Salt Creek Seven Prehistoric Sites along US 285

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Data Recovery at Seven Prehistoric Sites along US 285 in Chaves and De Baca Counties, New Mexico

by
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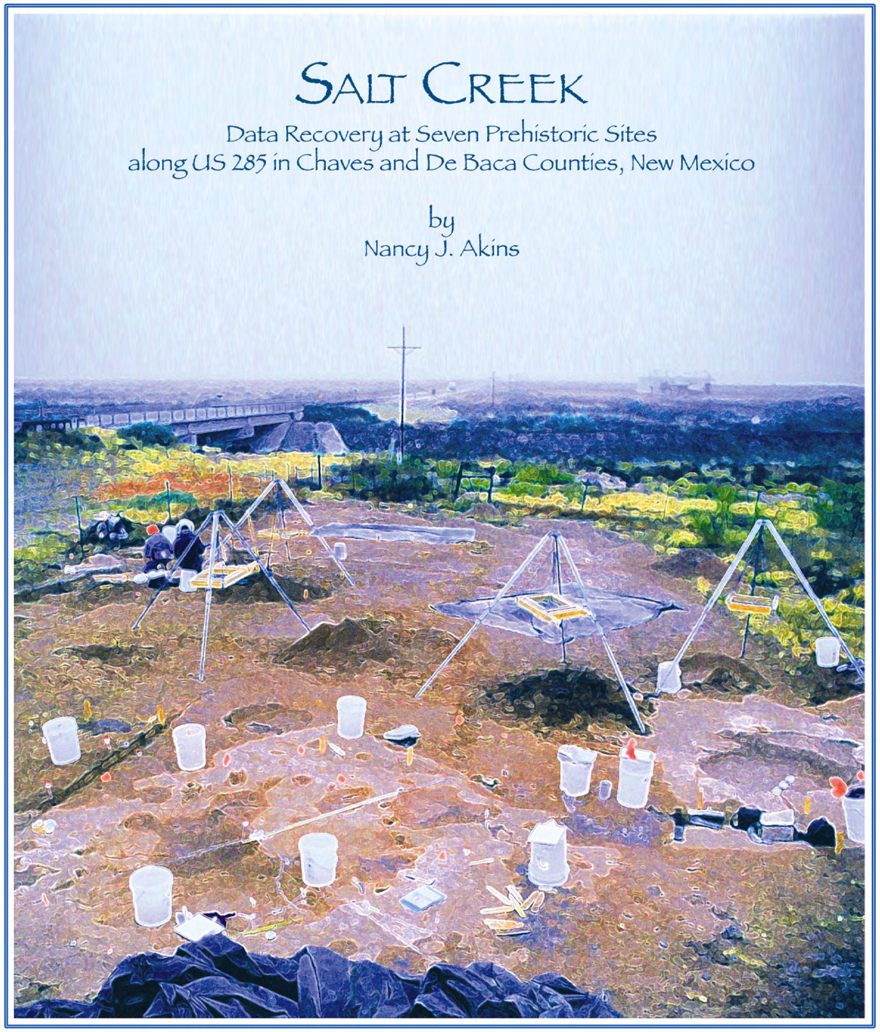

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Salt Creek

Data Recovery at Seven Prehistoric Sites along U.S. 285 in Chaves and De Baca Counties, New Mexico

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ADMINISTRATIVE SUMMARY

At the request of the New Mexico State Highway and Transportation Department (NMSHTD), the Office of Archaeological Studies (OAS) undertook data recovery at seven sites along U.S. 285 from the southern part of De Baca County to just north of Roswell in Chaves County. NMSHTD plans to widen U.S. 285 to four lanes between Roswell and Clines Corners within the current right-of-way and up to 15 m of new right-of-way. Excavations by OAS took place between July and December 1997 and in March 1998.

LA 117248 is on Bureau of Land Management land, Roswell Resource Area. Otherwise, the highway right-of-way is owned by the state. A portion of LA 34150 (the Townsend site) east of U.S. 285 is on State Trust land. At LA 34150 (east), LA 51095, LA 117246, LA 117255, and LA 117257, the project area extended beyond the current rights-of-way onto private land. Excavations at LA 34150 west of U.S. 285 and LA 117250 fell entirely within the highway right-of-way.

Much of the project was directed at the multicomponent Townsend site, dating from the Late Archaic to late Ceramic periods. Discrete deposits represent short-term occupations that resulted in a large number of features, seven structures, and a dense deposit of refuse. Fire pits were excavated at two other sites (LA 117255 and LA 117257). The remaining sites (LA 51095, LA 117246, LA 117248, and LA 117250) were artifact scatters with little or no subsurface remains.

The New Mexico State Highway and Transportation Department provided the funding for this project.

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MNM Project 41.6481 (Salt Creek).
State of New Mexico (CPRC) SE-129.
Bureau of Land Management Cultural Resource Use Permit 21-8152-97-12.
New Mexico State Land Office Archaeological Excavation No. A-76.

ACKNOWLEDGMENTS

Many individuals contributed to the completion of this project, beginning with the private land owners, who allowed us to work on their land prior to its purchase by the state. We thank them for their interest, and for their patience with any inconvenience we may have caused. The field crew, many of whom endured conditions ranging from the hot days of July through the December rains, deserve a great deal of credit for their efforts and enthusiasm. Alley Cat Excavation of Los Lunas and Dennis Goodman of Roswell provided mechanical excavation. Glen Greene spent time pondering and discussing the area soils. The efforts of Jessica Badner and Jesse Murrell, who undertook the processing of artifacts, developing a computer inventory, analysis of chipped and ground stone, and writing site reports, are especially appreciated, as are those of Dorothy Zamora, Dean Wilson, and John Ware for their site reports, Jim Moore for reporting on the lithic artifacts, Dean Wilson for analyzing and reporting on the ceramics, Pam McBride and Mollie Toll for the botanical remains, Tom Ireland for editing this report, Rob Turner for producing the graphics. I also want to thank the OAS administration for providing an atmosphere that facilitates basic research and accommodates a diversity of opinions.

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CHAPTER 1

INTRODUCTION

At the request of the New Mexico State Highway and Transportation Department (NMSHTD), excavations were carried out at seven sites along U.S. 285 in Chaves and De Baca counties (Fig. 1 and Appendix 1). The proposed widening of U.S. 285 to four lanes between Roswell and Clines Corners will impact the sites, and data recovery efforts were required within the current right-of-way and up to 15 m of additional right-of-way. Excavations by the Office of Archaeological Studies (OAS) took place between July and December 1997 and in March 1998.

LA 117248 is on Bureau of Land Management, Roswell Resource Area land. Otherwise, the highway right-of-way is owned by the NMSHTD. A portion of LA 34150 east of U.S. 285 is on State Trust land. At LA 34150 (east), LA 51095, LA 117246, LA 117255, and LA 117257, the project area extended beyond the current rights-of-way onto private land. Excavations at LA 34150 west of U.S. 285 and LA 117250 fell entirely within the right-of-way.

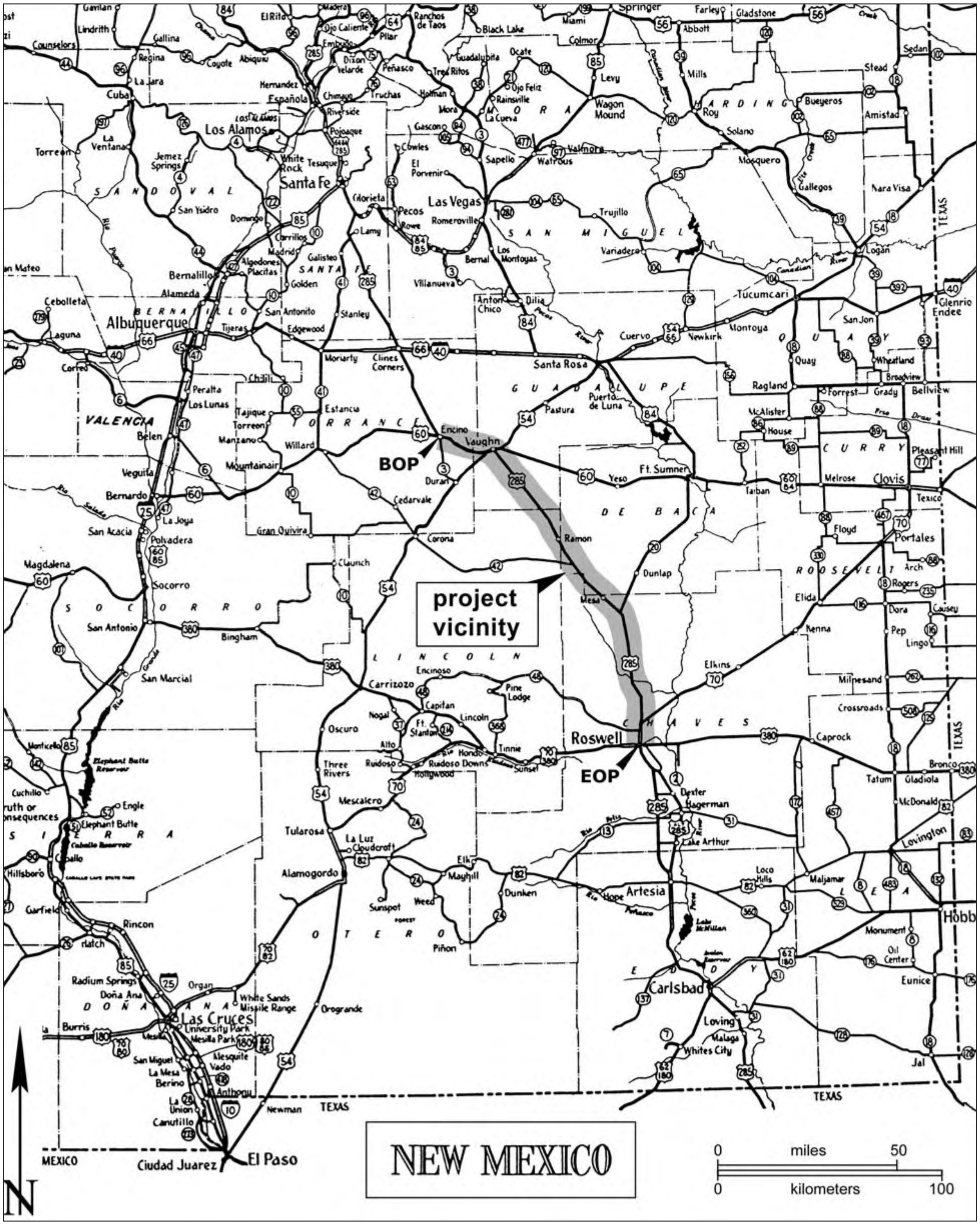

Figure 1. Project vicinity map.

CHAPTER 2

ENVIRONMENTAL SETTING

Geology

Salt Creek project sites are located along a 44-mile section of U.S. 285 that begins in the southern portion of De Baca County and ends a few miles north of Roswell. The area falls within the Pecos drainage basin. Bounded on the west by the Guadalupe and Sacramento Mountains, the basin stretches down to and beyond the Pecos River. West of the river, the Pecos slope is drained by nine major tributaries, of which Salt Creek is a trunk stream for Macho Creek (Kelley 1971:3). Artesia Group formations, primarily Grayburg and Queen formations, underlie the area but are covered with Quaternary alluvial formations, particularly in the southern part. Grayburg-Queen formations are Permian reef or bank deposits composed of red mudstone and muddy gypsum containing thin dolomite beds (Kelley 1971:16). A series of Quaternary alluvial terraces characterize the southern portion of the project area. In some areas these are capped by Blackdom gravel (Kelley 1971:32). Upstream and less than 8 km to the west is the Fourmile Draw Member of San Andres formation deposits. These are evaporitic with thin gypsum and gypsum-bearing dolomites but also contain reddish, pinkish, or yellowish mudstone (Kelley 1971:13).

In the Middle Pecos Basin, the river lies between the eastern outwash plain or Llano Estacado and the Sacramento Plain on slopes of the eastern Rocky Mountains. These once formed a continuous slope until a sequence of downcutting and aggradation of the Pecos produced a valley with a series of terraces that once formed the floor of the valley. While overbank flows of the Pecos River may have once cleansed the soil in the Lakewood Terrace along the river, once the overflows stopped, a high water table combined with high rates of evaporation have concentrated the alkali and rendered the surface unsuitable for agriculture. Nearly all of the irrigation agriculture taking place today is on the second or Orchard Park Terrace, while the oldest or Blackdom Terrace has well-cemented hard conglomerates and sandstones with occasional clay deposits below the surface (Jelinek 1967:5-8).

Soils

Three general soil types characterize the project sites. Soils around Roswell are calciorthids. These are forming in old calcareous alluvium from formations dominated by limestone with some gypsum, sandstone, and other sedimentary rocks. Sites in the north half of Chaves County and just into De Baca County are on soils classified as camborthids-torriorthents that are forming from sedimentary formations of interbedded shale, sandstone, silt, and gypsum. Soils are fine loam and silt overlying calcareous loam. Site soils in the remaining portion of De Baca County are gypsiorthids-calciorthids-torriorthents. These are forming mainly from sedimentary rocks that include shale, sandstone, siltstone, and gypsum. The surface layer is typically a calcareous loam or silt loam with clay loam or gypsiferous soil beneath (Maker et al. 1974:38, 74, 76).

Hydrology

Originating in the Sangre de Cristo Mountains, the Pecos River is augmented by springs and seeps within the river channel from Salt Creek south. The Rio Hondo, Rio Peñasco, Rio Felix, and Cottonwood Creek are perennial near their confluence with the Pecos River. Other tributaries, such as Macho Creek and Salt Creek, lose considerable water by infiltration in evaporate areas. Sinkholes, formed by groundwater moving upward under pressure and dissolving the soluble rocks, water peculating down, or a combination of the two, occur throughout the region (Motts and Cushman 1964:11-37). Flooding in the vicinity of Roswell is mainly caused by the tributaries originating in the mountains, including Rio Hondo, Rio Berrendo, and the usually dry Macho Creek (Dalrymple et al. 1939:1).

Climate

Climate in the project area is semiarid, characterized by abundant sunshine, low humidity, erratic rainfall, and strong winds. Daily and seasonal temperatures vary widely. Winters are short and mild, and summers are long and hot (Lenfesty 1980:126).

Precipitation in northern Chaves County averages 305 mm, increasing with elevation. In Roswell, just south of the project area, peak rainfall is from July to September. November has the least rainfall, averaging only 8 mm, and July has the most, 46 mm. Minimum temperature in January averages 6 degrees C, and 17 degrees C in July. Maximum temperatures for these same months average 13 and 35 degrees C (Houghton 1980:1, 140).

Vegetation and Wildlife

The project sites lie within the Pecos Valley physiographic area. The Pecos section is a long trough between the High Plains to the east and the Basin and Range Province to the west. It is eroded below the level of the High Plains. North of Roswell, the Pecos Valley is uneven from unequal degradation of area rocks. Most stream channels are dry, and much of the Pecos section is used mainly as pasture. The central Pecos Valley or Roswell Basin, an alluvium filled basin, is suited to irrigation agriculture and has a supply of artesian water (Fenneman 1931:47-50). By modern standards, the potential for agriculture based on soil productivity and irrigation water quality in the area along U.S. 285 around Salt Creek and between Salt Creek and Macho Creek is good, while the area due east along the Pecos River is poor (WRRI 1970:26). Yet, even areas with good potential may have been of little use to prehistoric farmers lacking irrigation technology and artesian wells (Kelley 1984:30).

Early settlers in the area describe Spring River, Rio Berrendo, Rio Hondo, and the Pecos River as alive with catfish, sunfish, suckers, eels, and bass. Pronghorn, rabbits, and quail were abundant, as were ducks, cranes, and geese in season. Grama grass covered the area but was eventually replaced by saltgrass after irrigation began (Shinkle 1966:16, 114-115). On a military expedition in 1885, James Bennett found the area along the Rio Hondo just below the junction with the Bonito as pleasant but said that the area around the Pecos River between Rio Hondo and Rio Peñasco had dry barren soil filled with vermin and the water in the river was brackish (cited in Jelinek 1967:25-26). This suggests a number of environments were found in the area and open to use by prehistoric inhabitants. Outside of riverine environments, fast-growing plants such as amaranth, chenopods, and grasses thrive in sinkholes and their depressions, even when they have water for only short periods or every few years (Motts and Cushman 1964:14).

To the west lies the Upper Sonoran Life Zone, on the east slopes of the Sierra Blanca, Capitan, and Sacramento Mountains, with scrubby juniper, piñon, oak, yucca, prickly pear, and clumps of grass. Beyond that is the Transitional Zone and the Canadian Zone. Prehistoric farmers settled in the Upper Sonoran Zone close to the Transitional zone and utilized the alluvial valleys of the Sacramento and Sierra Blanca Mountains (Kelley 1984:37).

CHAPTER 3

CULTURAL OVERVIEW

Lentz et al. (1997:9-10) list the more significant archaeological projects that have been conducted in the Roswell area. Many are surveys, involve sites with relatively late dates, or are far from the project area. Phillips et al. (1997:1.6-1.11) briefly describe the studies along or associated with U.S. 285. Unfortunately, many of the recently excavated sites in southeastern New Mexico could not be dated. Sebastian and Larralde (1989) provide an overview of this portion of the state.

Paleoindian

The earliest inhabitants of southeastern New Mexico were mobile groups of Paleoindians (11,000-7000 B.P.). During the Pleistocene, the climate was moister and cooler, supporting now-extinct species of bison and mammoths. Vegetation was lusher than it is now, with shallow lakes and pine and spruce stands throughout an open savanna environment. At the end of the Pleistocene and into the early Holocene, the climate became drier, warmer, and more variable. Vegetation zones shifted upward. Defined principally on the basis of projectile point typology, Paleoindian remains are decidedly rare. While a few Paleoindian components have been reported, most are south or west of the project area. However, water sources such as Salt Creek made portions of the project area attractive to mobile hunters and their subsistence prey, and ideal locations for Paleoindian camps (Sebastian and Larralde 1989:19, 21, 37-38).

Archaic

The Archaic period, beginning about 5000 B.C. and ending as late as A.D. 900-1000, was drier and warmer, and had less seasonal variation than the Paleoindian period. The broad-spectrum adaptation was based on plants and small animals, with some use of larger mammals such as pronghorn and deer. The Early Archaic is represented much less than the Late Archaic in the Roswell area (Sebastian and Larralde 1989:41, 47).

Since Archaic sites are notoriously difficult to recognize and date, it is hard to make definitive statements about settlement patterns and resource bases. Given the relatively long growing season and sparse population, there would have been little incentive for Archaic groups in the Roswell area to substitute storage for mobility. This makes it likely that the primary strategy was one of serial foraging, where groups move in order to take advantage of foods that are often highly seasonal and available for only short periods of time, and with some use of cached resources when other foods are not available. Sites resulting from this kind of strategy would be those left by small family groups settling in an area of abundant resources and remaining there until that resource is exhausted or another resource becomes available. The association of these camps with a particular resource would also result in sites being used repeatedly over a long span of time (Sebastian and Larralde 1989:54-56).

