell pendant blank.

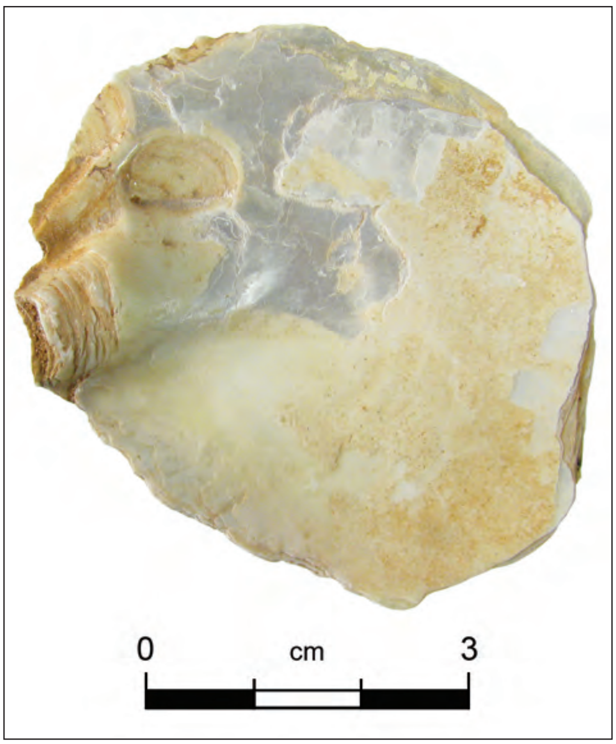

Figure 19.21. LA 113042, FS 233, mussell shell pendant preform.

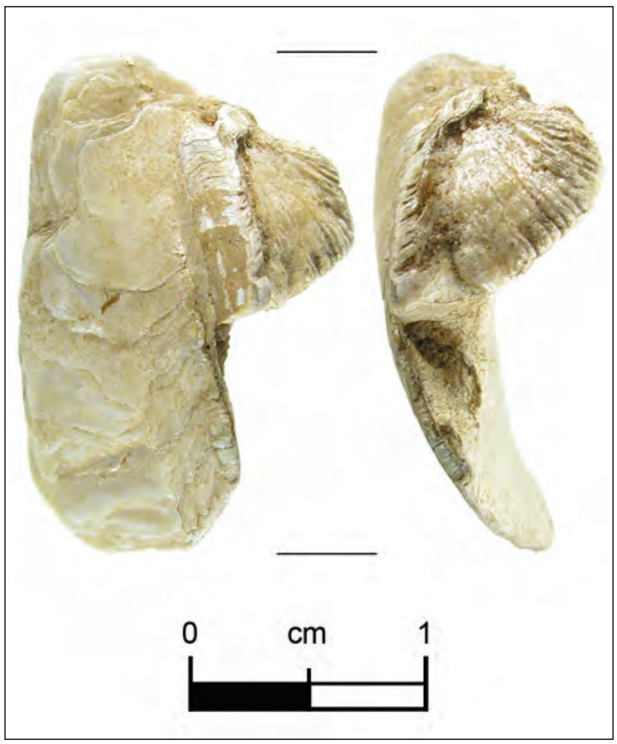

Figure 19.22. LA 113042, FS 929-1, mussell shell pendant or earring.

Shell Pendant Blank: A freshwater mussel bivalve, probably Pecos pearly-mussel, has been ground into a roughly oval form. The thick portion of the shell near the hinge is located at the edge of the piece (Fig. 19.21). The edges suggest that it may have been both chipped and ground to shape. No wear striations are evident on either surface. It measures 5.5 by 4.7 by .6 cm and was recovered from the surface at Grid Unit 474.47N/567.74E at LA 113042.

Pendant or Earring Blank: The hinge portion of a freshwater bivalve shell has been ground around the entire edge into an "L" shape (Fig. 19.22). Four aligned holes in the interior of the shell appear to be natural features. It measures 2.0 by 1.4 by 0.6 cm and was recovered from LA 113042, Block 12, Square 374N/602E, Level 4, Stratum 2.

Worked shell fragments (n = 2): The first worked-shell artifact is a small sub-rectangular freshwater shell valve fragment that may be ground on one edge. No wear is evident on the interior surface. It measures 0.9 by 0.5 by .07 cm and was recovered from LA 113042, Block 12, Square 374N/602E, Level 4, Stratum 2.

The second worked shell fragment is a freshwater mussel shell valve that displays one ground edge. The two remaining edges are broken and unmodified. The interior iridescent surface is intact and unworn. The exterior shell surface is brown and roughly textured, as though the original shell surface has eroded away. It measures 3.3 by 2.3 by .2 cm and was recovered from LA 113042 in the fill of Feature 60, a thermal pit.

Ornaments at Other Sites

Ornaments and worked shell are rare or absent in most southeastern New Mexico literature. None were reported from the WIPP survey (Earls and Bertram 1987) or from the WIPP excavation (Lord and Reynolds 1985). The Fox Place excavations represent an exception, yielding a significant number of variably shaped freshwater shell ornament blanks and blank/preforms (Wiseman 2002a:67–68, Fig. 42). The Fox Place shell blanks are of particular interest in that shaping was sometimes accomplished by breaking, similar to the shaping methods used for the NM 128 shell pendant preform.

Of the many NexGen/Core sites located near the NM 128 project, none yielded ornaments. The only NexGen/Core ornament occurrences are from sites located some distance from the project area. An artifact similar to the shell pendant preform was recovered from LA 130727, a Middle Archaic and Eastern Jornada Mogollon burned rock ring midden site near Whites city (Kearns 2010a: 549). The oval or circular pendant edges were cut, smoothed, and biconically drilled. Interestingly, most project ornaments were recovered from LA 113042, all of which are shell (Table 19.18). Nearby LA 129214 yielded the largest freshwater shell counts in the project, with LA 113042 producing the second largest shell assemblage (Akins this report). This is true for all freshwater shell species recovered from LA 129214 and LA 113042.

Of all project sites, LA 113042 and LA 129214 clearly had more shell-related activities taking place, whether related to subsistence or ornament manufacture. One might expect most worked shell to occur at LA 129214 based on the shell fragment counts. However, other artifact assemblages indicate that the greatest variety of activities was occurring at LA 113042, including ornament manufacture (see miscellaneous artifact analysis).

Minerals

The NM 128 project sites yielded a variety of minerals, comprised of red ochre (n = 434), yellow ochre (n = 25), chrysocolla (n = 3), compact hematite (n = 3), gypsum (n = 1), kaolinite (n = 1) and mica (n = 1). There are also seven copper-based minerals that have a turquoise-like texture.

Mineral distribution differs considerably depending on whether frequency or weight is used. Using frequency, LA 113042 (n = 246) yielded a higher mineral count than did LA 129214 (n = 210), followed by LA 129216 (n = 10), LA 129222 (n = 5), LA 129217 (n = 2) and LA 129218 (n = 2). The higher mineral count at LA 113042 as compared to LA 1291214 is the reverse of what occurred with nearly every artifact assemblage in the project. However, when mineral weight is used, LA 129214 again dominates (231.7 gm) over LA 113042 (142.2 gm); LA 129217 yields the third largest assemblage (36.5 gm) with LA 129216 (2.8 gm), LA 129218 (2.8 gm) and LA 129222 comprising the remainder (Table 19.19). These high mineral frequencies owe primarily to the highly fragmented nature of ochre on project sites. For this reason, ochres will be discussed in terms of

Table 19.18. Stone and shell ornaments, by site and block.

SITE	BLOCK NO.	NORTHING	EASTING	SHELL PENDANT BLANK	QUARTZITE PENDANT	CRINOID BEAD	SHELL PENDANT OR EARRING BLANK	WORKED SHELL	**TOTAL**
LA 113042	12	373.0	606.0	–	–	–	–	1	**1**
		374.0	602.0	–	–	–	1	1	**2**
		474.7	567.7	1	–	–	–	–	**1**
LA 129214	6	475.0	535.0	1	–	–	–	–	**1**
LA 129222	2	460.0	511.0	–	–	1	–	–	**1**
LA 129300	6	517.0	511.0	–	1	–	–	–	**1**
Total				**2**	**1**	**1**	**1**	**2**	**7**

weight, while all other minerals will be reported by frequencies.

The predominance of red ochre may be related to the natural occurrence of hematite in the project area. Carlsbad-area geology references mention the occurrence of sandstone cemented with hematite. This sandstone type occurs in the Tansill formation, which does not outcrop in the project area. However, nearly every geologic formation outcropping near NM 128 sites contains red sandstone, and the ground stone assemblage contains a high percentage of materials containing hematite.

Iron is an abundant element in many raw materials in the area, and it appears likely that hematite was readily available. With this in mind, it is interesting to note that the highest weight of red ochre was found at LA 12914. While this site yielded high numbers of artifacts in all assemblages, ochres appear to be concentrated in one area, suggesting the possibility of their having been transported to the site.

Mineral Analysis

The primary goals of the minerals analysis is to determine the variety and quantity of mineral types recovered from project sites. The analysis is also designed to identify whether minerals recovered are present naturally or transported to the sites for use as paint or ornaments. With these goals in mind, 12 attributes were recorded for each mineral.

Material type records the specific mineral. Ochres are further distinguished as red or yellow within this category.

Material texture values refer to the grain size and degree of induration. For example, most ochres are recorded as very fine grained and poorly indurated. Compact hematite, in contrast, is coded as very fine grained and well indurated. Grain size is identified with the aid of an American/Canadian Stratigraphic card. Large grained refers to particle sizes larger than 710 microns, medium grained refers to particles between 350 and 710 microns, and fine grained refers to particles 350 microns and smaller. No large grained materials were analyzed in the mineral assemblage.

Material source refers to the general location of the mineral outcrop. Materials are generally categorized as local or imported. Local materials are those found within a 10 mile radius of the site. Imported materials are located outside this 10 mile radius.

Raw Material Form records the morphology of the source material.

Modification documents the presence or absence of wear on minerals. Also recorded with this attribute are specific wear patterns, orientation of striae and number of modified surfaces.

The Munsell hue, value/chroma and color are recorded for every mineral using the *Munsell Soil Color Charts*. In the case of mottled ochres, the most prominent color is used. For the intense colors of copper-based minerals, the *Munsell Book of Color Readings for Chromatic Artifacts* was used.

Length in centimeters is recorded for all minerals. Because ochres frequently occur in unmeasurably small multiples grading down to power consistency, only the largest of a multiple-piece sample was measured.

Width is recorded in centimeters in the same manner as length.

Thickness is recorded in centimeters in the same manner as length and width.

Weight is recorded to the nearest tenth of a

Table 19.19. Mineral weight distribution, by material, site, block, and square. Weight in grams.