Recent OAS excavations at an open site and a series of rockshelters overlooking the Río Hondo, 50 km west of Roswell, produced radiocarbon dates ranging from about A.D. 1 to 425 at the open site, and possible Archaic horizons consisting of a few flakes and no ceramics in two of the shelters (Wiseman 1996a:54, 66, 71, 110). Large and small storage pits and a variety of faunal and floral resources, including corn, hearths, grinding stones, and a diverse range of stone tools, suggest extended stays, perhaps overwintering, or returning to the site to retrieve stored resources (Wiseman 1996a:182-183). Compared to the Ceramic period deposits in the shelters, the Archaic deposits are lower in diversity of economic plants (Toll 1996a:154). If the dating is correct, these sites suggest that some groups were already adopting a strategy that relied less on mobility and more on storage.

Ceramic Period

Ceramic vessels first appear in southeastern New Mexico in deposits dating between A.D. 600 and 900. Most sites with early ceramics are scatters with no apparent architecture. A variety of phase sequences have been proposed for the area, generally based on survey-level information and excavations at a small number of sites. Most pertinent to the project area are Jelinek's sequence for the Pecos River above Roswell, Leslie's for the eastern Jornada south of Roswell (Sebastian and Larralde 1989:73), and Kelley's for the Sierra Blanca west of Roswell (Kelley 1984).

Jelinek's sequence for the Middle Pecos Valley between Fort Sumner and Roswell has four phases with subdivisions. The earliest, 18 Mile phase sites (ca. A.D. 600-1000), have pit structures with surface rooms appearing toward the end of the phase. Early ceramics are Jornada Brown and Lino Gray. Middle Pecos Micaceous largely replaces the brown wares, and Red Mesa Black-on-white is fairly common late in the phase. Pit structures remain the most common house form in the Mesita Negra phase (A.D. 1000-1200). Chupadero Black-on-white becomes a common ceramic type, while micaceous sherds decline. McKenzie phase sites (A.D. 1200-1300) have rectangular surface structures. McKenzie Brown continues to replace the micaceous wares, but brown wares become less common toward the end of the phase. Chupadero and Middle Pecos Black-on-white are the most common painted wares. The post-McKenzie phase, after A.D. 1300, has ceramics that indicate northern Rio Grande connections (Sebastian and Larralde 1989:76, 78).

Closely related to the Jornada Mogollon sequence, Leslie's (1978) phases for the eastern extension begin with the Querecho phase (A.D. 950-1150). No structural sites are known until late in the phase, when small rectangular pit rooms are reported. Ceramics are locally manufactured variants of Jornada Brown with imported Mimbres and Cebolleta painted wares. The Maljamar phase (A.D. 1050-1300) has nonstructural camps and pithouse villages. Ceramics are Jornada Brown with some corrugated utility sherds. Chupadero Black-on-white is the main imported ware, with small quantities of El Paso Polychrome and Three Rivers Red-on-terracotta. The Ochoa phase (A.D. 1325-1450) has surface rooms as roomblocks or single rooms, and ceramics are mainly Ochoa Indented with imports of Chupadero Black-on-white (Sebastian and Larralde 1989:77).

Working in the area from Roswell west to the Sacramento Mountains and extending north to Corona and south to the Peñasco River, Kelley defined three phases. The Glencoe phase (A.D. 1100-1450) covers the area from the Peñasco River to the Ruidoso and Bonito valleys of the Hondo drainage and was comprised of small thinly spread sedentary groups who lived in pithouse villages and relied on both agriculture and hunting and gathering. Sites tend to be near drainages and in the piñon-juniper zone and ceramics are Jornada Brown with Chupadero Black-on-white, El Paso Polychrome, Lincoln Black-on-red, and Three Rivers Red-on-terracotta at the later sites. The Lincoln phase (A.D. 1200-1450) is slightly later and overlaps the northern reaches of the Glencoe phase area extending from just below the Río Hondo past Capitan Mountain and into the upper Gallo Drainage. Lincoln phase populations built stone and coursed adobe pueblos, some with ceremonial structures, and relied on corn agriculture supplemented by hunting and gathering. Sites are again in the piñon-juniper zone, some on broad flat areas well removed from major streams, some in the main valley bottom, and others on terraces adjacent to but some distance from streams. Ceramics were largely corrugated utility wares along with Chupadero Black-on-white, El Paso Polychrome, Three Rivers Red-on-terracotta, and Lincoln Black-on-red. Corona phase sites (A.D. 1100-1200) occupy the area of the upper Gallo Drainage, the upper Macho Drainage, and the slopes of Capitan Mountain. Houses are scattered shallow pithouses with jacal superstructures, apparently briefly occupied. Corona phase sites are concentrated in the piñon-juniper zone, in broad valley bottoms or flat areas near water. Major pottery types are Jornada Brown and Chupadero Black-on-white (Kelley 1984:44-55; Sebastian and Larralde 1989:78).

Rather than debating which phase scheme best applies to the Salt Creek sites, the neutral terms of early Ceramic (those dating up to about A.D. 1050, when Chupadera Black-on-white was made) and late Ceramic (dating after A.D. 1050 to 1100) periods are used in this report. The early Ceramic period has few equivalents in the phase designations outlined above. Jelinek's (1967) Early 18 Mile phase comes closest in time.

Many of the unanswered questions about Ceramic phase sites concern the degree of sedentism and the practice of agriculture. The apparent absence of structures and agriculture at many sites suggests to some that the area was used by agriculturalists who were sedentary only part of the year, and to others that the sites were occupied by mobile hunting and gathering groups who used ceramics and traded with agriculturalists. Another possibility is that both agriculturalists and mobile hunter-gatherers inhabited the area (Sebastian and Larralde 1989:82-83). Much of the recent work in the area has been directed at differentiating the archaeological remains left by the logistic forays of agriculturalists from those of late hunters and gatherers (e.g., Wiseman 1996a, 1996b, 2000) or, more recently, by attempts to relate these sites to groups from the southern plains (Wiseman 2000, 2002, in prep. a).

Excavations at a series of four rock shelters and small caves overlooking the Río Hondo produced radiocarbon dates ranging from post-A.D. 1000 to the early 1400s along with ceramics produced as late as the 1200s. One cave had hearths, a boulder metate, other grinding equipment, projectile points and chipping debris, pottery, and midden material. The upper layers at this cave and deposits at the others were less substantial intermittent occupations (Wiseman 1996a:54, 188-189). At the largest shelter, botanical remains suggest that late Ceramic occupants utilized a larger range of plants, especially perennials, than the Archaic groups using the same space (Toll 1996a:154-155). The author concludes that sites were probably occupied by hunters and gatherers who traded with groups practicing horticulture and perhaps adopted limited horticulture to supplement their diet (Wiseman 1996a:208). Similar conclusions were reached about a multicomponent site in sand dunes north of Roswell (Wiseman 1996b:103).

Another ephemeral site, River Camp, about 15 km east of the Townsend site and overlooking the Pecos River, is a small ceramic and lithic scatter lacking features of any kind. The nearby Bob Crosby site had a possible structure, a possible sleeping pit, a storage pit, and several other pits, suggesting it may have been more of a base camp occupied primarily during the Ceramic period (Wiseman 2000:111).

Extensive excavations at the Fox Place (Wiseman 2002), on the Rio Hondo just southwest of Roswell, uncovered 10 pit structures, a rectangular socioreligious structure, 27 storage pits, 1 hearth, 3 borrow pits, and extensive extramural trash dating between A.D. 1270 and 1420. While corn was nearly ubiquitous, the author concludes that the site was occupied by hunter-gatherers who were probably more plains than southwestern in affiliation.

Another project in the vicinity of Roswell (Wiseman in prep. b) investigated a series of sites overlooking Berrendo River. None had architecture or anything more than hearths and bedrock mortars along with artifact scatters. The sites suggest repeated use over a long period, and most had late Ceramic components. Similar sites comprised of artifact scatters and hearts overlooking less substantial drainages were also found south of Roswell (Wiseman in prep. a).

CHAPTER 4

PROJECT HISTORY AND OBJECTIVES

In preparation for the construction of a four-lane highway between I-40 and Roswell, SWCA surveyed the area for TransCore-JHK Associates, on behalf of NMSHTD (Phillips et al. 1997:vi). The survey, conducted in February and March 1997, located and described the sites that are the subject of this report. Two of the sites, the Townsend site (LA 34150) and LA 51095, were recorded during earlier surveys, and both had been investigated in previous testing programs associated with U.S. 285 (Maxwell 1986; Oakes 1986). SWCA's site descriptions and recommendations are included with the individual site reports.

In May 1997, NMSHTD requested that the OAS prepare a data recovery plan for the seven sites SWCA recommended for further work. The schedule did not allow for a testing phase prior to data recovery, so the recommendations in the plan were based entirely on surface observations and tentative NMSHTD project boundaries. Construction plans for the area north of NM 20 had not yet been drawn and were not finalized until after the main fieldwork was completed. OAS was initially advised that the highway would be expanded east of the current right-of-way. Ultimately, the right-of-way was expanded to the west.

Following site visits, a data recovery plan (Lentz et al. 1997) and modifications (letter to Glenna Dean dated July 15, 1997) were approved by the State Historic Preservation Office. Because of the schedule, the NMSHTD contractors were just beginning the process of land survey and determining ownership. At the time we were applying for our permits, NMSHTD did not know whether any of the right-of-way had been acquired and advised us to proceed as if it was all privately owned. This was complicated in the early stage of the project, in that the NMSHTD contractor was just beginning to determine ownership. Chaves County does not have ownership plats on file for any of the property on which the sites were located. Eventually, with the aid of the NMSHTD contractor, we assembled a list of owners and permission letters for each site location. However, the list was tentative, and in one instance the person identified as the owner did not own the parcel. In addition, we were almost ready to start work when the NMSHTD contractor discovered that the southern part of the Townsend site (LA 34150 east) was on State Trust Land but could not tell us where the boundary was. This precipitated a second round of permit applications and some delay in starting work on the east side of U.S. 285 at this site until the permit was issued by the State Land Office.

With BLM and Historic Preservation Division permits in hand we were able to begin work in late July. Stephen C. Lentz was the project director and Nancy J. Akins the assistant project director. When Lentz left the project, Akins became the project director. Lentz directed the initial excavations at LA 117255 (completed by C. Dean Wilson and Nancy Akins) and LA 117257, and all excavations at LA 117246 and LA 117250. John Ware directed work at LA 51095 and Dorothy Zamora at LA 117248. Akins and Rusty Greaves directed excavations at Townsend west, and Akins at Townsend east. Several months after the main project was completed, Dorothy Zamora returned to LA 117257 to do additional work outside the original right-of-way.

Well after this report was written and in production, when boxing and compiling inventories for each artifact type, it was discovered that some of the lithic data from four sites was lost. The artifacts were analyzed, but a computer hardware failure caused the loss of a great deal of data that could not be recovered. As a result, and unknown to us until it was too late, some of artifact data is not included in this report. Data from about 30 percent of the FS numbers at the Townsend site (LA 34150) was lost. Almost all of it was rough-sort data from surface collection that would not change the overall interpretation of this site. The loss in three of the smaller assemblages (LA 51095, LA 117248, and LA 117255) was between 30 and 50 percent of the FS numbers. LA 51095 and LA 117248 are quarry and early reduction-stage sites, and the lost data was probably redundant. The data from LA 117255, an undated disperse scatter, are largely from west of U.S. 285.

As stated in the data recovery plan and letter, the focus of this project is to contribute data that can be used to address regional settlement and subsistence patterns, since the information from a single site or small project rarely provides the data necessary to answer broader questions such as those concerning the evolution of foraging and collecting strategies. Thus, the primary goal is to use the data generated by this project to identify how each site or area was used and to determine the kinds of activities that occurred at the site, along with the origins of the materials and foods that were utilized or processed.

General Methods

Excavation methods varied slightly depending on the nature of each site. In general, artifacts within the project area were flagged to determine the extent of the site and locate features and artifact concentrations, then collected by 1 m unit or point-plotted when sparse. Hand-excavated 1 by 1 m grids were used to explore or define features, artifact concentrations, and site stratigraphy. Auger tests and mechanical scraping supplemented the hand excavations. Hand-excavated units were excavated in 10-cm levels and the fill screened through 1/4 or 1/8 inch hardware cloth. Sites were mapped, usually with a total station.

Project sites are described from north to south in the following chapters, with the exception of the Townsend site, which is covered last.

CHAPTER 5

LA 117257 (THE LONELY HEARTHS SITE)

BY DOROTHY A. ZAMORA

Environment and Condition

LA 117257 is on a small rise in the flat plains along U.S. 285 at an elevation of 1,469 m (4,820 ft). The site has a commanding view that takes in two ephemeral lakes and part of North Home Draw. When first recorded by Phillips et al. (1997) during the initial survey along U.S. 285, road construction activities and recent construction of a buried fiber optic cable line had disturbed much of the site area between the right-of-way fence and U.S. 285. The area beyond the fence was covered with grass (Phillips et al. 1997:5.22).

LA 117257 is in an environment that is best used for grazing (Fig. 2). The site is covered by grasses, modern weeds, and sparsely scattered snakeweed. According to Maker et al. (1974), the common grass species found in this environment are alkali sacaton (found at the site), blue grama, black grama, tobosa, gyp grama, sand dropseed, bush muhly, and burro grass. Other plants include chamisa, broom snakeweed, and traces of mesquite.

The soils on the site are within the gypsiorthids-calciorthids-torriorthents association, found in the western part of De Baca County and characterized as soils that are developing mainly from sedimentary rocks. The topography varies from nearly level to gently sloping valley areas that are intermingled with undulating to hilly uplands. Many of the valley bottoms and adjacent side slopes are dissected by gullies or arroyos (Maker et al. 1974).

Site Description

LA 117257 is a sparse lithic artifact scatter on the west side of U.S. 285. Phillips et al. (1997:5.22-5.23)

Figure 2. Environment at LA 117257, facing west.

Figure 3. Mechanical scraping within the existing right-of-way at LA 117257, facing north.

observed a few pieces of heavily burned limestone and 25 pieces of flaked stone, mostly outside of the right-of-way fence. Early in the data recovery project, Stephen C. Lentz visited the site and determined that much of the site surface was covered by gravel associated with highway construction and maintenance, and the remaining surface was too disturbed to merit hand excavations (Fig. 3). During the post-project excavations, three discrete concentrations were identified: a scatter of chert and fire-cracked rock, a scatter of fire-cracked rock, and a scatter of chert flakes and historic trash (Fig. 4) within the 9.4 m (30 ft) extension of the right-of-way. Several types of lithic debitage, including angular debris, flakes, and cores were found within the concentrations.

Data Recovery Results

On December 1 and 2, 1997, Nancy J. Akins, Macy Mensel, and Jessica Badner returned to the site prior to mechanical scraping. They examined the surface and flagged and collected four lithic artifacts present on the surface within the existing right-of-way and recorded the 25 lithic artifacts observed beyond the right-of-way fence. The surface was scraped with the aid of mechanical equipment operated by Dennis Goodwin (Fig. 3). A map was also produced using a Pentax total station.

After NMSHTD determined additional work was needed at the site, Dorothy Zamora and two assistants, Jim Quaranta and Tess Fresquez, returned for additional data recovery excavations between March 17 and 26, 1998. Mechanical stripping and trenching was done by Dennis Goodwin.

The site was excavated as proposed in the initial data recovery plan. First a main datum was established and a north/south and east/west baseline placed over the site. Then, 1 m by 1m grids were placed in areas where fire-cracked rock and artifacts were concentrated. Each unit was excavated in 10-cm arbitrary levels with trowels and shovels. All soil was screened through 1/4 inch wire screen. All artifacts were collected by grid and given a north and east designation. The artifacts were bagged by type. Flotation samples were collected from each of the features. Features were mapped before and after excavation and photographed. A site map was produced using a transit and stadia rod to record hand excavations, surface collections, site limits, area disturbed by the fiber optic line, and mechanical scraping.

A total of 18 grid units were hand excavated. The soil consisted of a layer of sandy clay, 7.5YR 4/6 strong brown (Munsell), that ranged between 5 and 10 cm deep. No excavation units were placed in Scatter 1, a small scatter of reddish chert flakes, because bedrock

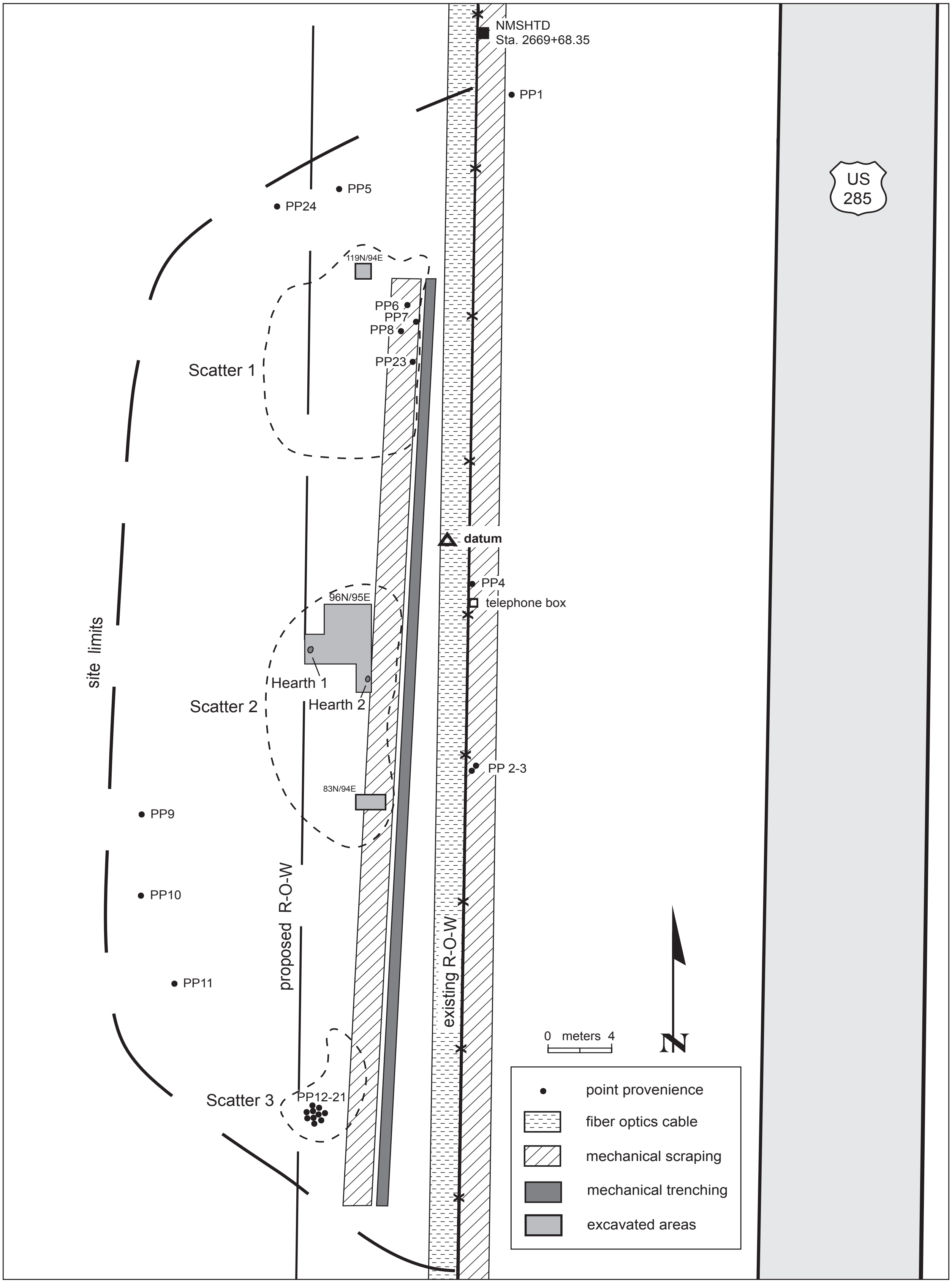

Figure 4. Plan of LA 115257.