BLOCK NO.	NORTH-ING	EAST-ING	CHRYSO-COLLA	COPPER-BASED MINERAL	MICA	GYP-SUM	RED OCHER	YELLOW OCHER	KAO-LINITE	COM-PACT HEMA-TITE	**TOTAL WEIGHT (G)**	**SITE TOTAL (G)**	**SITE %**
						LA 113042							
1	463	513	–	1.7	–	–	25.6	–	–	–	**27.3**	**–**	**–**
		517	–	2.3	–	–	–	–	–	–	**2.3**	**–**	**–**
	465	519	–	–	–	–	13.0	–	–	–	**13.0**	**–**	**–**
	467	513	–	–	–	–	19.3	–	–	–	**19.3**	**–**	**–**
		515	–	–	–	–	2.8	–	–	–	**2.8**	**–**	**–**
	469	513	–	–	–	–	41.4	–	–	–	**41.4**	**–**	**–**
		515	–	–	–	–	7.4	–	–	–	**7.4**	**–**	**–**
		517	–	0.8	–	–	–	–	–	–	**0.8**	**–**	**–**
		519	–	0.7	–	–	–	–	–	–	**0.7**	**–**	**–**
2	456	518	–	–	–	–	2.6	–	–	–	**2.6**	**–**	**–**
		520	–	–	–	–	3.1	–	–	–	**3.1**	**–**	**–**
	458	518	–	0.1	–	–	–	–	–	–	**0.1**	**–**	**–**
		520	–	–	–	–	7.7	–	–	–	**7.7**	**–**	**–**
		570	–	–	–	–	2.1	–	–	–	**2.1**	**–**	**–**
	460	518	–	–	–	–	5.6	–	–	–	**5.6**	**–**	**–**
		520	–	–	–	–	2.6	–	–	–	**2.6**	**–**	**–**
3	583	727	–	–	–	–	–	1.9	–	–	**1.9**	**–**	**–**
12	370	606	–	1.5	–	–	–	–	–	–	**1.5**	**142.2**	**34.0%**
						LA 129214							
1	503	504	–	–	–	–	–	6.4	–	–	**6.4**	**–**	**–**
		511	–	–	–	–	4.0	–	–	–	**4.0**	**–**	**–**
2	507	533	–	–	–	33.0	–	–	–	–	**33.0**	**–**	**–**
	Feature 44		–	–	–	–	4.0	–	–	–	**4.0**	**–**	**–**
5	468	445	–	–	–	–	1.0	–	–	–	**1.0**	**–**	**–**
	483	537	–	–	–	–	0.1	–	–	–	**0.1**	**–**	**–**
		540	2.0	–	–	–	–	–	–	–	**2.0**	**–**	**–**
	489	474	–	–	–	–	1.0	–	–	–	**1.0**	**–**	**–**
12	486	434	–	–	–	–	–	1.7	–	–	**1.7**	**–**	**–**
		435	–	–	–	–	1.2	2.0	–	–	**3.2**	**–**	**–**
		436	–	–	–	–	7.0	–	–	–	**7.0**	**–**	**–**
		439	–	–	–	–	2.1	–	–	–	**2.1**	**–**	**–**
	487	436	–	–	–	–	0.2	–	–	–	**0.2**	**–**	**–**
	489	437	–	–	–	–	–	–	–	46.0	**46.0**	**–**	**–**
	491	429	–	–	–	–	0.6	–	–	–	**0.6**	**–**	**–**
	492	428	–	–	–	–	–	0.9	–	–	**0.9**	**–**	**–**
13	467	418	–	–	–	–	0.7	–	–	–	**0.7**	**–**	**–**
		419	–	–	–	–	3.9	–	–	–	**3.9**	**–**	**–**
		420	–	–	–	–	0.1	–	–	–	**0.1**	**–**	**–**
	468	417	–	–	–	–	7.0	–	–	–	**7.0**	**–**	**–**
		420	4.0	–	–	–	–	–	–	–	**4.0**	**–**	**–**
	469	418	–	–	–	–	0.4	0.6	–	–	**1.0**	**–**	**–**
		421	1.0	–	–	–	–	0.1	–	–	**1.1**	**–**	**–**
	471	419	–	–	–	–	0.9	–	–	–	**0.9**	**–**	**–**
	473	419	–	–	–	–	0.1	–	–	4.0	**4.1**	**–**	**–**
	475	417	–	–	–	–	–	5.0	–	–	**5.0**	**–**	**–**
		423	–	–	–	–	0.1	–	–	–	**0.1**	**–**	**–**

(Table 19.19, continued)

BLOCK NO.	NORTH-ING	EAST-ING	CHRYSO-COLLA	COPPER-BASED MINERAL	MICA	GYP-SUM	RED OCHER	YELLOW OCHER	KAO-LINITE	COM-PACT HEMA-TITE	**TOTAL WEIGHT (G)**	**SITE TOTAL (G)**	**SITE %**
15	467	444	–	–	–	–	9.7	–	–	–	**9.7**	**–**	**–**
		445	–	–	–	–	32.3	–	–	–	**32.3**	**–**	**–**
		448	–	–	–	–	0.5	–	–	–	**0.5**	**–**	**–**
	468	444	–	–	–	–	0.3	–	–	–	**0.3**	**–**	**–**
		446	–	–	–	–	8.0	–	–	–	**8.0**	**–**	**–**
	469	444	–	–	–	–	0.9	–	–	–	**0.9**	**–**	**–**
		445	–	–	–	–	0.1	–	–	–	**0.1**	**–**	**–**
		446	–	1.0	–	–	–	–	–	–	**1.0**	**–**	**–**
	470	444	–	–	–	–	6.4	–	–	1.0	**7.4**	**–**	**–**
16	434	481	–	–	–	–	0.3	–	–	–	**0.3**	**–**	**–**
		482	–	–	–	–	1.7	–	–	–	**1.7**	**–**	**–**
		483	–	–	–	–	0.2	–	–	–	**0.2**	**–**	**–**
	435	473	–	–	–	–	–	0.1	–	–	**0.1**	**–**	**–**
		482	–	–	–	–	0.6	–	–	–	**0.6**	**–**	**–**
		483	–	–	–	–	1.6	–	–	–	**1.6**	**–**	**–**
	436	472	–	–	–	–	0.5	–	–	–	**0.5**	**–**	**–**
		473	–	–	–	–	2.1	–	–	–	**2.1**	**–**	**–**
		481	–	–	–	–	4.0	–	–	–	**4.0**	**–**	**–**
		482	–	–	–	–	0.7	–	–	–	**0.7**	**–**	**–**
		483	–	–	–	–	1.4	–	–	–	**1.4**	**–**	**–**
	437	483	–	–	–	–	0.6	–	–	–	**0.6**	**–**	**–**
	468	448	–	–	–	–	3.6	–	–	–	**3.6**	**–**	**–**
18	471	386	–	–	–	–	2.5	–	–	–	**2.5**	**–**	**–**
19	484	392	–	–	–	–	–	0.1	–	–	**0.1**	**–**	**–**
	486	392	–	–	–	–	8.3	–	–	–	**8.3**	**–**	**–**
		393	–	–	–	–	1.1	–	–	–	**1.1**	**–**	**–**
	487	395	–	–	–	–	–	1.0	–	–	**1.0**	**231.7**	**56.0%**
LA 129216													
5	488	470	–	–	–	–	0.1	–	–	–	**0.1**	**–**	**–**
	489	471	–	–	–	–	0.1	–	–	–	**0.1**	**–**	**–**
		472	–	–	–	–	0.2	–	–	–	**0.2**	**–**	**–**
12	487	440	–	–	–	–	2.7	–	–	–	**2.7**	**3.1**	**0.7%**
LA 129217													
3	528	500	–	–	–	–	–	0.1	–	–	**0.1**	**–**	**–**
5	488	480	–	–	–	–	–	–	36.4	–	**36.4**	**36.5**	**9.0%**
LA 129218													
1	537	465	–	–	–	–	–	0.1	–	–	**0.1**	**–**	**–**
8	541	477	–	–	–	–	–	2.7	–	–	**2.7**	**2.8**	**0.6%**
LA 129222													
1	454	525	–	–	0.1	–	–	–	–	–	**0.1**	**–**	**–**
2	460	515	–	–	–	–	–	0.1	–	–	**0.1**	**0.2**	**0.1%**
Total (g)			**7.0**	**8.1**	**0.1**	**33.0**	**258.1**	**22.8**	**36.4**	**51.0**	**416.5**	**–**	**100.4%**

gram. In the case of ochres occurring in multiples, all pieces are weighed together.