Figure 5. Hearths at LA 117257. Hearth 1 is in the background, Hearth 2 is in the foreground.

was already exposed. All the lithic debris in Scatter 1 was of the same material, and no tools or cores were found. A small amount of fire-cracked rock was noted.

Excavations were concentrated in Scatter 2 because of a higher density of fire-cracked rock. Seventeen excavation units were placed in Scatter 2. The first grid unit was placed in the densest concentration of fire-cracked rock and artifacts. This unit uncovered charcoal-stained soil and fire-cracked rock. The excavation area was expanded until the stained soil and artifacts disappeared. The depth of these units ranged between 5 and 10 cm, and each grid was excavated to sterile bedrock. Scatter 2 had two hearths that were built in bedrock depressions (Fig. 5). Hearth 1 was found during hand excavation and measured 70 cm in diameter, with a depth of 17 cm (Fig. 6). The hearth fill consisted of charcoal-stained sand with two flakes. There was no datable material in the hearth. Hearth 2 was found by mechanical scraping. It was 60 cm northeast of the Hearth 1 and measured 70 by 68 cm by 11 cm deep (Fig. 6). The fill in this hearth was also charcoal-stained sand. Charcoal chunks were absent from this feature as well. Fire-cracked rock was scattered throughout this area, and the artifact density was higher than elsewhere on the site. Attempts to excavate only half of the features failed because the soil was too sandy and dry.

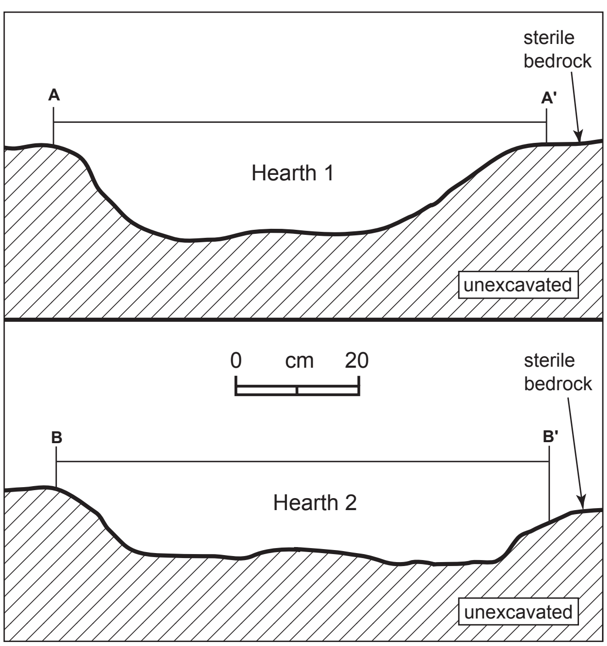

Figure 6. Profile of LA 117257 hearths.

Scatter 3 was approximately the same size as Scatter 2. Among the chert flakes and angular debris was a surface scatter of historic sheet trash consisting of pre-1920s artifacts such as sanitary cans, hole-in-top cans, olive glass, and purple glass; however, historic structures or trash dumps were not noted on the site. A

Figure 7. Mechanical scrape at LA 117527 with crew working at Hearth 2.

single 1 m by 1 m unit was placed in the portion of Scatter 3, where fire-cracked rock and a cluster of artifacts were present. The excavation was very shallow, having an average depth of 10 cm below the ground surface. Three artifacts were recovered from the surface; however, the subsurface soil was sterile, and bedrock was soon reached.

After the hand excavations were completed, mechanical scraping was employed to ensure that all cultural manifestations were recorded (Fig. 7). The stripped area was at the eastern edge of the scatters away from the fiber optics trench and measured 63 m long by 4.2 m wide and ranged between 4 to 10 cm deep. Hearth 2 was uncovered in Scatter 2 northeast and excavated. A trench measuring 37.7 m long by 3.4 m wide and 35 cm deep was placed east of the stripped area. No other cultural features were revealed. The trench fill consisted mainly of bedrock with pockets of sandy clay and caliche.

Material Culture

Seventy lithic artifacts were recovered from LA 117257 (Table 1). The variety of flake types suggests tool processing or maintenance. The dominant material type is chert (77.1 percent); however, at least one material, Alibates chert, was imported from Texas. Over half of the assemblage consists of core flakes (77.1 percent), with fewer biface flakes (8.6 percent). The biface flakes suggest that tools were manufactured, resharpened, or reworked. The biface, with a snapped tip, was found near Hearth 2. It is made of white and light yellow chert and is in the late stage of production; however, it has not been notched. No prehistoric cultural floral material was found in the flotation sample from Feature 1.

Summary and Interpretation

The chipped stone analysis (Moore, this volume) suggests that the Lonely Hearths site dates to the Archaic period. Absent diagnostic artifacts or datable material from the hearths, this cannot be confirmed. The presence of two hearths suggests it was a campsite. The biface flakes and the unfinished biface indicate tool manufacture as well as sharpening or reworking took place.

Evaluation and Data Potential

The data potential of this site has been exhausted. Excavation, scraping, and trenching indicated that the site consisted of only the two hearths and lithic debris. Bedrock is exposed north of the site, and only 10 cm or less of sand covers the bedrock elsewhere. No further work is needed on the site.

Table 1. Lithic artifacts from LA 117257 (the Lonely Hearths site).

Material Type	Artifact Morphology								Row Total
	Angular Debris	Core Flake	Biface Flake	Bipolar Flake	Tested Cobble	Uni-directional Core	Bipolar Core	Late-Stage Biface	
Chert	4 80.0%	42 77.8%	5 83.3%	1 100.0%	- -	1 100.0%	- -	1 100.0%	54 77.1%
Alibates chert	- -	8 14.8%	1 16.7%	- -	- -	- -	- -	- -	9 12.9%
Silicified wood	- -	2 3.7%	- -	- -	- -	- -	1 100.0%	- -	3 4.3%
Basalt	- -	1 1.9%	- -	- -	- -	- -	- -	- -	1 1.4%
Quartzite	- -	1 1.9%	- -	- -	1 100.0%	- -	- -	- -	2 2.8%
Massive quartz	1 20.0%	- -	- -	- -	- -	- -	- -	- -	1 1.4%
Row total	5 7.1%	54 77.1%	6 8.6%	1 1.4%	1 1.4%	1 1.4%	1 1.4%	1 1.4%	70 100.0%

CHAPTER 6

LA 117255

BY C. DEAN WILSON AND NANCY J. AKINS

Environment and Condition

LA 117255 is just south of Mesa, New Mexico, on both sides of U.S. 285 on a slope between a low hill to the east and an intermittent pond to the west. Associated vegetation includes sparse blue grama, wheatgrass, mesquite, and snakeweed. Plant cover is sparse and reflects both the effects of a dry climate and heavy cattle grazing. Soil surveys describe the upper strata as Poquita loam, which forms in calcareous alluvium as a deep and well-drained loam on alluvial sides of slopes. Typically, the surface layer is brown loam, and the subsoil is brown clay loam over a reddish yellow clay loam (Lenfesty 1980:50).

Maintenance activities in the form of mechanical blading have removed sediments and may have displaced cultural deposits on both sides of the right-of-way fence east of U.S. 285 and within the right-of-way on the west side, especially those areas adjacent to the road. In addition to the blading and highway maintenance activities, two telephone poles, a utility line, an old alignment of U.S. 285, and cattle grazing and walking along the fenceline after heavy rains have severely disturbed the upper fill in the site area on the east side.

Site Description

LA 117255 was originally recorded as a small lithic scatter with four dark stains. The surface scatter, consisting of eight lithic artifacts, was in the northern portion of the site, and the four stains were exposed during recent blading along the fenceline and just outside the U.S. 285 right-of-way at the south end. As originally defined, site boundaries, limited to the right-of-way and a strip of private land east of the road, measured 130 m (north to south) by 10 m (east to west). The linear shape reflects the artifact distribution and the features exposed by mechanical blading (Phillips et al. 1997:5.17-5.20).

SWCA described Feature 1, the largest and most visible of the four features, as a semicircle of black stained soil measuring 1.6 m in diameter and containing small charcoal chunks and baked earth, with a possible hard-packed surface at the north edge of the feature. The other three features were more difficult to define. Feature 2 was a gray stain 45 cm northwest of Feature 1 and measuring 35 cm in diameter. Feature 3 was an irregular ashy stain 30 cm in diameter, about 20 m north of Feature 2. Feature 4 was another irregular soil stain, 25 cm in diameter, about 1 m south of Feature 1. During the initial recording, SWCA was not able to determine whether Features 2, 3, and 4 were cultural or produced by natural fires (Phillips et al. 1997:5.17-5.20).

While some of the features recorded by SWCA were still visible during the first OAS visit to the site, they could not be found at all during the second visit. Rain and cattle traversing the bladed road churned and disturbed soil in and around the features. Eventually, LA 117255 was divided into three areas, based on observations regarding the possible extent of the site, the spatial separation of the features, a low-density artifact scatter on the east side, and the presence of sparse cultural material west of U.S. 285. The site boundaries have been extended to portions of the right-of-way west of U.S. 285.

Data Recovery Results

While personnel, strategies, and grid systems varied for the three areas of LA 117255, the basic field methods and strategies from the research design (Lentz et al. 1997) were employed. Mapping activities were centered at datums established for each of the three areas defined for this site (Fig. 8).

Investigations in each area began with pinflagging all surface artifacts within the right-of-way. Given the sparseness of the artifact concentration, the exact location of each artifact was recorded. Excavated units were established in reference to a baseline placed parallel to the right-of-way fence. Within these grids, 1 by 1 m hand-excavated units were placed in areas near surface artifacts or possible features. Excavation units were initially dug in 10-cm levels, and later by stratigraphic layer when distinctive strata were encountered. Auger tests, extending almost 1 m deep, were placed at the base of some units. Profiles noting the stratigraphy of various units were made after the excavation of a grid. Some areas with possible features were also surface skimmed to expose the features. This involved taking off the top few centimeters of loose fill.

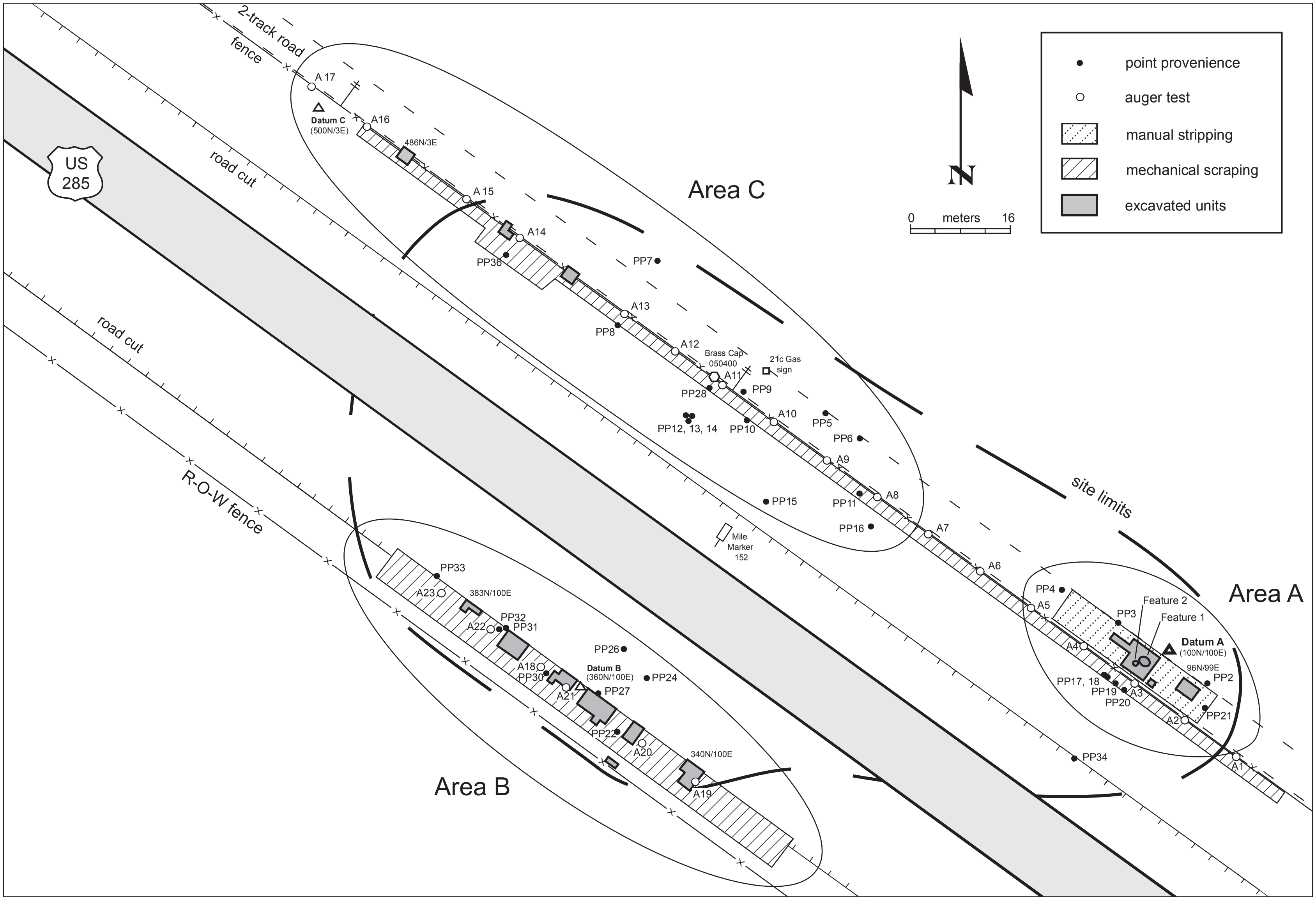

Figure 8. Plan of LA 117255.

Other subsurface investigations were implemented to search for cultural strata or features. Auger tests were placed every 10 m along the fenceline on the east side (A1-A17) and 5 m from the fenceline on the west side (A19-A23). Changes in soil reflecting natural stratigraphy or cultural deposits were noted. Following the completion of hand excavations, the surface was bladed to ensure that no cultural strata or features had been missed. The following account of data recovery operations covers the east side (Areas A and C) and then the west side (Area B) of U.S. 285, respectively.

Area A

Investigations in Area A (Table 2) took place between August 7 and 22, 1997, and were supervised by Stephen Lentz. Crew members included Dean Wilson, Jim

Table 2. LA 117255 Area A excavated grids.

Unit	Number of Levels	Depth bsd, NE corner (cm)	Comments	Lithics
EU 1	4	10-52	surface removed by blading	1
EU 2	4	10-50	surface removed by blading	
EU 3	2	10-22	historic material in fill	1
EU 4	2	10-16	stain and possible oxidizing in NW corner	1
EU 5	3	10-33	modern disturbance	2
EU 6	3	10-33		
EU 7	1	8-13		
101N 96E	1	20-23	disturbed by rodents and cattle	
101N 97E	1	21-23	part of Feature 1 in grid	1
101N 98E	1	8-22	part of Feature 1 in grid	1
101N 99E	2	8-22	two pieces of fire-cracked rock	
102N 96E	1	20-22	part of Feature 1 in grid	
102N 97E	1	22-26	part of Feature 1 in grid	
102N 98E	1	17-22	grid is mostly Feature 1	1
102N 99E	1	10-22		
103N 96E	1	17-21	small pieces of burned adobe and charcoal	
103N 97E	1	22-24	Feature 2 and part of Feature 1 in grid	1
103N 98E	1	?	part of Feature 1 in grid	
103N 99E	2	11-21		
104N 96E	1	19-25		
104N 97E	1	26-28		
104N 98E	1	12-20		
104N 99E	1	9.5-19		2
105N 98E	1	10-21	light stain in NW quad	
105N 99E	1	18-20		1
106N 98E	1	13-23		
107N 98E	1	7-26		
108N 98E	1	14-?		

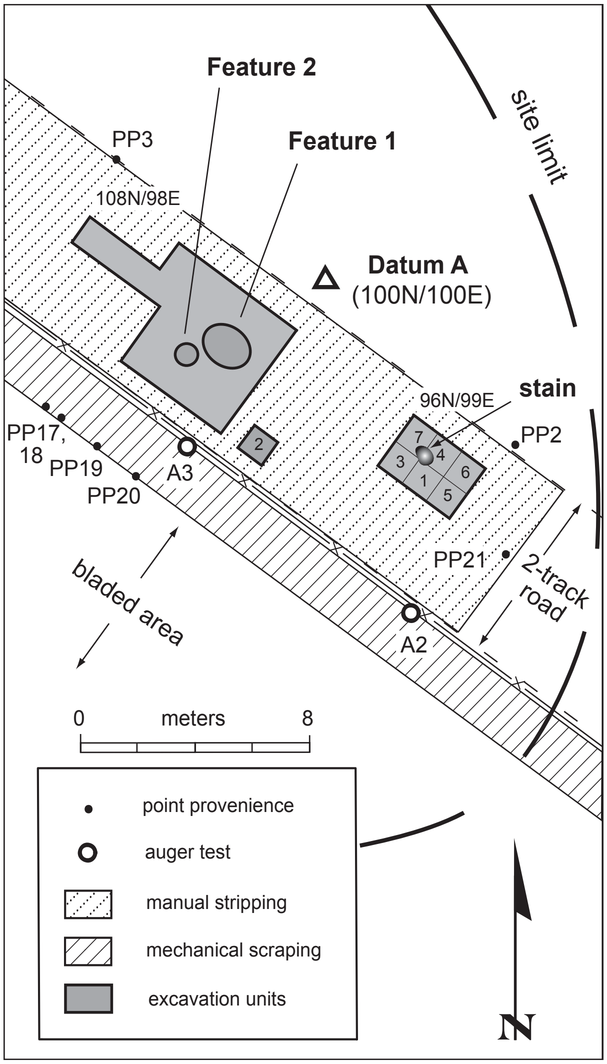

Figure 9. Plan of LA 117255 Area A excavated grids.

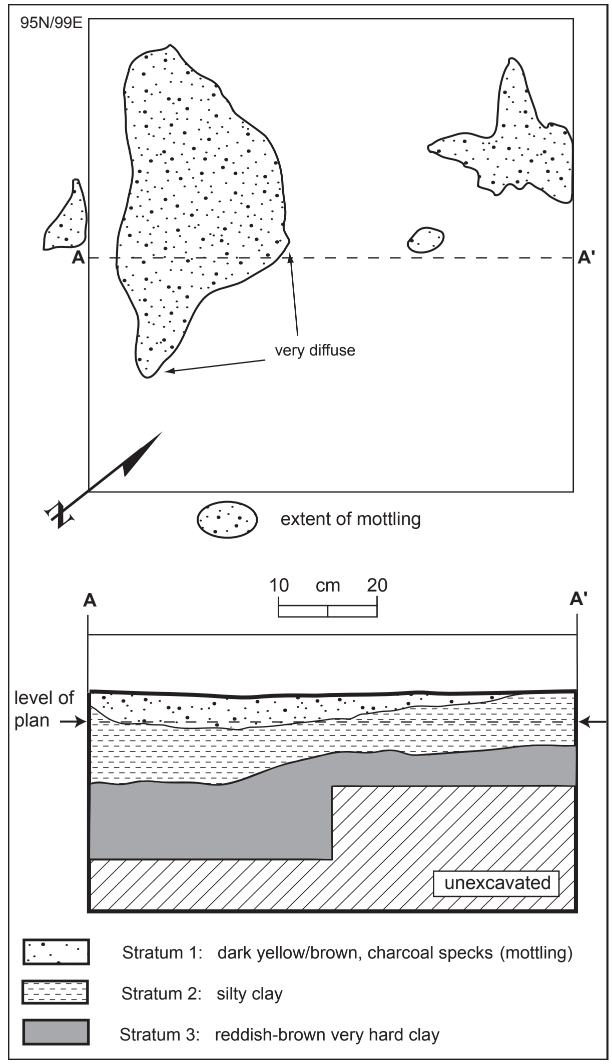

Figure 10. Plan and profile of EU4 at LA 117255.

Quaranta, Jesse Murrell, and Eric Harkrader. The SWCA survey stake was utilized as the site and area datum (Datum A at 100N 100E). Excavations in this area included two groups of contiguous grids, a single isolated grid, and surface stripping of the area encompassing the features (Fig. 9). A total of 12 lithic artifacts were found and collected from the surface (one angular debris, one tested cobble, eight core flakes, and one bipolar flake). Excavations began with two grids (EU 1 and EU 2) placed in the general area where the features recorded by SWCA were thought to occur. EU 2 yielded no artifacts or cultural fill. EU 1 contained a darker fill that may be a cultural deposit directly underlying a thin layer of topsoil. This layer was concentrated in the eastern part of the unit and consisted of 8 cm of grayish brown sandy loam that gradually disappeared in the western portion of the unit. To determine the nature of these deposits, excavations were extended to five more units (EU 3 through EU 7), all excavated to sterile.

Cultural fill was most noticeable in EU 4 (Fig. 10), which contained a dark sandy loam level up to 6 cm thick. This layer was similar to the overlying top soil but darker and harder. The soil underlying the cultural layer was easily distinguished since it was typical of the natural loam clay deposits. The dark cultural fill in these grids yielded low frequencies of artifacts (four core flakes, a biface flake, and a potlid). While the darkness of the stratum and the presence of charcoal, burned clay, and some artifacts indicated the presence of a cultural deposit, the stain lacked clear boundaries and a discernable shape, so it was not considered a feature. Instead, it is probably all that remains of a deposit that was disturbed by blading and grazing, which resulted in mixing of subsurface soil and possibly the fill of a feature.

Given the location of the stain relative to Datum A, this area could be Feature 1, 2 or 4, as defined by SWCA (Phillips et al. 1997:5.19).

In order to define and locate the features, a fairly large area was manually excavated or scraped. This involved skimming off the top few centimeters of loose top soil to expose the undisturbed loamy soil horizon. Skimmed soils were not screened and encompassed a 28 by 6 m area, paralleling the right-of-way fence. The deeper mixed deposits previously encountered in the excavations were not present in most of this area, suggesting they were localized organic or burned deposits rather than a more extensive stratum.

Skimming exposed two features, designated Features 1 and 2 (Fig. 11). Both features are pits dug into the sterile loamy soil and filled by a dark, burned stratum. Once these features were identified, most of the area around them was excavated, and the fill screened. Ultimately, 21 units in the area of these features were excavated to depths of 2 to 19 cm. Very little evidence of a cultural stratum was encountered during these excavations. The upper layer consisted of a loosely consolidated sandy loam with gravel. Lower levels were more compact loam, typical of the local soil. Artifacts were present, but extremely rare (six core flakes and one angular debris).

Feature 1 is an oval thermal feature or fire pit. It measured approximately 116 cm north to south and 160 cm east to west and was 11 cm deep (Fig. 12). The topmost fill was a 3-cm lens of soft grayish sandy loam (7.5YR 4/3) with charcoal fragments. Beneath it was a similar layer that was slightly more compact. It was a brown (7.5YR 5/2) sandy loam. The margins of the pit were hard and partly oxidized. A single potlid of chert was recovered from the fill, suggesting it may have been used to heat treat lithic material.

Feature 2 was close to Feature 1 and had similar fill. It was nearly round, measuring 29 cm by 32 cm and 8 cm deep, and had a basin-shaped profile. The upper fill was dark brown (7/5YR 4/1), moderately consolidated loam overlying a thin layer of mottled dark gray (7.5YR 4/1) and brown (7.5YR 5/4) loam with oxidized clay intrusions. No artifacts were recovered from Feature 2; however, a limestone rock was exposed at the same level just to the west of the feature.

Both features are thermal features excavated into native soil. They appear to have been used briefly, possibly during a single episode. Flotation samples did not yield culturally related botanical material other then fuel wood. Feature 1 contained charcoal from salt bush, an undetermined conifer, and mesquite (McBride and Toll, this volume). A radiocarbon sample (Beta-134638) gave a calibrated date of 810 to 410 B.C. and a conventional date of 570 ± 60 B.C., indicating an occupation during the Late Archaic period. The absence of pottery further indicates an Archaic date for at least this portion of the site.

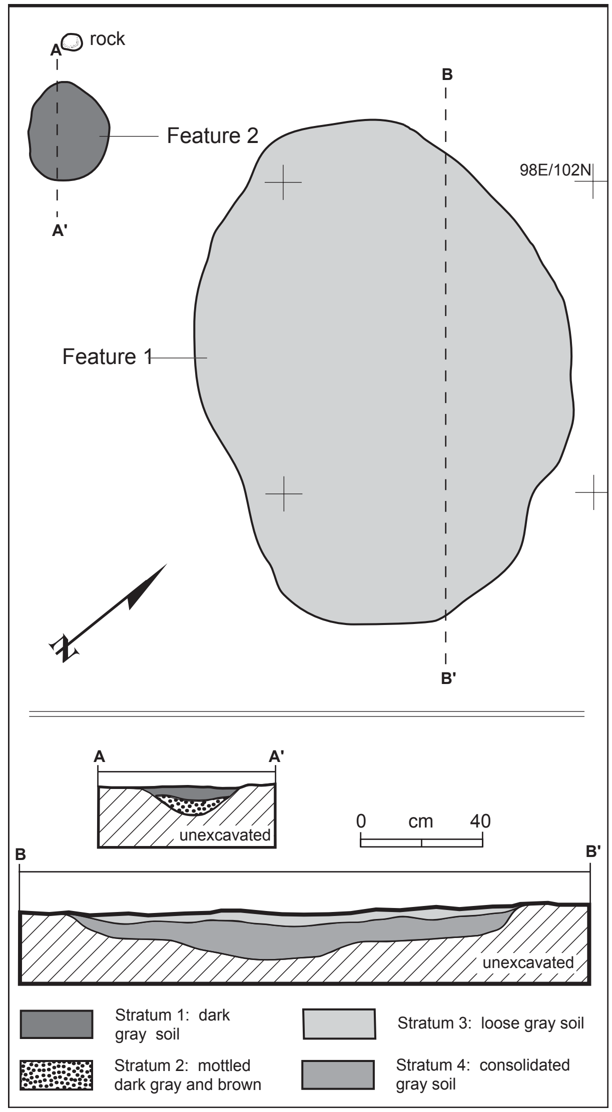

Figure 11. Plan and profiles of Features 1 and 2 at LA 117255.

The stratigraphic profiles and auger tests (A1-A7) show a more or less uniform stratigraphic sequence. The upper fill is a loose reddish brown (7.5 YR 5/4-6 d) eolian silt that may have a few small pieces of gravel. This grades into a more compact red brown fine silt (10 YR 5/6 d) with small chunks of caliche. At the south end and about 1 m deep, there is a red (5 YR 5/6 d) fine silt that is formed from or metamorphosing into a hard siltstone. The siltstone is found in small fragments measuring up to 2 cm. In the other tests, this third layer was not reached and may have been replaced by a yellowish red (5 YR 5/6) more clayey layer still containing chunks of

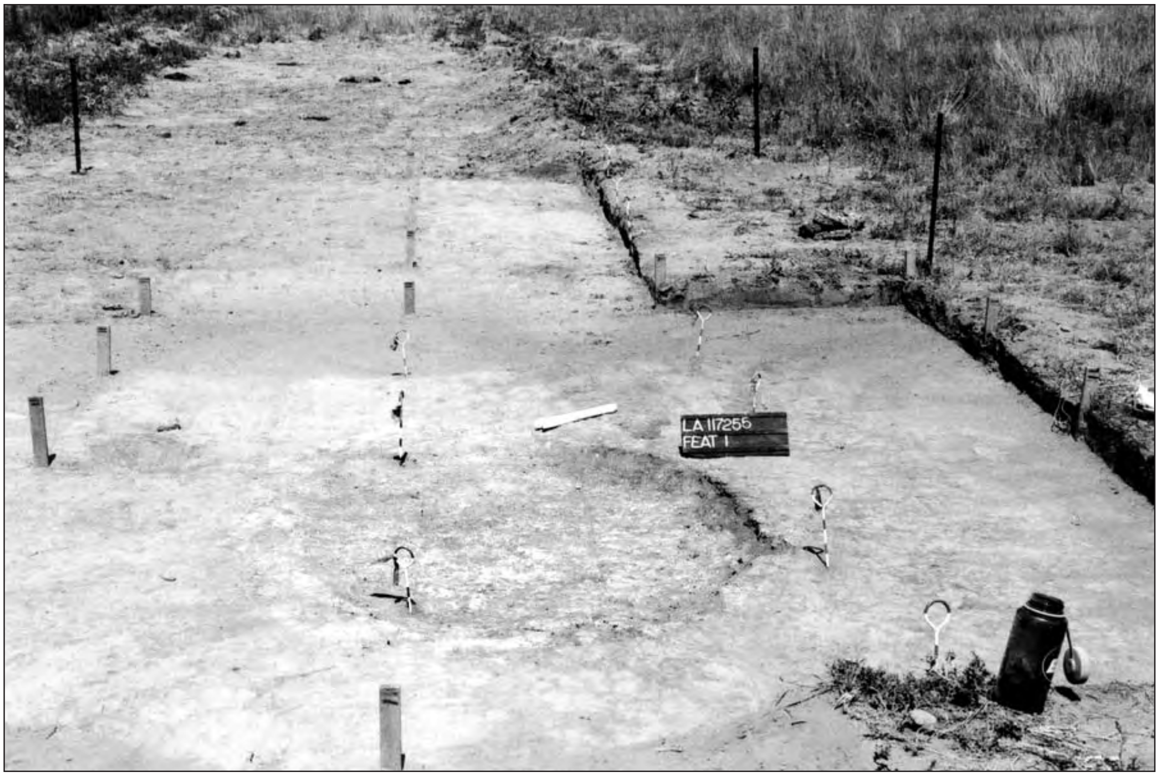

Figure 12. Features 1 and 2 at LA 117255.

caliche along with small pieces of hard red clay (starting about 90 cm below ground surface (bgs) and continuing to at least 115 cm).

Area C

The next portion of LA 117255 investigated was Area C, about 80 m north of Area A and coinciding with the northern artifact concentration identified by SWCA. Excavations in Areas B and C began on August 22 and continued until August 28 with a change in supervision and personnel. After the departure of Stephen Lentz, Nancy Akins directed excavations at this site. The crew included Dean Wilson, Jennifer Ware, Eric Harkrader, Jesse Murrell, Jessica Badner, and Sarah Morris. A total of 16 lithic artifacts were collected from the surface (4 tested cobbles, 11 core flakes, and 1 early stage biface). New grid reference numbers, distinct from those employed during excavations of Area A, were employed in C. Excavation in of Area C involved excavation of 11 grids just inside and slightly outside of the right-of-way fence (Table 3) in one to three levels (Fig. 13).

No subsurface cultural features or strata were found in the northernmost cluster of grids. The middle grids recovered two core flakes from the upper level of fill and one from the second level. The southernmost units in Area C produced two core flakes, both from the upper level of fill. Other than the few artifacts, no charcoal or other indications of cultural fill was found. Profiles of these units show the typical sequence of eolian brown (7.5 YR 5/6 d) fine silt grading to a finer-grained (7.5 YR 6/4-7/4 d) loam with increasing amounts of caliche.

Auger tests in Area C (A8A17) indicate this entire area has similar strata with no indications of buried cul-

Table 3. LA 117255 Area C excavated grids.

Unit	Levels	Depth bsd, NE corner (cm)	Comments	Lithics
453N 002E	2	10-27		1
453N 003E	2	10-37	three fire-cracked rock fragments	1
454N 002E	2	10-40		
454N 003E	3	10-38		
465N 002E	2	10-30		
466N 002E	3	5-35		2
466N 003E	2	10-20	glass in Level 1	1
485N 002E	1	13-19		
485N 003E	1	8-20		
486N 002E	1	8-13	disturbed	
486N 003E	1	10-21		

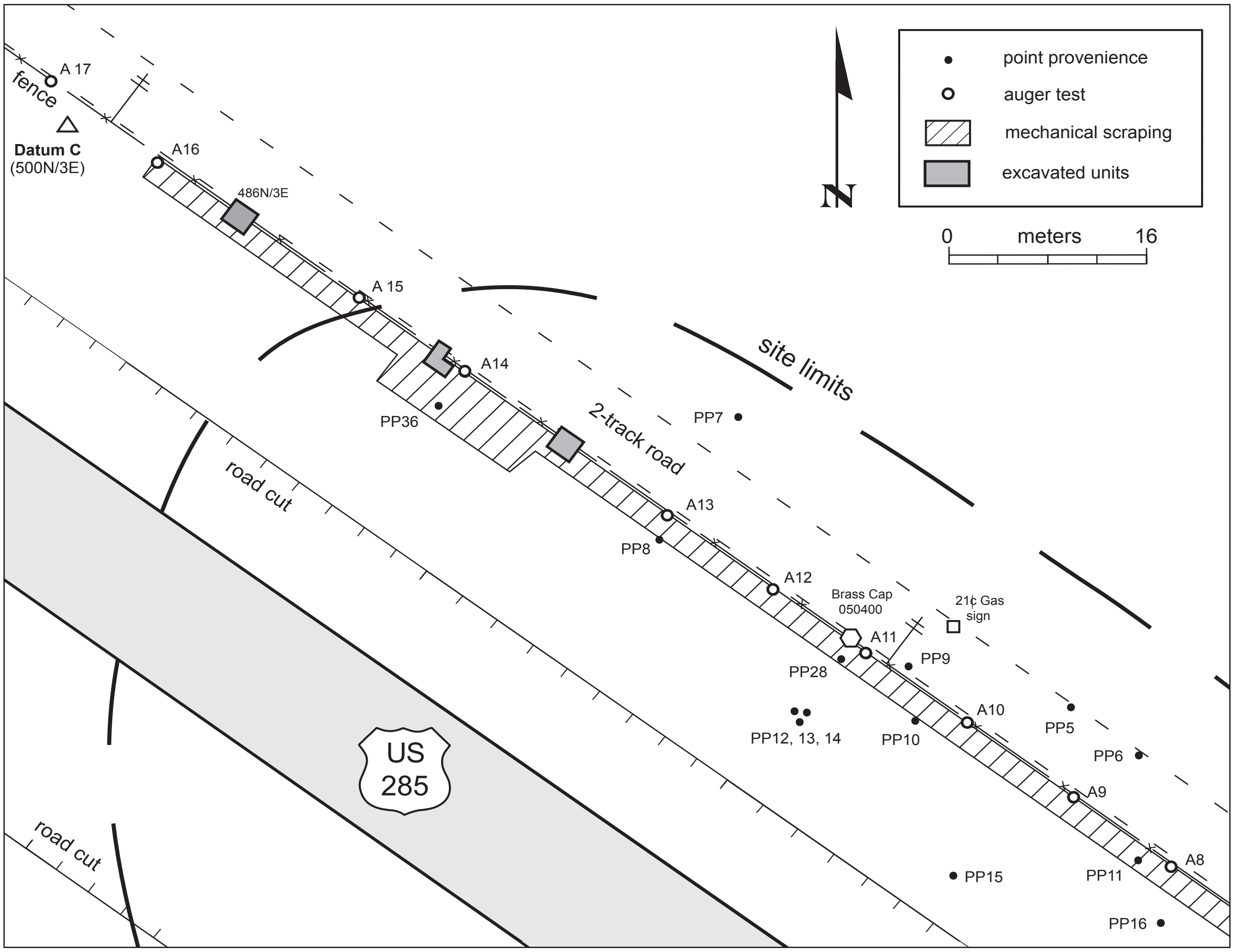

Figure 13. Plan of LA 117255 Area C excavated grids.

tural strata. The top layer continued to be a loose red-brown eolian soil, which is somewhat thicker along the fenceline, overlying the slightly redder more compact fill with varying amounts of caliche, then a more compact layer with caliche, hard dry clay, and pebble inclusions. One deeper test (A11) encountered chunks of limestone at 1.5 m bgs, while another (A12) had both chunks of siltstone and bits of limestone at 1.5 m. Further north, A17 encountered a similar layer with siltstone and limestone at about 90 cm bgs.

Area B

This area, on the west side of U.S. 285, had a scatter of lithic artifacts and limestone concentrations that could represent possible features. Eight lithic artifacts (five core flakes, a piece of angular debris, a multidirectional core, and a tested cobble) were collected from the surface.

During an examination of this area by OAS, limestone rock concentrated in the south part of the site area was initially thought to indicate possible features. Such suspicions were fueled by the lack of similar limestone on the surface east of U.S. 285, a grayish or pinkish color on some rocks suggestive of burning, and the sparse lithic scatter. Excavations (Table 4) removed a single level of fill from 58 grids (Fig. 14), mostly in areas with surface limestone. Few artifacts were recovered (17 core flakes, 1 biface flake, 7 angular debris, a multidirectional core, and a late-stage biface), and no more than three were found in any one grid. Grids with the heaviest limestone concentrations yielded no artifacts, suggesting these were a combination of local deposits, possibly indicating construction activities.

Stratigraphy resembled that east of U.S. 285. The uppermost fill was a loose to well consolidated silty to sandy loam (7.5 YR 4/6 d) with small gravel, often an interface layer mixing the sandy loam with chunks of caliche, then a layer of mostly caliche. In some grids, the caliche layer was covered by only 2 cm of fill; in others it was over 20 cm bgs. Pieces of limestone were

Table 4. LA 117255 Area B excavated grids.