Count refers to the number of minerals in a given Field Specimen (FS) number. All FS artifacts could be counted with one exception. This FS consists of hundreds of very small pieces measuring less than 1 mm in length.

Ochres (n = 462, 280.9 grams)

Ochres are the most common mineral in the assemblage (Table 19.20). The assemblage is comprised of red ochre (258.1 g), yellow ochre (22.8 g), and compact hematite (n = 3). The vast majority of the red ochre specimens are very fragmented and quite soft, with a maximum Mohs Scale of Mineral Hardness reading of one. Two red ochre textures are represented in the assemblage. Both are fine textured and can only be distinguished microscopically.

The darker colored red ochres typically display a homogenous, silty texture. Lighter colored red ochres are more likely to exhibit a mixture of sand and silt-sized particles. The least common red ochre is a thinly bedded, compact hematite. This material is well indurated and considerably harder, with a Mohs scale reading of five to six. Striations are well defined on the compact hematite as compared to the less discernible wear on soft material.

Most red ochres are homogenous in color, with a minority displaying mottled color. All red ochre colors fall within the Munsell soil-color chart hues of 2.5YR and 5YR, with red and yellowish-red colors in the highest weight range (Table 19.21). These two hues account for 79 percent of all ochre colors. Atypical ochre Munsell colors are dark red, dusky red and very dark gray.

Yellow ochre weight is far less than red (22.8g), but displays the identical range of texture. It is important to note that red ochre was not collected throughout the duration of the project. During the excavation of LA 113042, large amounts of naturally occurring red ochre, described as “handfuls” were discovered near the site (Don Tatum, personal communication, 2012). When these natural occurrences were discovered, collection of the material ended.

Ochre Occurrences at Other Sites

Red ochre is sometimes referred to as hematite in the literature. While it is not an uncommon find, most sites yield the material in small numbers. Numerous sites in the AT&T NexGen/Core Project yielded hematite, or red ochre manuports, though always in small numbers. Five pieces of hematite, four of which are ground, were found at LA 130727, a Middle Archaic and Eastern Jornada Mogollon ring midden site near Cavern City Air Terminal (Kearns 2010a:526, 533, 543). LA 132487, a Late Archaic/Early Formative Eastern Jornada Mogollon temporary camp southwest of Hobbs yielded one piece of unmodified hematite (Wheaton 2010a:116, Table 10.6). This is the only site east of the Pecos River in the NexGen/Core Project that yielded hematite. All other sites are west of the river. Two hematite manuports were recovered from LA 54812, a large multicomponent Late Archaic and possible Middle Archaic site, with Formative components, though the context is not mentioned (McClure-Cannon and Moreland 2010:1121).

Limonite, hematite and kaolin are thought to be present at LA 144921, possibly for use as pigment (Kearns 2010b:1353). All of the New Mexico NexGen/Core Project hematite artifacts are unmodified, and none appear to have been recovered in feature context. One basin and one slab metate displayed ochre stains at LA 49336, though the ochre color is not specified (McVickar and McClure-Cannon 2010:841).

The Texas segment of the NexGen/Core Project also recovered hematite artifacts, though at far fewer sites. One piece of hematite was recovered from 41HZ569, a large camp and roasting locale in the Hueco Mountains, where hematite is not locally available (Wheaton 2010b:746, 801, 812). Site 41CUU657, a large, repeatedly used, multicomponent roasting locale and possible camp with Jornada Mogollon and Late Archaic components, yielded one piece of unmodified hematite (Conlan and McClure-Cannon 2009:249, 269).

One piece was found at 41EP5488, a large habitation and roasting locale used during the Doña Ana to El Paso phases, and possibly during the Spanish Colonial period. (McVickar and McClure-Cannon 2010:871, 895).

Table 19.20. Mineral distribution, by site, color value, type, and weight. Material weight in grams.

MUNSELL HUE	MUNSELL VALUE/ CHROMA	MUNSELL COLOR	CHRYSO-COLLA	COPPER-BASED MINERAL	MICA	GYP-SUM	RED OCHER	YELLOW OCHER	KAOLIN-ITE	COMPACT HEMATITE	**TOTAL WEIGHT (G)**
LA 113042											
2.5YR	6/6	light red	–	–	–	–	15.6	–	–	–	**15.6**
	5/6	red	–	–	–	–	47.1	–	–	–	**47.1**
	4/6	red	–	–	–	–	5.4	–	–	–	**5.4**
	4/8	red	–	–	–	–	3.1	–	–	–	**3.1**
5YR	5/6	yellowish red	–	–	–	–	26.9	–	–	–	**26.9**
	5/8	yellowish red	–	–	–	–	30.4	–	–	–	**30.4**
	6/6	reddish yellow	–	–	–	–	2.6	–	–	–	**2.6**
	6/8	reddish yellow	–	–	–	–	2.1	–	–	–	**2.1**
10YR	5/8	yellowish brown	–	–	–	–	–	1.9	–	–	**1.9**
5Y	6/2	light olive gray	–	1.5	–	–	–	–	–	–	**1.5**
	7/3	pale yellow	–	0.8	–	–	–	–	–	–	**0.8**
5G (GLEY)	5/2	grayish green	–	2.3	–	–	–	–	–	–	**2.3**
	5/1	greenish gray	–	0.1	–	–	–	–	–	–	**0.1**
	6/1	greenish gray	–	1.7	–	–	–	–	–	–	**1.7**
	7/1	light greenish gray	–	0.7	–	–	–	–	–	–	**0.7**
LA 129214											
No hue given	white	white	–	–	–	33.0	–	–	–	–	**33.0**
10R	4/6	red	–	–	–	–	–	–	–	46.0	**46.0**
2.5YR	6/6	light red	–	–	–	–	43.1	–	–	–	**43.1**
	7/6	light red	–	–	–	–	5.0	–	–	–	**5.0**
	5/6	red	–	–	–	–	23.4	–	–	–	**23.4**
	4/6	red	–	–	–	–	1.5	–	–	–	**1.5**
	4/8	red	–	–	–	–	13.7	–	–	–	**13.7**
	5/8	red	–	–	–	–	5.7	–	–	–	**5.7**
	7/6	light reddish brown	–	–	–	–	0.1	–	–	–	**0.1**
	7/4	light reddish brown	–	–	–	–	7.0	–	–	–	**7.0**
	3/6	dark red	–	–	–	–	0.1	–	–	–	**0.1**
	3/2	dusky red	–	–	–	–	–	–	–	1.0	**1.0**
5YR	5/6	yellowish red	–	–	–	–	0.7	–	–	–	**0.7**
	4/6	yellowish red	–	–	–	–	4.0	–	–	–	**4.0**
	5/8	yellowish red	–	–	–	–	1.7	–	–	–	**1.7**
	6/6	reddish yellow	–	–	–	–	0.9	–	–	–	**0.9**
	7/6	reddish yellow	–	–	–	–	13.0	–	–	–	**13.0**
	8/4	pink	–	–	–	–	1.9	–	–	–	**1.9**
	3/1	very dark gray	–	–	–	–	–	–	–	4.0	**4.0**
7.5YR	6/6	reddish yellow	–	–	–	–	–	0.2	–	–	**0.2**
	7/8	reddish yellow	–	–	–	–	–	2.0	–	–	**2.0**
	8/6	reddish yellow	–	–	–	–	–	0.6	–	–	**0.6**
	5/4	brown	–	–	–	–	–	1.0	–	–	**1.0**
10YR	7/6	yellow	–	–	–	–	–	2.6	–	–	**2.6**
	7/8	yellow	–	–	–	–	–	6.4	–	–	**6.4**
2.5Y	6/2	light brownish gray	–	1.0	–	–	–	–	–	–	**1.0**
	8/4	pale yellow	–	–	–	–	–	5.0	–	–	**5.0**
	7/4	pale yellow	–	–	–	–	–	0.1	–	–	**0.1**

(Table 19.20, continued)

MUNSELL HUE	MUNSELL VALUE/ CHROMA	MUNSELL COLOR	CHRYSO-COLLA	COPPER-BASED MINERAL	MICA	GYP-SUM	RED OCHER	YELLOW OCHER	KAOLIN-ITE	COMPACT HEMATITE	**TOTAL WEIGHT (G)**
5G (GLEY)	4/6	no color name given	1.0	–	–	–	–	–	–	–	**1.0**
2.5BG	6/6	no color name given	4.0	–	–	–	–	–	–	–	**4.0**
5G (GLEY)	6/2	pale green	2.0	–	–	–	–	–	–	–	**2.0**
LA 129216											
2.5YR	4/8	red	–	–	–	–	2.9	–	–	–	**2.9**
5YR	6/6	reddish yellow	–	–	–	–	0.1	–	–	–	**0.1**
	7/6	reddish yellow	–	–	–	–	0.1	–	–	–	**0.1**
LA 129217											
10YR	6/2	light brownish gray	–	–	–	–	–	–	36.4	–	**36.4**
	8/2	very pale brown	–	–	–	–	–	0.1	–	–	**0.1**
LA 129218											
10YR	8/4	very pale brown	–	–	–	–	–	2.8	–	–	**2.8**
LA 129222											
7.5YR	6/1	gray	–	–	0.1	–	–	–	–	–	**0.1**
10YR	7/8	yellow	–	–	–	–	–	0.1	–	–	**0.1**
Total (g)			**7.0**	**8.1**	**0.1**	**33.0**	**258.1**	**22.8**	**36.4**	**51.0**	**416.5**

Ochre Wear and Function

The outcropping of the material in the project area is reflected in the near absence of modification (8/462: 2 percent). Only eight red ochre fragments display modification, most in the form of uni/bidirectional striations on one surface (n = 5/8: 63 percent). Random striations were observed on two pieces only—one yellow ochre and one compact hematite. One yellow ochre displays a smooth, unstriated, faceted ground surface. All other minerals are unmodified (454/462: 98 percent). All striations, while shallow, are quite distinct and easily distinguished from an unmodified surface.

While red ochre occurs naturally in the project area, this certainly does not eliminate the possibility of cultural use. It may have been crushed to make paint or powdered pigment. This may have been accomplished with tabular knives, as most of these tools displayed red pigment stains on one or two edges (see Tabular Knife analysis). Also, the thin distal edges of three wedge cross-section manos display red stains (see Mano and Metate Analysis). On all of these tools, the pigment is confined to the edge and a very narrow strip of surface area adjacent to the edge.

These red-stained tool edges and the lack of wear on red ochre may be related. If red ochre was being abraded to reduce the material, striations would result. However, if the ochre was being crushed with the edge of a tabular knife or wedge mano, it would become increasingly fragmented and unlikely to display striations. When red ochre, or hematite, is found in archaeological contexts, it is most often assumed to have been used for paint. The use of tool edges to reduce the material, however, was not encountered in the literature. While it seems to be the least efficient way to crush ochre, the stained tool edges stand as evidence of contact between the two.

Copper-based Mineral (n = 7)

All blue-green minerals recovered from the site appear to be naturally occurring pebbles from site gravels. All pieces are angular in shape, but the edges and surfaces are worn smooth from weathering. No cultural modification of any kind was observed. The copper-based mineral Munsell colors fall primarily into the 5.Y Gley hue range (n = 4), with the remaining colors matched in the 2.5Y and

Table 19.21. Mean ochre dimensions and weight distribution, by Munsell hue, all sites.