Unit	Levels	Depth bsd, NE corner (cm)	Comments	Lithics
338N 97E	1	7-16	fire-cracked rock on surface	
338N 98E	1	8-18	2 fire-cracked rocks	
338N 99E	1	16-26		
338N 100E	1	10-18		
339N 97E	1	1-22		
339N 98E	1	10-18		
339N 99E	1	12-17		
339N 100E	1	10-24		
340N 99E	1	15-23		
340N 100E	1	24-32		
349N 93E	1	9-18	4 pieces of limestone	
349N 98E	1	10-24	4 pieces of limestone	
349N 99E	1	5-20	3 pieces of limestone, possibly fire-cracked	
349N 100E	1	7-20	4 pieces of limestone	
350N 93E	1	6-18	3 pieces of limestone	
350N 98E	1	10-24	13 pieces of limestone	
350N 99E	1	?		
350N 100E	1	5-20	4 small and 1 slab of limestone	
355N 98E	1	9-24		1
355N 99E	1	8-23	2 pieces of glass in upper fill; 1 limestone	
355N 100E	1	16-23	1 piece of limestone	
356N 97E	1	18-27		1
356N 98E	1	9-25	1 limestone, 2 possible fire-cracked rocks	5
356N 99E	1	7-23		1
356N 100E	1	14-24	1 piece of glass	1
357N 98E	1	7-19	4 pieces of limestone	2
357N 99E	1	10-13		3
357N 100E	1	10-15		1
358N 98E	1	7-20		1
358N 99E	1	7-18	1 piece of limestone	2
358N 100E	1	3-13	1 piece burned? limestone	
359N 98E	1	10-20		1
359N 99E	1	7-20		2
359N 100E	1	4-16		
362N 99E	1	7-12		1
362N 100E	1	10-17		1
363N 99E	1	3-10		1
363N 100E	1	12-23		
364N 99E	1	10-18		
364N 100E	1	10-30	auger in base (A 18) to 1 m	
365N 98E	1	10-21		
365N 99E	1	9-19		
372N 98E	1	23-26		
372N 99E	1	11-19		
372N 100E	1	10-28		biface
373N 98E	1	18-28		
373N 99E	1	4-16		
373N 100E	1	10-24		
374N 98E	1	14-21		
374N 99E	1	7-14		
374N 100E	1	7-19		core
375N 98E	1	10-20		
375N 99E	1	10-25		1
375N 100E	1	10-21	1 piece of limestone (?)	
381N 100E	1	10-20		
382N 100E	1	9-20		
383N 99E	1	8-28		
388N 100E	1	10-22		

found on and just below the surface. The gravels were composed of small (less than 2 cm) rounded irregular pieces of quartz, quartzite, silicified wood, limestone, and chert.

Auger tests (A19-A23) noted these same soils with varying amounts of caliche. A21 reached bedrock at 137 cm below the surface.

Once the hand excavations were completed, extensive surface scraping (Fig. 15) removed virtually all of the remaining fill between the highway and the right-of-way fence. Repeated thin scrapes in these areas revealed only a single suspicious stain, and that was a burned modern fencepost.

Material Culture

Other than pieces of bottle glass, which were noted and left in the field, almost all of the material recovered from LA 117255 consists of lithic artifacts. Two sun-bleached jackrabbit bones, a proximal rib and a distal radius, and a gastropod were the only faunal remains found. Neither of the flotation samples (McBride and Toll, this volume) produced economic taxa. Fuel wood used for the radiocarbon sample was largely mesquite.

While not quite equally divided between the areas, the sample sizes are similar (Table 5). Area C has the smallest sample, as well as the least variability. Nearly half of the material is quartzite (45.4 percent), including core flakes, three tested cobbles, and an early-stage biface, ample evidence of core and biface reduction in this area. Area A stands out as having the least quartzite, evidence of core reduction, some heat-treated lithic materials, and some biface reduction. Area B also has a large amount of quartzite and enough angular debris, core flakes, and cores, in addition to a tested cobble, to confirm core-reduction activities. The late-stage biface and biface flake suggest that biface reduction also took place. In spite of the variability in materials found, glassy or fine-grained material predominate in all (Area A=72.0 percent, Area B=51.4 percent, Area C=81.8 percent). None of the material was considered coarse-grained, and relatively little was medium-grained (12.0, 34.3, and 13.6 percent, respectively). Much of the quartzite used at this site was fine-grained, including all of that from Area A, 44 percent of that from Area B, and 70 percent of that from Area C. The only wear recorded in this assemblage was on an early-stage quartzite biface recovered from the surface of Area C, suggesting that the primary activities carried out at this site involved lithic reduction.

Summary and Interpretation

Investigations at LA 117255 found sparse and widely scattered evidence of human use of the site area. Features were limited to two thermal features in Area A, although additional features could have been removed when U.S. 285 was built. The lack of substantial cultural deposits (even charcoal flecks) and the character of the lithic assemblage suggest that only limited activities took place. The radiocarbon date from Feature 1 indicates an occupation sometime around 570 ± 60 B.C.,

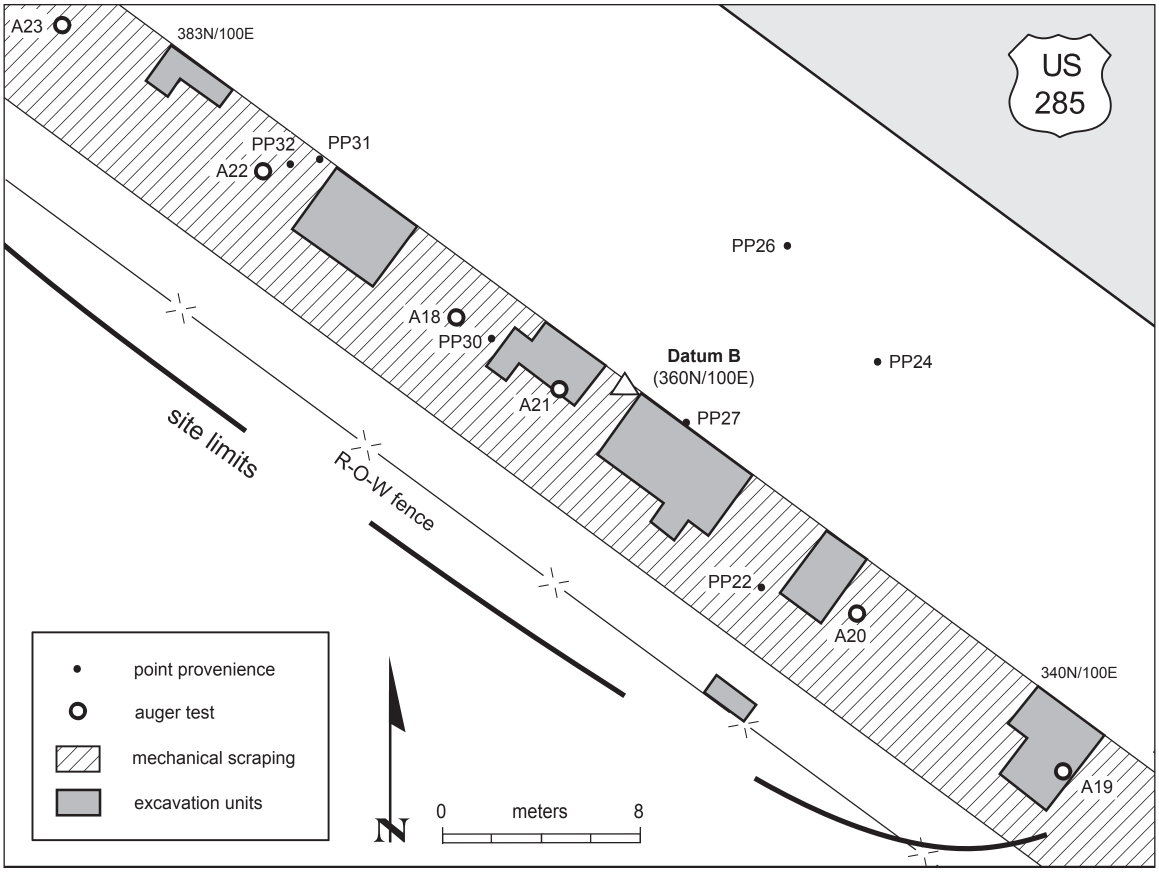

Figure 14. Plan of LA 117255 Area B excavated grids.

Figure 15. Area B at LA 117255, 354N area, looking north.

Table 5. Lithic artifacts from LA 117255.

Material Type	Artifact Morphology									Row Total
	Angular Debris	Core Flake	Biface Flake	Bipolar Flake	Pot Lid	Tested Cobble	Multi-directional Core	Early-Stage Biface	Late-Stage Biface	
Area A										
Chert	3 100.0%	8 47.1%	1 100.0%	- -	2 100.0%	- -	- -	- -	- -	14 56.0%
Silicified wood	- -	- -	- -	1 100.0%	- -	- -	- -	- -	- -	1 4.0%
Obsidian	- -	2 11.8%	- -	- -	- -	- -	- -	- -	- -	2 8.0%
Siltite	- -	1 5.9%	- -	- -	- -	- -	- -	- -	- -	1 4.0%
Siltstone	- -	3 17.6%	- -	- -	- -	- -	- -	- -	- -	3 12.0%
Quartzite	- -	1 5.9%	- -	- -	- -	1 100.0%	- -	- -	- -	2 8.0%
Quartzitic sandstone	- -	1 5.9%	- -	- -	- -	- -	- -	- -	- -	1 4.0%
Area A row total	3 12.0%	17 68.0%	1 4.0%	1 4.0%	2 8.0%	1 4.0%	- -	- -	- -	25 100.0%
Area B										
Chert	2 25.0%	7 31.8%	1 100.0%	- -	- -	- -	- -	- -	1 100.0%	11 31.4%
San Andreas chert	- -	1 4.5%	- -	- -	- -	- -	- -	- -	- -	1 2.9%
Silicified wood	- -	- -	- -	- -	- -	- -	1 50.0%	- -	- -	1 2.9%
Siltite	- -	1 4.5%	- -	- -	- -	- -	- -	- -	- -	1 2.9%
Rhyolite	1 12.5%	- -	- -	- -	- -	1 100.0%	- -	- -	- -	2 5.8%
Andesite	- -	1 4.5%	- -	- -	- -	- -	- -	- -	- -	1 2.9%
Siltstone	- -	2 9.0%	- -	- -	- -	- -	- -	- -	- -	2 5.8%
Quartzite	5 62.5%	10 45.4%	- -	- -	- -	- -	1 50.0%	- -	- -	16 45.7%
Area B row total	8 22.9%	22 62.9%	1 2.9%	- -	- -	1 2.9%	2 5.8%	- -	1 2.9%	35 100.0%
Area C										
Chert	- -	4 25.0%	- -	- -	- -	2 40.0%	- -	- -	- -	6 27.3%
Obsidian	- -	2 12.5%	- -	- -	- -	- -	- -	- -	- -	2 9.1%
Siltstone	- -	2 12.5%	- -	- -	- -	- -	- -	- -	- -	2 9.1%
Siltite	- -	2 12.5%	- -	- -	- -	- -	- -	- -	- -	2 9.1%
Quartzite	- -	6 37.5%	- -	- -	- -	3 30.0%	- -	1 100.0%	- -	10 45.4%
Area C row total	- -	16 72.7%	- -	- -	- -	5 22.7%	- -	1 4.5%	- -	22 100.0%

which, in conjunction with an absence of ceramics, indicates an Archaic period use of the site area.

Archaic period sites in the Pecos Valley and surrounding area are mainly artifact scatters (62.3 percent). Just under a third (30.5 percent) also have thermal features (Sebastian and Larralde 1989:137). The presence of numerous scatters and potential camp sites throughout the area is consistent with a mobile hunting and gathering adaptation dependent on plant resources and small game. Water may have accumulated to the west of LA 117255, and this may have been a critical factor in the use of the site area by mobile groups in an area with little permanent water. This site probably represents a series of brief and limited-use episodes by highly mobile groups who occasionally exploited the very sparse resources occurring in this area. Certainly, the range and quality of lithic materials, especially the obsidian and San Andres chert, reflect a degree of mobility.

Evaluation and Data Potential

It is difficult to estimate the potential of finding additional cultural resources in this particular area. All of the artifacts and features found were in areas disturbed by construction. This leaves open the possibility of additional buried resources outside the disturbed area investigated as this site. As for the highway right-of-way, the potential for recovering any, yet alone significant, information has been exhausted. No further work is recommended.

CHAPTER 7

LA 117248 (THE ARAÑA SITE)

BY DOROTHY A. ZAMORA

Environment and Condition

The Araña site is on a nearly level plain on the east side of U.S. 285 at an elevation of 1,228 m (4,030 ft). It is in an environment of mesquite, Russian thistle, tall grass, and modern weeds on overgrazed land (Fig. 16). The site lies within the Alama-Poquita soil association. These are deep, well-drained soils formed in calcareous alluvium. Alama soils are a strong brown loam at the surface with a subsoil of reddish brown and yellowish red clay loam. Poquita soils are reddish brown and yellowish red fine sandy loam and loam on the surface, and a yellowish red clay loam subsurface (Lenfesty 1980:16). The site is 0.25 km northeast of a small unnamed drainage and 1.5 km northeast of the Middle Fork of Fivemile Draw. Most of the topsoil within the highway right-of-way corridor has eroded away, leaving the sterile hardpan of clay with chipped stone exposed. Sand is present around the mesquite and in areas where grass is present.

The site area has been disturbed by grazing, wind and water erosion, road construction and maintenance, installation and maintenance of power poles, and two underground cables. Erosion, especially, has had a major impact on the site. If features were present within the corridor, they have disappeared. Two telecommunications cable lines were placed along the existing fence. A ditch, now an arroyo, cut for a county road drainage defines the eastern boundary of the site. A road maintenance drainage ditch for U.S. 285 also cuts through the site at the western end.

Figure 16. Environment at LA 117248 (the Araña site).

Site Description

The Araña site is on land owned by the Bureau of Land Management. It is a long (200 by 160 m) lithic artifact scatter encompassing an area of 32,000 square meters (Fig. 17) and consists of three discrete concentrations of core flakes and angular debris on the east side of U.S. 285. During the initial survey, Phillips et al. (1997:5.5) noted artifacts on the west side of U.S. 285. OAS conducted a thorough reconnaissance of the area and found no artifacts; however, several pieces of gravel from road construction were observed.

Table 6 summarizes the size and number of excavated and surface-collected units. Each scatter consists of a variety of lithic materials. Quartzite is the most common. The North Cluster is at the northern part of the site, 3.5 m east of the existing right-of-way-fence. The Middle Cluster, the largest, is at the center of the site on both sides of the existing right-of-way fence. The South Cluster is not as large as the Middle Cluster, but the artifact density is higher. It also extends on both sides of the existing fence.

The only feature noted at the site is a small, intact hearth near the arroyo and outside the highway right-of-way (Fig. 17). It is east of the arroyo and has a small amount of fire-cracked rock scattered around it. It measures 25.0 cm north to south by 23.0 cm east to west. Soil is dispersed and charcoal stained, and no burned wood is visible. Several lithic artifacts consisting of core flakes, angular debris, an exhausted core, and a hammerstone are near the hearth. The soil in this area is deeper because the dense vegetation has stabilized it.

Table 6. Artifact concentrations at LA 117248.

Cluster	Length (m)	Width (m)	Excavated Grids	Collected Grids
North	9	28	1	5
Middle	69	30	8	54
South	47.5	34	6	53

Table 7. Stratigraphy at the Araña site.

Stratigraphy	Matrix	Color	Thickness
Layer 1	sandy silty sand	7.5YR 5/6 strong brown	10 to 18 cm
Layer 2	sandy clay	5YR 5/6 yellowish red	20 to 26 cm
Layer 3	sterile red sand with caliche	5YR 5/6 yellowish red	20 to 70 cm

Data Recovery Results

Excavations at LA 117248 took place under BLM Permit 21-8152-97-12 from August 11 to 21, 1997. The crew members were Phil Alldritt, Jim Quaranta, Robert Sparks, Jennifer Ware, and Alice Wydro, supervised by Dorothy A. Zamora. Alley Cat Excavations did the surface scraping and trench excavation for the site after all hand excavations were completed.

Before excavations began, a main datum was established and baselines were established in a north-south and an east-west direction. After the baselines were set up, the site area was surveyed in transects 3.0 m apart and each artifact marked with a pinflag. Artifact concentrations were mapped with a Pentax total station. Artifacts within the proposed corridor were collected in 1 by 1 m units. Each grid was given a north and east designation. Tools and diagnostic artifacts were bagged separately.

Hand-excavated grids were placed in areas with potential for subsurface cultural materials based on artifact densities. Nineteen grids were excavated in 10-cm levels and all fill screened through quarter-inch hardware cloth. Three stratigraphic breaks were noted in the excavated units (Table 7).

Layer 1, a silty sandy substrate, contains very few artifacts. Only three of the excavated grids produced any subsurface materials, a total of five artifacts. These artifacts were found just below the present ground surface. Below this level the soil was compact, with clay and caliche, and in some areas very gravelly sand. Once the hand excavations were completed, an auger test was placed in the center of each grid to ensure that sterile had been reached. These reached a depth of 30 to 60 cm.

A total of 667.4 cubic meters of soil was excavated on the site. The breakdown for each type of excavation method is given in Table 8. Mechanical stripping and trenching did not reveal any cultural features (Fig. 18). Stripping in 10-cm levels stopped at 20 cm when no cultural materials or features were found. In some areas caliche was exposed, and in others the soil was sterile, red, sandy clay. When the stripping did not reveal any features, a 21 m trench was excavated through the largest concentration down to solid caliche or gravel (Fig. 19). The trench contained the same soils as the hand excavations, confirming that the soils had eroded down to sterile soil and left the artifacts exposed (Fig. 20). All three layers lacked cultural material.

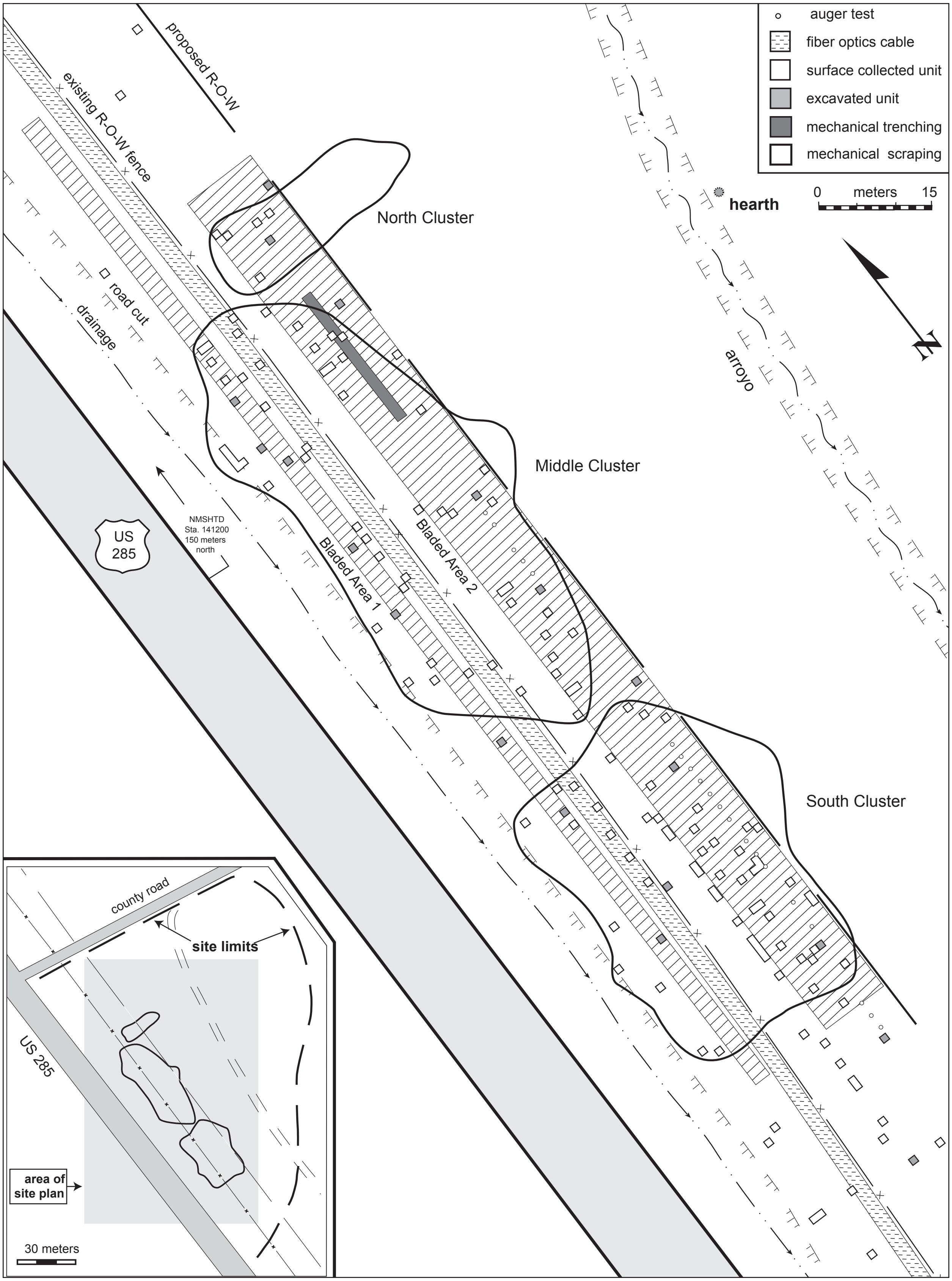

Figure 17. Plan of LA 117248.

Table 8. Total area excavated at the Araña site.

Excavation Method	Length (m)	Width (m)	Depth (m)	Square Meters	Cubic Meters
Mechanical Stripping Area 1	137	11	0.2	1,507	301.4
Mechanical Stripping Area 2	158	3	0.2	474	94.8
Mechanical trench	20	15	0.7	300	210
Hand Excavation Units (N=19)	1	1	3.2	19	60.8
Total	316	30	4.3	2,300	667.4

Besides stripping and trenching, 26 hand auger tests were placed at intervals of 2 m in areas where artifacts were dense but no grids were excavated (see Fig. 17). The depth of the auger tests ranged from 0.2 to 1.3 m depending on the compaction of the caliche and the amount of gravel present in that particular area. The auger tests revealed no cultural material.

Material Culture

The artifact assemblage at the Araña site consists of 120 pieces of chipped stone (Table 9). Core flakes (70.8 percent) are the most frequent artifact type, and the most utilized materials are various colors of quartzite (48.3 percent) and chert (29.2 percent). Some of these materials could have come from the gravel terraces along the Pecos River. Jelinek (1967) states that the terraces north of Roswell contain quartzose rocks, including chert, quartzite, siltstone, agate, chalcedony, and silicified wood. Others could have been obtained from the north or west. At least five nearby soil types contain large numbers of cobbles (Lenfesty et al. 1980). Phillips et al. (1997:5.6) note purple quartzite and chert gravel eroding from cuts and blowouts at the site. No formal or informal tools were found. The assemblage is primarily early-stage core reduction (Moore, this volume).

Figure 18. Mechanical stripping at LA 117248, looking south.

Figure 19. Trench at LA 117248, looking south.

Summary and Interpretation

The Araña site cannot be assigned to a cultural period. The fact that no ceramics were found could indicate it dates to the Archaic; however, without diagnostic artifacts, this cannot be confirmed (see Moore, this volume). It is possible that the site served as a temporary campsite, as suggested by the number of chipped stone artifacts and the hearth. The size of the hearth and lack of evidence of burning indicate that it was probably used no more than once or twice. The soil was not oxidized, and charcoal was not visible on the surface or within the scattered charcoal-stained sand. Although we collected only 120 items, a large number of lithic artifacts remain outside of the highway right-of-way.

Evaluation and Data Potential

LA 117248 has no significant cultural depth. The cultural remains exposed by erosion consist of lithic artifacts of many different materials. The absence of cultural features such as pit structures or above-ground structures, storage pits, hearths, and roasting pits within the right-of-way makes it difficult to assign site function. Excavations at this site have reduced much of the potential to provide information that would contribute to our knowledge of the prehistory of the area. An exception is the hearth outside the highway corridor, which could

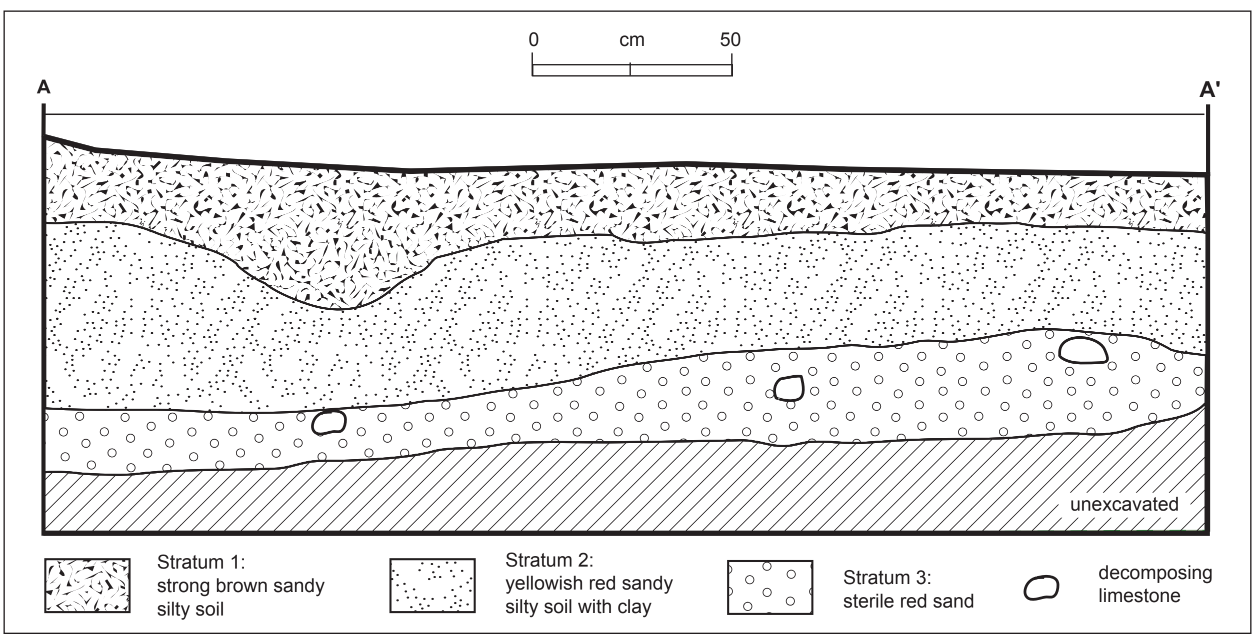

Figure 20. Plan of backhoe trench stratigraphy.

produce economic and datable material. With the amount of current damage by erosion, it is possible that the hearth will not last much longer. The potential of finding any more features is very small, and no further work is needed within the proposed right-of-way corridor.

Table 9. Chipped stone artifacts from the Araña site.

Material	Morphology						Row Total
	Angular Debris	Core Flake	Tested Cobble	Uni-directional Core	Multi-directional Core	Bipolar Core	
Chert	8 30.8%	25 29.4%	- -	- -	1 25.0%	1 100.0%	35 29.2%
San Andres chert	- -	3 3.6%	- -	- -	- -	- -	3 2.5%
Silicified wood	- -	1 1.2%	- -	- -	- -	- -	1 0.8%
Basalt	- -	2 2.4%	- -	- -	- -	- -	2 1.7%
Granite	- -	- -	1 33.3%	- -	- -	- -	1 0.8%
Rhyolite	- -	- -	1 33.3%	- -	- -	- -	1 0.8%
Siltstone	5 19.2%	6 7.1%	- -	- -	- -	- -	11 9.2%
Quartzite	11 42.3%	43 50.6%	1 33.3%	1 100.0%	3 50.0%	- -	58 48.3%
Quartzitic sandstone	2 7.7%	5 5.9%	- -	- -	1 25.0%	- -	8 6.7%
Row total	26 21.7%	85 70.8%	3 2.5%	1 0.8%.	4 3.3%	1 0.8%	120 100.0%

CHAPTER 8

LA 51095

BY JOHN A. WARE

Environment and Condition

LA 51095 is on gently sloping, treeless terrain on the east side of U.S. 285 with commanding views to the east, west, and south. The east fork of Fivemile Draw is 1.2 km west of the site and cuts a shallow canyon that served as the most likely source of water and raw materials for lithic tool manufacture. The walls of the canyon are sufficiently steep to have served as a trap or catchment for pronghorn, which are the most abundant local large-mammal species in the region.

The site is in a high plains, short grass community dominated by grama and other grasses and yucca. Various xeric shrubs including saltbush occur along the road edge and ephemeral water course (Fig. 21). The principal soils belong to the Alama-Poquita association, described as deep and well-drained with pockets of recent alluvium overlying a clay hardpan and sedimentary substrate (Lenfesty 1980).

LA 51095 is heavily disturbed by both highway and roadside utility construction. Over half of the site within the U.S. 285 right-of-way was disturbed during construction of the roadbed and adjacent drainage structures. The east-side right-of-way fence is associated with a parallel bladed track several meters in width just outside the highway corridor. A small stock tank was constructed immediately east of the right-of-way fence and within the main site scatter. Other right-of-way disturbances include an overhead powerline and a buried fiber optic cable. Outside the right-of-way, livestock overgrazing is contributing to a general denuding of the landscape.

Figure 21. LA 51095 with Locus C in the foreground.

Site Description

LA 51095 was first recorded by Norman Nelson (1985) and Charles Haecker of the NMSHTD, who described a diffuse lithic scatter measuring 60 by 15 m and containing at least three clusters of fire-cracked rock (Fig. 22). Since the fire-cracked rock features were noted along the edges of a shallow, bladed area immediately outside of the eastern right-of-way fence, it was determined that there was a high likelihood of additional buried cultural deposits. Subsequently, Yvonne Oakes and Dorothy Zamora of the Museum of New Mexico conducted test excavations at the site (Oakes 1986) and recorded 173 flaked stone artifacts but no evidence of features or buried cultural deposits. Based on these limited data returns, no additional work was carried out or recommended at the site.

In the winter of 1997 the site was resurveyed by SWCA, and the boundaries of the surface artifact concentration were expanded considerably (Fig. 23). SWCA crews defined a diffuse area of surface lithic artifacts extending north from the original site boundaries nearly 700 m, including a large area west of the U.S. 285 right-of-way. Within this large scatter were three smaller surface concentrations: Locus A is on the east side of the highway and corresponds roughly with the original site boundary recorded by Nelson and Haecker and tested by Oakes and Zamora. Locus B and Locus C, north of Locus A on the east (B) and west (C) side of the highway, consist primarily of secondary and tertiary flakes of chert, quartzite, limestone, and a fine-grained igneous material (Phillips et al. 1997:18). SWCA crews noted extensive disturbance within the highway right-of-way from bar ditch and utility construction, with the likelihood of significant displacement of surface artifacts. No fire-cracked rock features were noted in the SWCA surveys.

Surveys preliminary to the present project found a fourth artifact concentration (Locus D) immediately east of the eastern right-of-way fence and 50 m north of the previously recorded site boundary (Fig. 24). The excavations described in this report were concentrated in the vicinities of Loci B, C, and D, and intensive surveys were conducted within the project area several hundred meters on either side of these surface manifestations. The current estimated site size is about 800 m north to south by 100 m east to west.

Data Recovery Results

Data recovery at LA 51095 took place from August 4 to 8, 1997. Backhoe excavations and mechanical blading operations occurred on August 21, 1997. The field crew consisted of Phil Alldritt, Jesse Murrell, Alice Wydro, Jim Quaranta, and John Ware. Backhoe excavations were conducted by Alley Cat Excavations under the supervision of John Ware.

Field methods followed procedures outlined in the approved data recovery plan for the Salt Creek Archaeological Project (Lentz et al. 1997). The first task entailed an intensive pedestrian survey of the project area, a rectangular area measuring 50 m east-west by over 700 m north-south. The survey, which took most of the first day to complete, was conducted by the field crew walking closely spaced (approx. 1-3 m, depending on ground visibility) transects parallel to the highway. During the survey all surface artifacts were marked with pinflags to facilitate mapping and collection. Visibility over most of the ground surface within the highway right-of-way averaged less than 20 percent due to a heavy vegetation cover, and so surface collections probably represent a small sample of the total surface artifacts present. The plotting of artifact locations permitted field crews to reconstruct the primary artifact concentrations noted on prior site surveys (Loci B and C) and a third previously unrecorded concentration (Locus D) nearly 200 m north of Locus B and just outside the eastern right-of-way fence. Hand and mechanical excavations were concentrated in and around these areas of high surface artifact density.

Once the survey was completed, the site was mapped with the aid of a Pentax total station (Fig. 25). The main north-south baseline (the actual orientation of the baseline was 20 degrees west of magnetic north) for a coordinate grid system was established parallel to U.S. 285 along the western right-of-way edge just inside the highway fence. A point was arbitrarily selected along the baseline just south of the Locus C artifact concentration to serve as the principal mapping datum (Datum A), and this point was arbitrarily assigned the coordinates 500N 500E. An arbitrary elevation of 500 m was also assigned to Datum A. All grid corners and subordinate mapping stations were established from Datum A with the aid of the laser transit and prism.

Ten 1 by 1 m units were established in or immediately adjacent to the primary artifact concentrations (Loci B, C, and D), because there were no surface indications of buried features at the sites. Units were placed on the principal axes of the grid system and assigned a northing and easting provenience based on the coordinates of the unit's northwest grid stake. Excavations proceeded in arbitrary 10-cm levels using standard hand tools (shovels, trowels, brooms, etc.). Except as noted in the unit descriptions below, all unit fill was screened through 1/4-inch wire mesh. Artifacts and nonartifactual samples recovered from each level were collected and bagged separately. After one or two culturally sterile

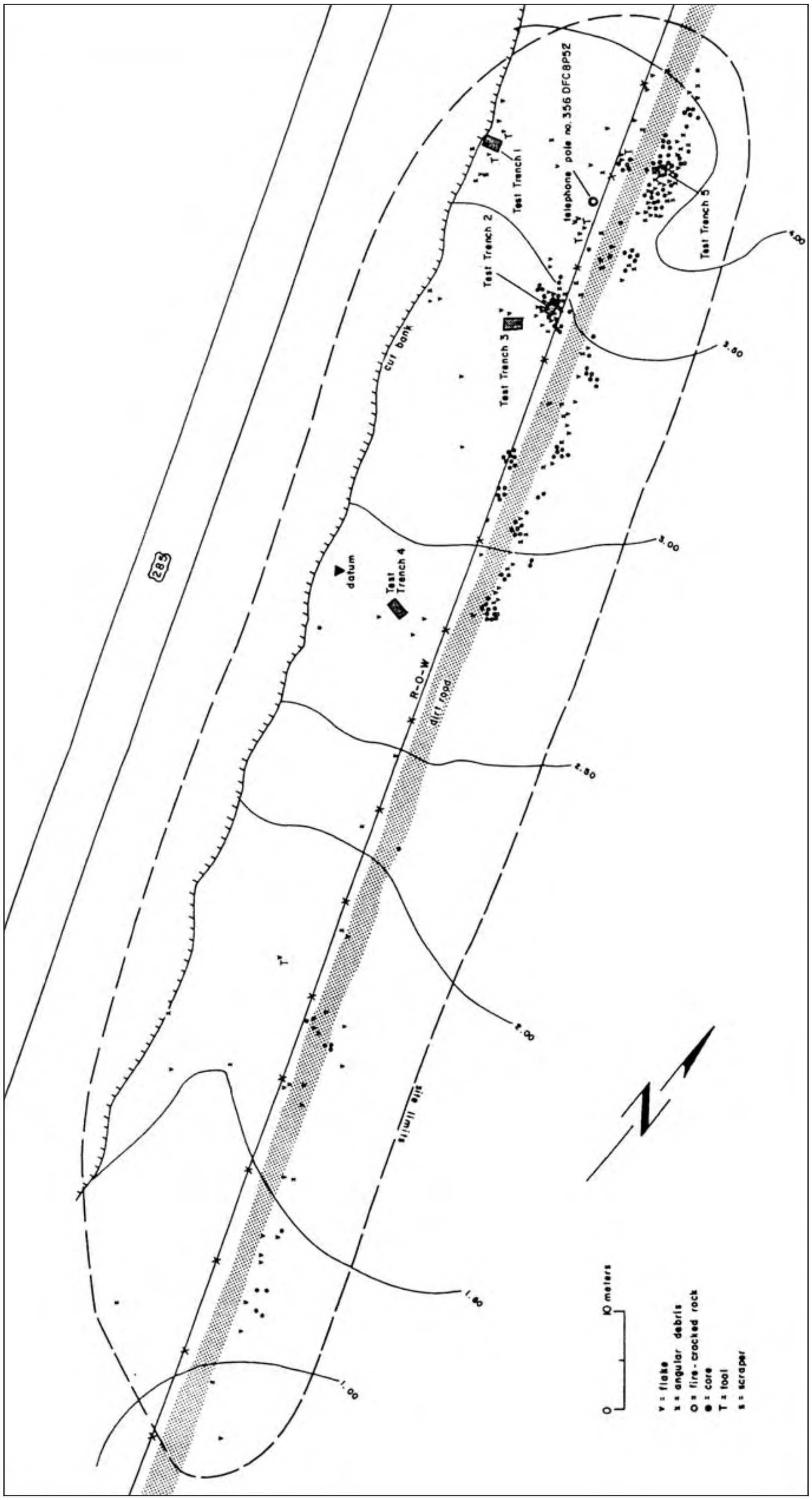

Figure 22. Plan of LA 51095, Locus A, showing extent of testing in 1985.