MUNSELL HUE		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	WEIGHT (G)
10R	Mean	4.90	3.40	1.90	46.00
	n	1	1	1	1
	SD	–	–	–	–
	Median	4.90	3.40	1.90	46.00
	Minimum	4.90	3.40	1.90	46.00
	Maximum	4.90	3.40	1.90	46.00
	Range	0.00	0.00	0.00	0.00
2.5YR	Mean	1.31	1.10	0.74	6.42
	n	270	270	270	270
	SD	0.57	0.76	0.40	7.49
	Median	1.30	1.10	0.80	4.70
	Minimum	0.30	0.20	0.10	0.10
	Maximum	2.60	10.40	1.60	31.00
	Range	2.30	10.20	1.50	30.90
5YR	Mean	1.48	1.24	0.92	7.07
	n	166	166	166	166
	SD	0.55	0.50	0.54	7.56
	Median	1.50	1.40	1.00	7.40
	Minimum	0.30	0.20	0.10	0.10
	Maximum	2.50	2.10	6.20	24.50
	Range	2.20	1.90	6.10	24.40
7.5YR	Mean	1.03	0.75	0.53	0.97
	n	6	6	6	6
	SD	0.64	0.37	0.24	0.87
	Median	0.90	0.85	0.60	0.80
	Minimum	0.30	0.30	0.20	0.10
	Maximum	1.80	1.10	0.80	2.00
	Range	1.50	0.80	0.60	1.90
10YR	Mean	1.39	1.07	0.45	1.41
	n	15	15	15	15
	SD	0.77	0.54	0.36	1.65
	Median	1.50	1.10	0.30	1.70
	Minimum	0.60	0.50	0.10	0.10
	Maximum	2.70	1.90	1.20	6.40
	Range	2.10	1.40	1.10	6.30
2.5YR	Mean	1.15	0.70	0.63	3.78
	n	4	4	4	4
	SD	0.10	0.20	0.05	2.45
	Median	1.10	0.60	0.60	5.00
	Minimum	1.10	0.60	0.60	0.10
	Maximum	1.30	1.00	0.70	5.00
	Range	0.20	0.40	0.10	4.90
Total	Mean	1.38	1.15	0.79	6.48
	n	462	462	462	462
	SD	0.60	0.67	0.47	7.63
	Median	1.40	1.20	0.80	4.00
	Minimum	0.30	0.20	0.10	0.10
	Maximum	4.90	10.40	6.20	46.00
	Range	4.60	10.20	6.10	45.90

SD = Standard Deviation, n = count

5Y hues. All copper-mineral pebbles are quite small, with the largest stone weighing slightly over 2 grams (Table 19.22). A similar turquoise pebble was recovered from LA 59652, a multicomponent Mogollon habitation site near Red Mountain and the Mimbres River (Jones 2010:1271, Table 95.108).

Kaolin (n = 1)

One large piece of kaolin was recovered from LA 129217 (weight = 36.4 grams). Kaolin is pure clay that may have been used to make white paint (Colton 1953). No Munsell color match could be obtained as the mineral is pure white. It is unmodified. It was recovered from Level 5 of Square 488N/480E.

Chrysocolla (n = 3)

All three chrysocolla artifacts are very angular in form, measure less than 1 cm in length and have a combined weight of seven grams. While they do not appear to be culturally modified, their proveniences may indicate they are present as raw material. All three pieces were recovered from LA 129214, two of which were found proximate to one another within Block 13 (Table 19.19). These small pieces may be waste material from ornament production.

Mica

One small piece of unmodified mica was recovered from Level 2 of Square 454N/452E at LA 129222. Muscovite mica is an "accessory mineral" in the Santa Rosa sandstone outcrops of the Nash Draw area (Vine 1963:B26). Mica is used as ceramic temper for El Paso Brown at LA 132520 (Fiske 2010b:598). The mica temper at LA 132520 is atypical, however. However, it is unlikely that this was the function of the LA 129222 as pottery was not being manufactured there. The LA 129222 mica measures 1.8 by 1.4 by 0.1 cm and weighs .01 gm.

Gypsum (n = 1)

This moderate-sized piece of gypsum was found at LA 129214 in Level 2 of Square 537N/533E in block 2. It is an angular piece of material measuring nearly 5 cm square and weighing 33 grams. A gypsum manuport was recovered at LA 130720, a multicomponent prehistoric roasting locale and historic refuse site southwest of Carlsbad (McClure-Cannon and Moreland 2010:441). Gypsum is listed as a lithic material type for LA 130727 (Kearns 2010a:581) and LA 132520 (Fiske 2010b:588). A projectile point produced from gypsum was found at LA 54814 (Kearns 2010b:1371). Smith et al. (2010:1051, 1052) state gypsum was also used to temper El Paso Brown and Alma Plain at LA 129554. As is the case with mica, however, this is the least likely function of this material as ceramics were not manufactured at the project sites. It is also present naturally, as gypsum is a component of several members of the Rustler and Salado formations (Vine 1963 and U.S. Geological Survey 1977:337).

Pecos Diamonds

Pecos diamonds are doubly terminated, hexagonal quartz crystals that occur naturally in the project area. "Pecos diamond" is a term coined by local collectors, thought to result from the effect of sunlight on the crystal faces. They occur in the Permian Seven Rivers Formation along the Pecos River Valley in southeastern New Mexico (Albright and Lueth 2003:63, Kelley 1971:18). Within this source area, they vary considerably in crystal form and color, many of which are described and illustrated by Albright and Lueth (2003). The NM 128 crystal assemblage is quite uniform in morphology and color, however (Fig. 19.23). While specific crystal form was not monitored for this analysis, it was noted that the vast majority are elongated, double pointed, hexagonal forms identical to Albright and Lueth's "prismatic" crystals (2003:67, Fig. 6D, far right image). The primary variation on this form is a shorter, wider hexagonal crystal, present in small frequencies only (Albright and Lueth 2003:Fig. 6D, third image).

While many colors are documented for Pecos diamonds, only a handful was present among the NM 128 assemblage (Table 19.23). Two Munsell colors dominate, 2.5YR 5/6 (n = 44), and 2.5YR 4/6 (n = 29). These two "red" colors combined comprise 65 percent of all crystals.

All red colors account for 70 percent of the assemblage (n = 79/113). Yellowish red, 5YR 4/6, is the next most dominant Munsell color (n = 20). Yellowish-red crystals comprise 23 percent (n = 26/113). Atypically colored crystals are light red and reddish brown.

Most Pecos diamonds are whole (n = 66/113: 58 percent), and vary little in size (Table 19.24). End

Table 19.22. Mean mineral dimensions and weight, all sites.