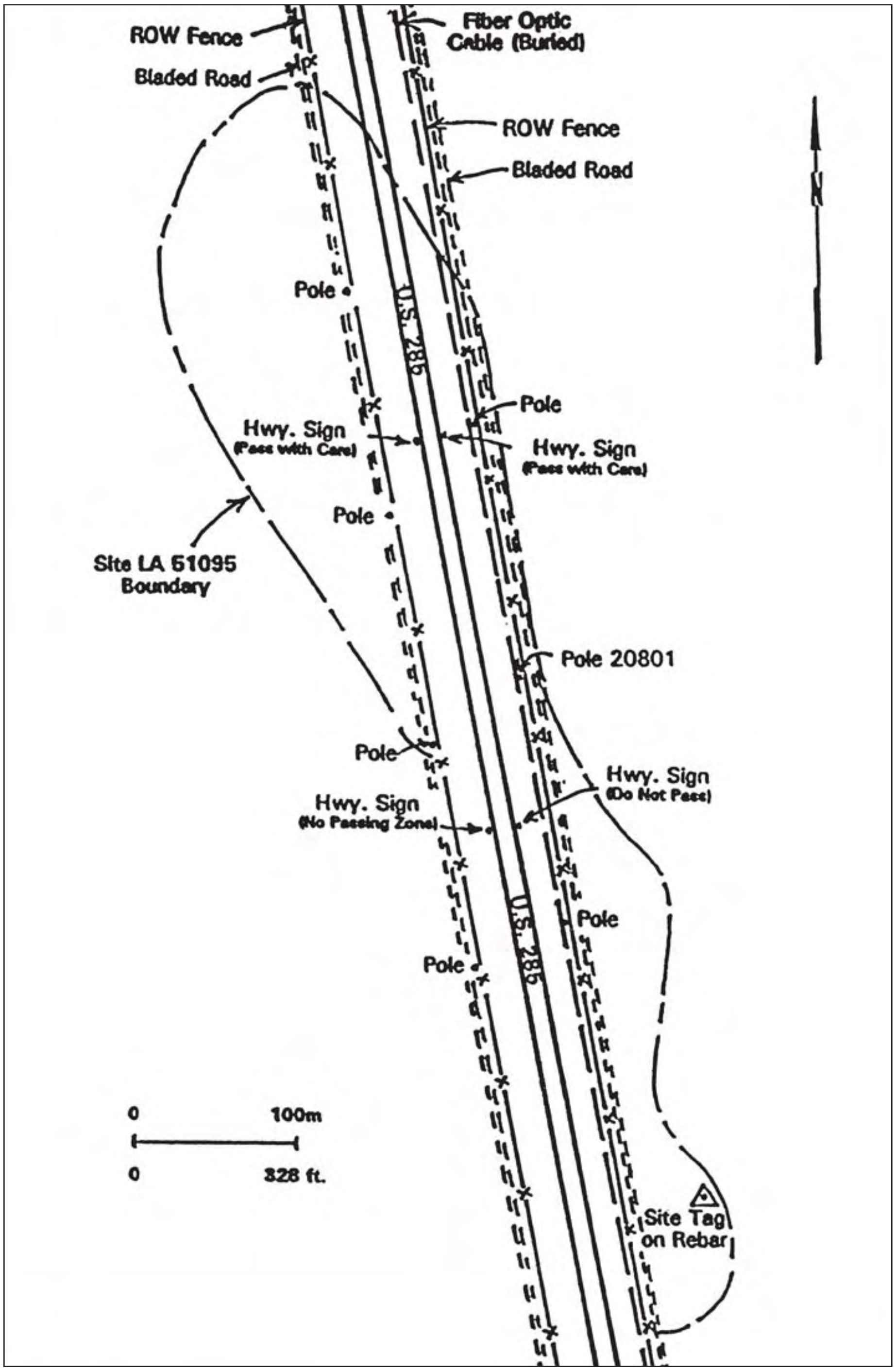

Figure 23. Plan of LA 51095 showing expanded site boundaries resulting from SWCA resurvey.

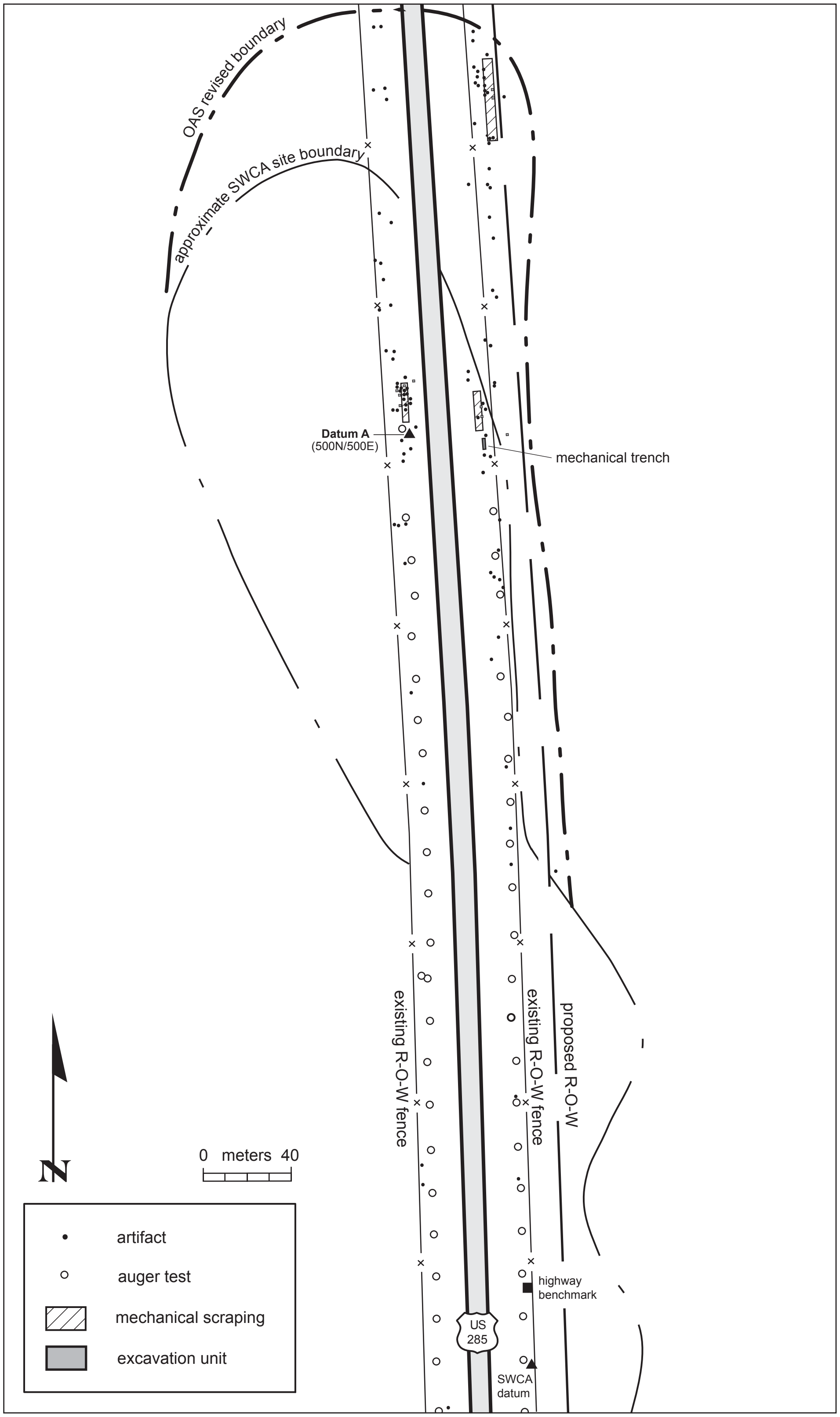

Figure 24. Plan of LA 51095.

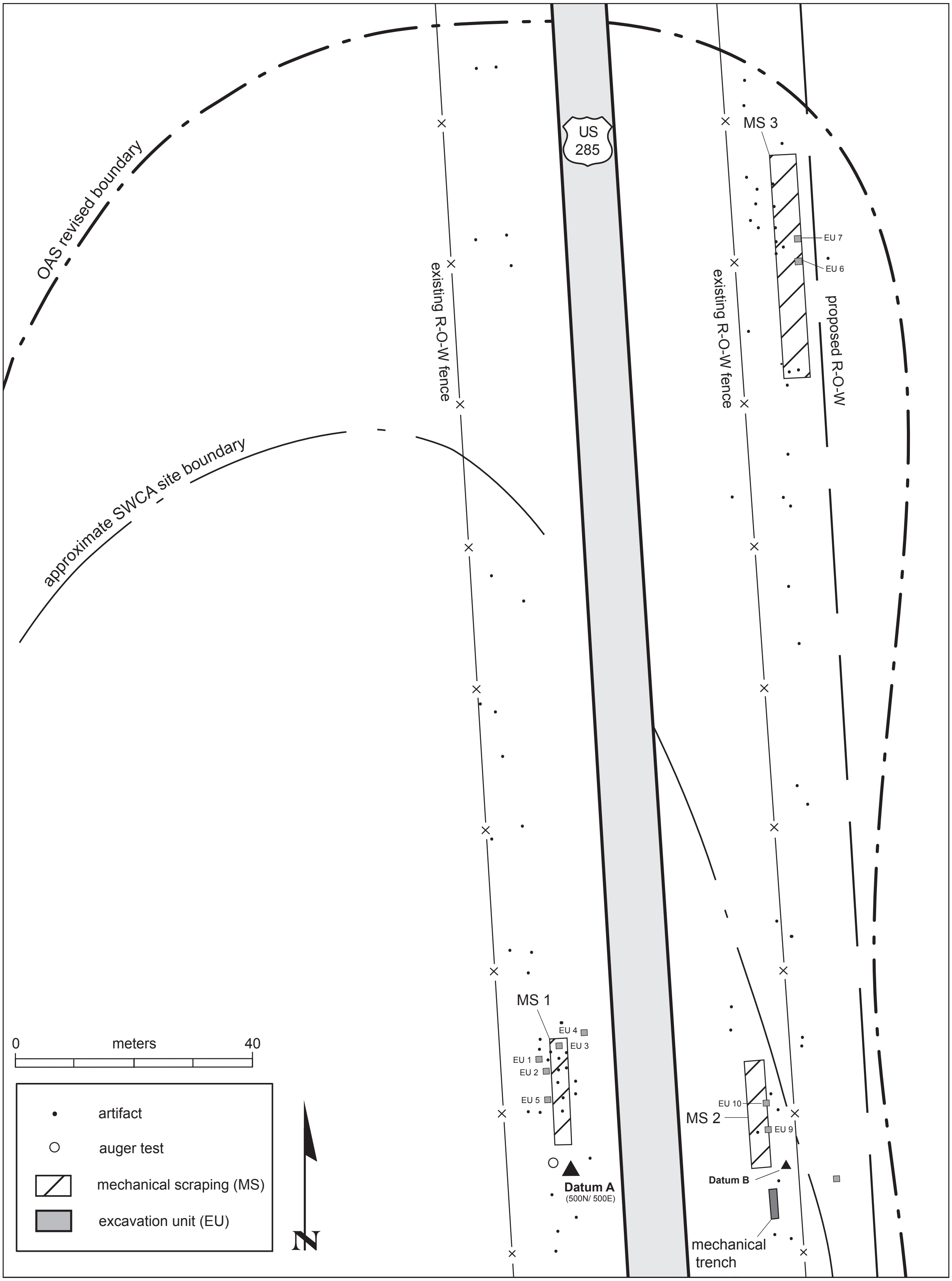

Figure 25. Plan of LA 51095 showing areas of excavation and survey conducted during OAS project.

levels were excavated in a unit, hand excavation was terminated and a soil auger hole was excavated in the floor of the unit to rule out deeply buried cultural deposits. Auger tests averaged 50 cm to 100 cm in depth, depending on the nature and compaction of substrate deposits (in several instances the presence of a calcium carbonate or caliche hardpan forced the curtailment of excavation below about 50 cm). Standardized excavation unit descriptive forms were completed for each unit level, and at the completion of excavation, a soil profile was drawn and photographs were made.

In addition to grid excavations, 72 soil auger tests were excavated at 25 m intervals along the length of the site on both sides of the U.S. 285 right-of-way. Fill from all auger tests was screened through 1/4-inch wire mesh, and the depth of the test and a brief soil description were recorded on standardized forms.

At the completion of hand excavations, mechanical stripping with a backhoe front-end loader was conducted on both sides of the highway right-of-way in the vicinities of the principal artifact concentrations, and a 10 m backhoe trench was excavated in the eastern right-of-way, parallel to the highway. These excavations were closely monitored, and upon completion, they were cleaned, photographed, and documented.

Ten 1-by-1-m excavation units were excavated at LA 51095: five units within the highway right-of-way west of U.S. 285, two units within the highway right-of-way immediately east of the highway, and three units to the east of the right-of-way fence but within the project limits (Fig. 25). Units were excavated by hand in arbitrary 10-cm levels, in most cases to a depth of 30 cm below present ground surface. The results of these excavations are presented in tabular form (Tables 10-19).

In addition to the 10 auger holes excavated in the bottoms of the excavation units described above, a total of 72 systematic auger tests were excavated at approximately 25-m intervals on both sides of the highway right-of-way (34 east and 38 west), along the entire long (north-south) axis of the site. Fill from the auger excavations were examined at 10- to 20-cm intervals. The stratigraphy encountered in these auger holes was consistent with the stratigraphy described in the 10 excavation units. All of the auger holes were culturally sterile, and most were terminated at a depth of 50 to 60 cm below present ground surface.

At the completion of surface collections and hand excavations at LA 51095, a mechanical front-end loader was used to excavate three rectangular blocks in areas adjacent to the primary hand excavation units to rule out the presence of buried features and cultural deposits associated with the principal artifact concentrations at the site. Backhoe Strip 1 was excavated in the western right-of-way, in the vicinity of artifact Locus C, and measured approximately 22 m long (north-south) by 4 m wide by 30-40 cm deep. Backhoe Strip 2 was excavated in the eastern right-of-way, in the vicinity of Locus B, and measured 23 m long (north-south) by 4 m wide by 30 cm to 40 cm deep. Backhoe Strip 3 was excavated outside the eastern right-of-way fence in the vicinity of Locus D and measured 47 m long (north-south) by 5 m wide by 30 cm to 40 cm deep. No evidence of cultural staining or buried cultural deposits was noted in any of the mechanical strip areas, adding fur-

Table 10 LA 51095 EU 1, Locus C

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	sandy loam overlying strong clay layer	strong brown 7.5 YR 5/6	two flakes recovered at or near surface; unit surface covered with grasses and weeds; some root and insect disturbance
2	well consolidated clay with caliche nodules and soil flecking	reddish brown 5 YR 4/4	single flake recovered from level 2; no obvious disturbances noted
3	well consolidated clay with 15 percent gravel inclusions and caliche	reddish brown 5 YR 4/4	no artifacts or other evidence of cultural deposits; no obvious disturbance; only north half of unit excavated in Level 3
auger	well to loosely consolidated sand and gravel	reddish yellow 5 YR 4/4 to 6/6	soil grading from clay to gravelly sand with abundant calcium carbonate inclusions; no artifacts or evidence of cultural disturbance

Comments: This 1-by-1-m unit was excavated to a depth of 30 cm near the center of Locus C on the west side of U.S. 285 (N526/E496). The soil profile of Unit 1 consisted of a sandy loam in the first 10 cm grading to a layer of clay loam with strong caliche staining and loosely consolidated sand and gravel at depth. Two lithic flakes were recovered from the first 4 cm of unit fill, and a single flake was recovered from the 10-20 cm level. This was the deepest evidence of cultural material recovered from any excavation unit at the site. However, the flake was unaccompanied by any evidence of charcoal staining, so the significance of this depth is problematic. An auger test was excavated in the bottom of the unit to a depth of 1.3 m below present ground surface. No cultural material was recovered from the auger hole.

Table 11. LA 51095 EU 2, Locus C.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	fine-grained clay loam; some small gravels	strong brown 7.5 YR 5/6	two small flakes from at or near surface; plant root disturbance in first 5 cm
2	clay loam with small caliche fragments	strong brown 7.5 YR 4/6	no artifacts or organics and no obvious disturbance
3	clay loam with caliche inclusions	strong brown 7.5 YR 4/6	no artifacts or other cultural inclusions; only east half of unit excavated
auger	clay to sandy loam with strong calcium carbonate component at depth	strong brown 7.5 YR 4/6	no artifacts or other cultural evidence; hard caliche layer at 70 cm below ground surface; soil sandier below caliche

Comments: This 1-by-1-m excavation unit was placed along the south edge of a small surface lithic concentration (Locus C) on the west side of U.S. 285 (N522/E497). The unit was excavated to a depth of 30 cm below present ground surface through very fine-grained, well consolidated, sandy clay loam. The upper 10 cm was mixed with small amounts of gravel (<5%) and appeared to be primarily of eolian origin. The lower two levels were clayey, with strong caliche staining appearing at 20 cm below ground surface. Two flakes were recovered from the first 10 cm level, on or near the surface. The lower levels appeared to be culturally sterile. An auger test was excavated from the 30 cm level to a depth of 112 cm below present ground surface. The test was culturally sterile.

Table 12. LA 51095 EU 3, Locus C.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	very fine grain silty loam; small gravels	strong brown 7.5 YR 5/6	three lithic flakes on or near the surface of unit; extensive insect and plant disturbance
2	very fine grain, compact silty-clay loam	brown 7.5 YR 5/4	no artifacts and no visible disturbance
3	massive silty loam with clay; light caliche flecks	brown 7.5 YR 5/4	no artifacts recovered; only west half of unit excavated; very compact clay at 30 cm level
auger	massive clay grading to caliche hardpan	brown 7.5 YR 5/4	auger excavation terminated at impenetrable calcium carbonate hardpan; culturally sterile

Comments: Unit 3 (1 by 1 m) was excavated to a depth of 30 cm on the west side of U.S. 285 near the center of Locus C (N527/E500). The soil profile was similar to nearby excavation units, with an eolian sand surface layer overlying a massive clay substrate with caliche flecking. Three flakes were recovered near the surface of the grid, but all subsurface levels were culturally sterile. A sterile auger hole was excavated at the bottom of the 30 cm level to a depth of 70 cm below present ground surface, terminating at a caliche hardpan.

Table 13. LA 51095 EU 4, Locus C.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	sandy clay loam	strong brown 7.5 YR 5/6	single unutilized flake recovered from at or near surface; roadside garbage (glass, plastic, etc.) on surface of unit
2	silty loam with some clay and trace gravel	reddish brown 2.5 YR 4/4	no prehistoric artifacts; modern refuse (glass, plastic, rubber tire fragment) was present throughout unit; minimal rodent disturbance
3	silty loam with some clay and caliche	reddish brown to red 2.5 YR 4/4 to 4/6	excavation limited to west half of unit; no prehistoric artifacts recovered; modern refuse drops off; some rodent disturbance
auger	silty loam with clay and caliche inclusions	reddish brown to red 2.5 YR	no artifacts recovered; excavation terminated at approx. 90 cm below ground surface

Comments: Unit 4 (1 by 1 m) was excavated to a depth of 30 cm near the eastern edge of Locus C on the west side of U.S. 285 (N529/E505). The surface of the test was highly disturbed by the prior excavation of a roadside drainage ditch, and there was a significant quantity of modern refuse in the immediate vicinity of the unit. Upper levels consisted of sand-silt loam with small gravel inclusions at the 10-20 cm level. A single flaked stone artifact was recovered near the surface of the grid from the 0-10 cm level; lower excavation levels were culturally sterile, with the exception of modern trash. A single auger test was excavated from the bottom of the unit to a depth of 90 cm below present ground surface. The auger test was culturally sterile.