MINERAL TYPE		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)	WEIGHT (G)
Chrysocolla	Mean	1.1	0.8	0.5	1.2
	n	7	7	7	7
	SD	0.5	0.4	0.3	0.7
	Median	1.1	0.8	0.5	1.0
	Minimum	0.4	0.3	0.1	0.1
	Maximum	2.0	1.3	0.9	2.3
	Range	1.6	1.0	0.8	2.2
Copper-based	Mean	1.1	2.4	0.5	1.2
	n	7	7	7	7
	SD	0.5	4.7	0.3	0.7
	Median	1.1	0.8	0.5	1.0
	Minimum	0.4	0.3	0.1	0.1
	Maximum	2.0	13.0	0.9	2.3
	Range	1.6	12.7	0.8	2.2
Mica	Mean	1.8	1.4	0.1	0.1
	n	1	1	1	1
	SD	–	–	–	–
	Median	1.8	1.4	0.1	0.1
	Minimum	1.8	1.4	0.1	0.1
	Maximum	1.8	1.4	0.1	0.1
	Range	0.0	0.0	0.0	0.0
Gypsum	Mean	4.7	4.5	1.5	33.0
	n	1	1	1	1
	SD	–	–	–	–
	Median	4.7	4.5	1.5	33.0
	Minimum	4.7	4.5	1.5	33.0
	Maximum	4.7	4.5	1.5	33.0
	Range	0.0	0.0	0.0	0.0
Kaolinite	Mean	5.7	3.4	1.8	36.4
	n	1	1	1	1
	SD	–	–	–	–
	Median	5.7	3.4	1.8	36.4
	Minimum	5.7	3.4	1.8	36.4
	Maximum	5.7	3.4	1.8	36.4
	Range	0.0	0.0	0.0	0.0
Total	**Mean**	**1.7**	**2.1**	**0.6**	**6.5**
	n	**13**	**13**	**13**	**13**
	SD	**1.7**	**3.5**	**0.5**	**12.6**
	Median	**1.1**	**0.8**	**0.5**	**1.5**
	Minimum	**0.3**	**0.3**	**0.1**	**0.1**
	Maximum	**5.7**	**13.0**	**1.8**	**36.4**
	Range	**5.4**	**12.7**	**1.7**	**36.3**

SD = Standard Deviation, n = count

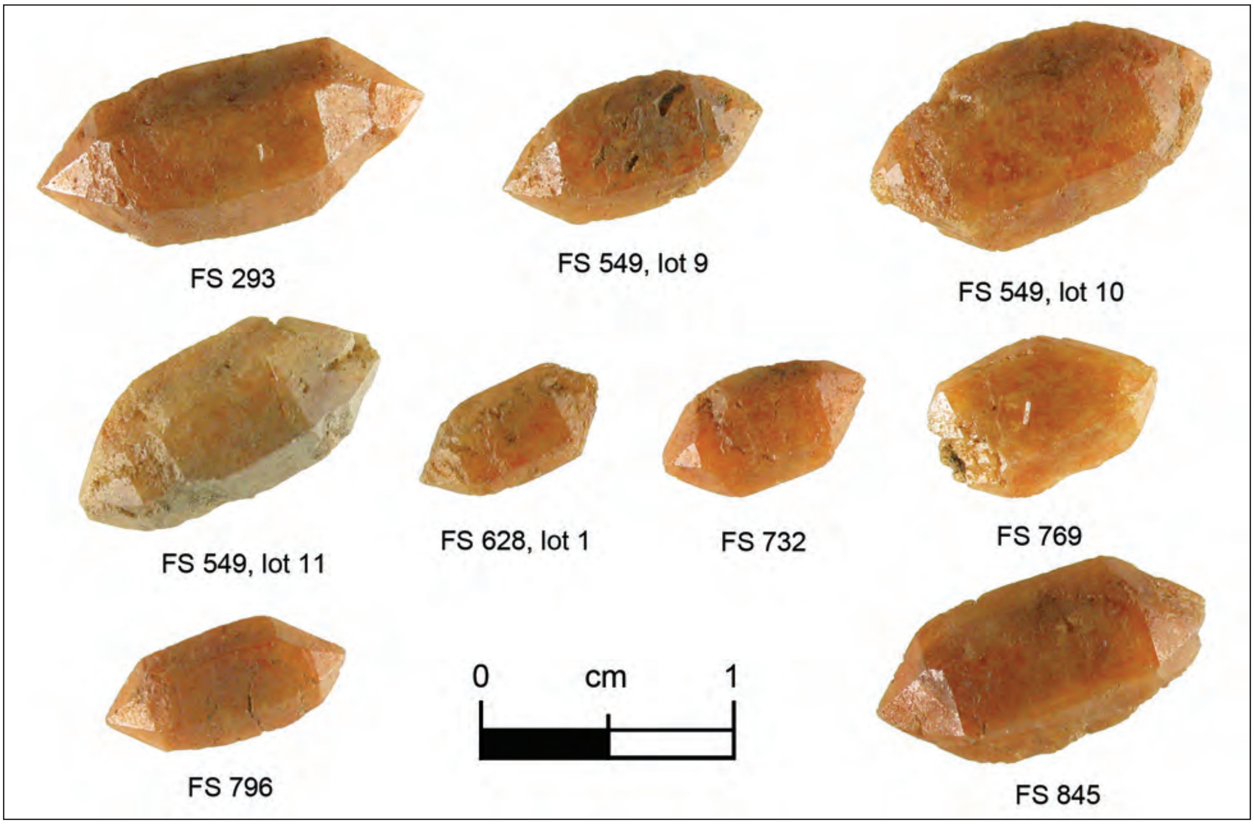

Figure 19.23. LA 129214; FS 293, 549-9, 549-10, 549-11, 628-1, 732, 769, 796, and 845; Pecos diamonds.

fragments are the next most common portion (n = 32). Most end fragments are nearly complete, fractured only at the extreme crystal point. A Pecos diamond that is broken cleanly in half at the midpoint is rare. A small percentage of the crystals are split lengthwise parallel to the crystal face (n = 9/113: 8 percent), creating lateral fragments. Many crystals display extremely weathered surfaces that have become pitted from long exposure on the desert surface (n = 43/113: 38 percent). Despite this heavy surface weathering, most crystals remain intact.

Damage to the lateral crystal faces, usually in the form of tiny flake scars, is another frequently occurring weathering pattern, though one less prevalent than surface pitting (n = 10/113: 9 percent). Also common is the fracturing of the extreme crystal tips, resulting in a wedge-shaped indentation at the point. This type of point fracture is clearly the result of natural weathering, as the fracture is clean, occurring along the crystal faces without crushing or flaking wear.

None of the NM 128 crystals appear to be culturally modified. They may be manuports, as is postulated for those found at the NexGen/Core Project sites. The high percentage of heavily weathered crystals may indicate that they are present naturally and are not manuports. Weathered and/or fractured crystals are far more common than whole, un-weathered specimens (Rick Montoya, personal communication, 2010). About 30 percent of all surface crystals are whole and unweathered. In the NM 128 project area, the majority occur in drainages, mixed in with alluvial surface gravels. Outside of these drainages, the crystals are far less frequent, occurring approximately once every 10 sq m.

The New Mexico segment of the NexGen/Core Project recovered hexagonal quartz crystals from four sites. All are thought to be manuports. LA 132487, a Late Archaic/Early Formative Eastern Jornada Mogollon temporary camp southwest of Hobbs, yielded one such crystal. It is considered a manuport based on the context from which it was recovered (Wheaton 2010a:99, 103, 106, 113, 115, Fig. 10.9). This crystal was unmodified. Interestingly, the NexGen/Core Project crystal is a pale yellow color that differs considerably from the reddish-orange color of the NM 128 specimens.

A small manuport crystal identical in color to those from NM 128 was recovered from LA 130723, a "repeatedly used Eastern Jornada Mogollon camp and specialized plant-processing locale occupied during the Hueco phase of the Late Archaic period and the Formative period (AD 1 to 1450)" southwest of Carlsbad (Morgan 2010:755, Fig. 48.29). This site is located close to the project area and is similar in nature to LA 129214 and LA 113042, indicating a similar context for quartz crystals from both projects.

Four quartz crystals of indeterminate color, all considered manuports, were recovered from LA 129554, a multicomponent Middle Archaic, Early to Late Pithouse period Mogollon site east of Deming (Smith et al. 2010:1062). LA 59652 recovered three crystals (Jones 2010:1158, 1271). The proximal end of one crystal may have been flaked to shape and subsequently utilized (Jones 2010: Table 95.108, p. 1271) and represents the only modified crystal from the NexGen/Core Project.

All NM 128 project Pecos diamonds were recovered from LA 129214. This is due to the fact that collection of the crystals stopped after it was determined that they were naturally occurring and may not have been present as manuports. The crystal collection was ended at the beginning of 2008. A large portion of the site had been excavated at this point, but a significant amount of work remained to be done. Thus, the Pecos diamond assemblage does not represent all of the crystals present at the site. This stated, it is interesting to note that most crystals, both whole and fragmentary, originated from one square, 493N/504E (Table 19.25). The square is within Block 8, central to the site itself. This lessens the chances of the crystals having been water deposited, as the square is located midpoint between the drainage east of the site and the summit of the ridge. The vast majority of the crystals found in this square originated in Stratum 1, Level 2 (n = 45/50: 90 percent). Only 10 percent were recovered from Level 2, the cultural level. However, it is also interesting to note that crystal collection was still underway during the excavation of all other project sites, which again may indicate manuport status for these items.

Another factor strongly suggesting the crystals are naturally occurring in the site area is the observation of crystals outside the site boundaries (Rick Montoya, personal communication, 2010), and the discovery of a crystal imbedded in naturally occurring calcrete at the site (Don Tatum, personal communication, 2012). Discovery of Pecos diamonds in this context may be unusual. Kelley notes that "finding crystals imbedded is not common, as the usually weathered gypsum gives up the crystals easily" (Kelley 1971:18).

In summary, there appear to be equal numbers of factors both in support of and against the possibility of the crystals being manuports. It seems reasonable to assume that these objects held the same interest for site inhabitants that they do for modern day collectors, but for LA 129214, the degree and specificity of this interest is indefinite.

Table 19.23. Distribution of color values for Pecos diamonds.

MUNSELL READING	VALUE/ CHROMA	COLOR	COUNT
2.5YR	6/6	light red	3
	5/6	red	44
	4/6	red	29
	4/8	red	5
	5/8	red	1
Total			**82**
5YR	4/3	reddish brown	1
	6/6	reddish yellow	3
	6/8	reddish yellow	1
	5/6	yellowish red	20
	4/6	yellowish red	1
	5/8	yellowish red	5
Total			**31**
Total count			**113**

Table 19.24. LA 129214, Pecos diamond mean whole dimensions.

	LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)
Mean	0.73	0.40	0.34
n	75.00	100.00	100.00
SD	0.24	0.10	0.08
Minimum	0.40	0.20	0.20
Maximum	1.60	0.70	0.60
Range	1.20	0.50	0.40
Median	0.70	0.40	0.30

SD = Standard Deviation, n = count
Length: whole and lengthwise-split crystals
Width and thickness: whole, medial, and end fragments

Table 19.25. LA 129214, Pecos diamond distribution, by block and square.

NORTHING	EASTING	WHOLE	FRAGMENTARY	TOTAL	COL. %
Block 1					
504	508	1	–	**1**	–
505	508	4	–	**4**	–
	511	1	–	**1**	–
506	508	3	1	**4**	–
	511	1	–	**1**	–
512	509	1	–	**1**	–
Total		**11**	**1**	**12**	**10%**
Block 5					
484	540	3	–	**3**	–
Total		**3**	–	**3**	**3%**
Block 8					
488	499	1	–	**1**	–
490	499	1	1	**2**	–
492	500	2	–	**2**	–
	501	2	1	**3**	–
	502	1	2	**3**	–
493	501	2	2	**4**	–
	502	1	–	**1**	–
	504	21	29	**50**	–
494	501	1	–	**1**	–
	502	1	3	**4**	–
	503	1	–	**1**	–
	504	4	–	**4**	–
495	500	1	–	**1**	–
498	503	–	–	**1**	–
Total		**40**	**38**	**78**	**69%**
Block 9					
501	461	–	1	**1**	–
Total		–	**1**	**1**	**1%**
Block 10					
481	472	1	–	**1**	–
483	472	1	–	**1**	–
Total		**2**	**–**	**2**	**2%**
Block 13					
472	419	1	–	**1**	–
475	417	9	6	**15**	–
476	417	–	1	**1**	–
Total		**10**	**7**	**17**	**15%**
Table Total		**66**	**47**	**113**	**100%**

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