Table 14. LA 51095 EU 5, Locus C.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	Fine-grain, sand-silt loam with 1 percent gravel	Strong brown 7.5 YR 5/6	no artifacts present on or below surface; surface very disturbed by roots and insects
2	Well consolidated silty loam with <1 percent gravels	Strong brown 7.5 YR 5/6	no artifacts or other evidence of cultural disturbance
auger	Silty grading to sandy loam with caliche staining and nodules	Reddish brown to Yellowish red 5 YR 5/4 to 6/6	auger test was culturally sterile; calcium carbonate layer encountered below 1.0 m, difficult to penetrate with hand soil auger

Comments: Unit 5 (1 by 1 m) was excavated to a depth of 20 cm in the southern half of Locus C on the west side of U.S. 285 (N516/E497). As with the other soil profiles on the west side of US 285, the upper 5-10 cm consists of sandy loam, possibly of eolian origin, which grades at depth to a massive clay loam with strong caliche flecking and small amounts of gravel. No artifacts or cultural staining was noted in the unit, so excavation was terminated at the 20-cm level. A soil auger test was excavated to a depth of 1.02 m below present ground surface, but no evidence of cultural material was recovered.

Table 15. LA 51095 EU 6, Locus D.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	fine-grained, well-sorted, sandy clay loam	strong brown 7.5 YR 4/6	no cultural materials were recovered; some plant roots in upper 5 cm; no other disturbances
2	sandy clay loam with caliche flecking turning to nodules at 15 cm	strong brown 7.5 YR 5/6	no cultural materials recovered, and no obvious disturbance noted
auger	sandy clay loam grading to massive clay loam with caliche cementing	strong brown 7.5 YR 5/6	no cultural materials present, and no evidence of cultural staining

Comments: Unit 6 (1 by 1 m) was placed near the center of a surface lithic scatter that was exposed in a shallow bladed road paralleling the eastern highway right-of-way fence of U.S. 285 (Locus D, N688/E555). The scatter is nearly 200 m north of Locus B and was noted during initial flagging operations at the site. There is no indication that the concentration was noted during prior surveys at LA 51095 (e.g., Phillips 1997). Unit 9 was excavated to a depth of 20 cm below present ground surface and was devoid of cultural material throughout the excavation profile. Soil stratigraphy was comparable to profiles recorded for Locus B and C. Due to the absence of artifactual remains, only half of the fill of the unit was screened through 1/4-inch mesh. A soil auger hole was excavated near the center of the unit to a maximum depth of 60 cm below present ground surface. The auger test was culturally sterile.

Table 16. LA 51095 EU 7, Locus D.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	fine-grain sandy clay loam with few inclusions	strong brown 7.5 YR 4/6	single lithic flake recovered from the surface of the unit; only light grass root disturbance was noted, and no cultural staining
2	fine-grain sandy clay loam with few inclusions	strong brown 7.5 YR 4/6	no artifacts, and no obvious cultural staining
auger	sandy clay loam grading to massive clay with caliche cementing	strong brown 7.5 YR 4/6	no artifacts, and no obvious cultural staining

Comments: Unit 7 (1 by 1 m) was placed 5 m north of Unit 6 near the northern edge of a small surface lithic scatter on the east side of U.S. 285, immediately east of the right-of-way fence (N693/E555). Unit 7 was excavated in 10-cm levels to a maximum depth of 20 cm, and a soil auger hole was excavated to a maximum depth of 50 cm below present ground surface near the center of the unit. A single flake was recovered near the surface from the 0-10 cm level, but Level 2 (10-20 cm) and the auger test were culturally sterile.

Table 17. LA 51095 EU 8, Locus B.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	well consolidated silt-sand loam	strong brown 7.5 YR 4/6	no cultural materials, and no visible signs of disturbance
2	well consolidated silt-sand loam	strong brown to yellowish brown 7.5 YR 4/6 to 6/4	no cultural materials, and no obvious disturbance noted
Auger	well consolidated silt-clay loam with caliche staining at depth	yellowish brown 7.5 YR 6/4	no cultural materials recovered; auger test terminated at caliche hardpan or bedrock

Comments: Unit 8 (1 by 1 m) was placed immediately east of the eastern right-of-way fence, along the eastern boundary of Locus B (N497/E557). No cultural material was recovered from the unit. Consequently, only half of the fill was screened, and hand excavations were terminated at 20 cm below present ground surface. Soil stratigraphy within the unit was comparable to other east-side pits, with a surface layer of sandy loam overlying massive silt-clay loam. Unlike other test pits at the site, there was little if any evidence of caliche within EU 8. A sterile auger test was excavated to a depth of 45 cm below present ground surface near the center of the excavation unit.

Table 18. LA 51095 EU 9, Locus B.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	fine-grain, sandy clay loam	strong brown 7.5 YR 4/6	four flakes in upper 5 cm of fill; plant root disturbance in upper 5 cm; no other disturbance
2	clay loam with light caliche flecking	strong brown 7.5 YR 4/6	no cultural materials recovered; rodent burrow traverses northwest corner of grid
3	sandy clay loam with caliche flecking	yellowish red 5 YR 4/6	no cultural materials, and no obvious disturbance
auger	clay loam grading to sand and caliche	yellowish red 5 YR 4/6	no cultural materials recovered

Comments: Unit 9 (1 by 1 m) was excavated on the east side of U.S. 285 (N508/E543) to test for subsurface cultural deposits associated with Locus B (Phillips 1997). Unit 9 was placed near the center of a low-density surface artifact scatter in a relatively undisturbed area between a utility excavation and a highway bar ditch. The unit was excavated to a depth of 35 cm below present ground surface in controlled 10-cm levels. Soil stratigraphy in the east right-of-way is similar to layers documented west of the highway, with a surface layer of sandy loam overlying massive clay loam with light to moderate caliche flecking. Although four lithic artifacts were recovered from near the surface in the 0-10 cm level (Level 1), lower levels were culturally sterile. An auger hole was excavated from the 30 cm level to a depth of 1.09 m below present ground surface. Fill from the auger test was culturally sterile.

Table 19. LA 51095 EU 10, Locus B.

Level	Soil Type	Munsell Color	Cultural Materials/Disturbance
1	very fine silt-sand loam	strong brown 7.5 YR 5/6	single lithic flake recovered; no obvious disturbance or cultural staining
2	compact silt-clay loam with small caliche gravel inclusions	strong brown to light brown 7.5 YR 5/6 to 6/4	no artifacts, and no obvious disturbance
3	compact silt-clay loam with small caliche gravel inclusions	strong brown to light brown 7.5 YR 5/6 to 6/4	two lithic flakes recovered but no evidence of cultural staining or other disturbance
4	very compact silt-clay loam with heavy caliche cementing	strong brown to light brown 7.5 YR 5/6 to 6/4	culturally sterile
auger	soft sand mixed with gravels grading to caliche substrate	reddish yellow 7.5 YR 6/6	no cultural materials or organics recovered; test terminated at caliche hardpan

Comments: Unit 10 (1 by 1 m) was excavated near the northern edge of Locus B on the east side of U.S. 285 (N514/E543). A single lithic flake was recovered from the upper portion of the 0-10 cm level in Unit 10, and two additional flakes were found in the 20-30 cm level within the test. Although the flakes were not found in association with cultural staining or other evidence of disturbance, a fourth level was excavated in the unit to rule out a buried feature or culture-bearing deposit. Aside from the two flakes, however, fill from the lower portions of the unit was massive, hard-packed, caliche-cemented, and apparently culturally sterile. An auger test to a depth of 70 cm below present ground surface encountered mixed sand and gravel deposits terminating in a caliche hardpan, with no evidence of cultural material.

ther support to the hypothesis that there are no cultural features at LA 51095 and cultural material is confined primarily to the upper 5 cm to 10 cm of surface soil.

As a final step in data recovery at LA 51095, a 5 m long backhoe trench was excavated on the eastern right-of-way parallel to U.S. 285, between grids 488N 543E and 493N 543E, to a maximum depth of 1.2 m below present ground surface, and the east face of the backhoe trench was cleaned and profiled (Fig. 26). The profile contained a weak A horizon consisting of a sandy clay loam from surface to about 40 cm below present ground surface (strong brown 7.5 yr 5/8); a B horizon consisting of massive clay (reddish yellow 7.5 yr 6/6) approximately 40 cm to 50 cm in thickness and separated from the A horizon by a strong but intermittent caliche lens; and a weak C horizon consisting of clay, sand, and what appear to be fragments of limestone bedrock at a depth of 0.9 to 1.20 m below present ground surface. No cultural materials or disturbances were observed in the trench profile, and after maps and photographs were made, the trench was filled in.

To summarize, no cultural features and only 17 artifacts were recovered during excavations at LA 51095. Subsurface artifacts were from extremely shallow depths, most coming from the top 5 cm of eolian sand. The absence of subsurface cultural staining suggests that the majority of cultural materials at LA 51095 are restricted to the surface, and this observation suggests two obvious conclusions. First, it is possible that the behaviors that occurred at the site were sufficiently ephemeral or superficial in nature as to leave little or no trace below the ground surface. That is, no prehistoric excavations were conducted, no features were cut, no structures were constructed. We will return to evaluate this hypothesis in the conclusions of this report following an examination of the artifact assemblage. Another possibility is that the prehistoric occupation surface at LA 51095 has been removed by surface or sheet erosion that removed cultural features and deposits and concentrated associated artifacts on an erosion surface well below the former occupation surface.

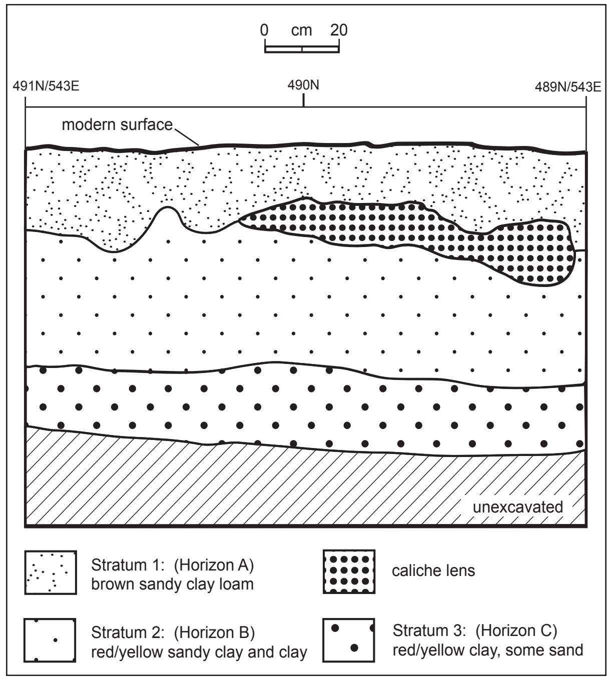

Figure 26. LA 51095, east face of backhoe stratigraphic trench.

Material Culture

A total of 161 artifacts were recovered during data recovery efforts at LA 51095, seventeen from subsurface proveniences and the remainder from the surface of the site. Unfortunately, analytical data for the majority (101 artifacts) of the site collections were lost due to computer error, leaving an analytical sample of only 60 artifacts to interpret for this report. The fortunate part of this loss is that all artifacts recovered at LA 51095 during fieldwork in 1997 were nondiagnostic lithic flakes and cores, and field inspections at the time of recovery suggest that there was considerable redundancy in the occurrence of most analytical attributes across the entire assemblage. Significantly, no formal tools or temporally/culturally diagnostic artifacts were recovered during the investigations, so we can be reasonably confident that no formal tools were lost and that the information content of the lost assemblage fraction was probably minimal. On the other hand, all of these mitigating statements must be qualified because the data never made it to the analysis table. Ultimately, the only positive thing that can be said about this particular loss is that a large percentage of the site assemblage remains intact outside the highway corridor.

The entire artifact assemblage recovered from LA 51095 consisted of lithic flakes and cores. The analytical assemblage consists of core flakes (61.6 percent), angular debris (23.3 percent), and cores and tested cobbles (15.0 percent). A diverse assemblage of lithic raw materials were reduced at the site. The most common material is chert (38.3 percent), followed by quartzite (31.7 percent), sedimentary limestones and siltstones (20.0 percent), and trace frequencies of igneous rocks and other materials. Flakes average 30.68 mm long, 28.42 mm wide, and 13.57 mm thick, with cryptocrystalline cherts falling well below this average, and other,

Table 20. Lithic artifacts from LA 51095.

Material Type	Tool Morphology				
	Angular Debris	Core Flake	Tested Cobble	Multi-directional Core	Row Total
Chert	6 42.9%	14 38.9%	- -	3 42.9%	23 38.3%
Silicified wood	- -	1 2.7%	- -	- -	1 1.7%
Basalt	- -	1 2.7%	- -	- -	1 1.7%
Rhyolite	1 7.1%	- -	- -	1 14.3%	2 3.3%
Limestone	3 21.4%	3 8.1%	- -	- -	6 10.0%
Siltstone	- -	4 10.8%	- -	1 14.3%	5 8.3%
Siltite	- -	1 2.7%	- -	- -	1 1.7%
Quartzite	3 21.4%	12 32.4%	2 100%	2 28.6%	19 31.7%
Quartzitic sandstone	- -	1 2.7%	- -	- -	1 1.7%
Crystalline quartz	1 7.1%	- -	- -	- -	1 1.7%
Column total	14 23.3%	37 61.7%	2 100%	7 11.7%	60 100%

Table 21. Artifacts recovered during test excavations at LA 51095 in 1985

Material	Core Flakes	Angular Debris	Cores	Tools	Row Total
Chert	13 30.2%	10 76.9%	1 33.3%	4 57.1%	28 42.4%
Quartzite	8 18.6%	1 7.7%	2 66.7%	2 28.6%	13 17.9%
Siltstone	11 25.6%	1 7.7%	- -	- -	12 18.2%
Chalcedony	9 20.9%	1 7.7%	- -	- -	10 15.1%
Clastic chert	2 4.6%	- -	- -	- -	2 3.0%
Basalt	- -	- -	- -	1 14.3%	1 1.5%
Total	43 65.1%	13 19.7%	3 4.5%	7 10.6%	66 100.0%

After Oakes (1986): Table 5

coarser-grained materials distributed above the average (Table 20).

No formal tools were recovered at the site, and there are no obvious indications of intentional retouch or use-wear observed in the assemblage portion that was analyzed. All of the debitage appears to be from the early stages of core reduction. Thirty-six flakes (60.0 percent) are whole, and the remainder are in various stages of fragmentation, with proximal portions outnumbering other portions two to one. Measurable platforms are present on only 29 (48.0 percent) flakes in the assemblage. Of these, 17 percent exhibit cortical, 52 percent single-facet, and 31 percent multifacet platforms. Cortex is present on 66 percent of the artifacts analyzed. In nearly three-quarters of these cases, cortex appears waterworn, suggesting that parent material was obtained from a stream bed. Only two flakes in the analyzed assemblage exhibit evidence of heat treatment in the form of potlidding, and a surface luster consistent with heating. These attributes could just as easily be attributed to wild fires as to intentional heat treatment.

Characteristics of the lithic assemblage at LA 51095 documented during data recovery efforts in 1997 are generally consistent with previous site studies. In 1985 OAS archaeologists tested the southern portion of the site and recovered 66 flaked stone artifacts (Table 21), most consisting of core flakes (65 percent) and angular debitage (20 percent), with no evidence of formal flaked stone tools or ground stone tools (Oakes 1986:18). Three cores were recovered within the project area of the test excavations, and 14 cores were observed but not collected outside the highway right-of-way. The investigators concluded that the primary activity represented on the site was primary and secondary core reduction and that formal tools were probably removed from the site. Unlike the present excavations, seven expedient flake stone tools with extensive use-wear were recovered in 1985, but none of the tools had any evidence of intentional shaping. Also unlike the present project, substantial amounts of fire-cracked rock were observed in the southern portions of the site scatter, but test excavations failed to recover any evidence of subsurface cultural stratigraphy.

Surface surveys conducted by SWCA (Phillips et al. 1997) significantly expanded the boundaries of the surface scatter at LA 51095 and added to our understanding of artifact variability at the site. A total of 69 artifacts were analyzed in the field during the survey, which concentrated in the northern portion of the scatter, in the vicinity of the current data recovery project. Significantly, no ceramic or ground stone artifacts were noted, and no temporally diagnostic artifacts were observed. Retouched or utilized flakes included three small chert scrapers with unifacial use on a lateral edge. A tested cobble and two core fragments were also documented on the surface. The principal silicious materials were local cherts and quartzites, and the majority of flakes were small and lacked cortical facies. Surveyors described the assemblage as low in both density and material diversity.

Attributes observed in the LA 51095 lithic assemblage present a reasonably consistent picture of lithic reduction at the site. The preponderance of cores, core flakes, and angular debris coupled with the absence of formal tools, retouch, and the low frequency of use-wear suggests behaviors associated with the early stages of core testing and initial reduction. Three cores were composed of chert, and all three had multiple negative flake scars indicating multiple detachments. Four cores of quartzite or quartzitic sandstone were recovered, but two of these were cobbles with a single flake removed and may have functioned as expedient hammerstones or pounders. The remaining two cores were composed of gray rhyolite and a fine-grained siltstone. The comparatively high frequency of waterworn cortex combined with the wide variety of raw material types present at the site suggests that cores were being obtained from nearby mixed gravel or terrace deposits. The low frequency of use-wear and absence of intentional retouch in the assemblage suggests that flakes were either not being used at the site or their use was so expedient that it left very little detectable trace on the implement. These characteristics, combined with the apparent absence of structures or other cultural features, suggest that the dominant behavior at LA 51095 was core reduction. If this activity was embedded within other behaviors, as it often is, no obvious traces remain of the other activity or behaviors. The only way to evaluate this hypothesis is to examine the behaviors represented at other sites on the project and in the region, and these questions will be addressed in the conclusion to this volume.

Summary and Interpretation

Excavations at LA 51095 determined that cultural material, consisting principally of primary core reduction debris, is confined mostly to the surface and first 10 cm of site stratigraphy. No subsurface features or cultural deposits were encountered during hand excavations at the site, and mechanical stripping of surface deposits in the vicinity of the principal artifact concentrations was equally unproductive.

The principal behaviors represented at the site are the early stages of lithic core testing and reduction. If formal tools were manufactured on the site, tool fragments and late-stage reduction debris were not deposited in sufficient quantities to be recognized. The area surrounding the site is ranch land, and it is possible that formal tools have been picked up by several generations of local collectors, but at least two intensive surveys and two excavation projects at the site over the past 15 years should have recovered some evidence of formal implements if they were ever there in the first place.

The extremely low incidence of use-wear on artifacts at LA 51095 suggests that core reduction at the site was not accomplished primarily for the production of expedient tools related to some on-site activity. Instead, it is likely that core testing and reduction was coincidental to other activities that left no obvious trace on the landscape or in the sediments. The presence of fire-cracked rock in the southern portion of the site (Oakes 1986) is problematic since extensive testing in the vicinity of the deposits failed to uncover any evidence of hearths, burned soil, or other cultural associations. No fire-cracked rock was observed at LA 51095 during the present project, and it is possible that these activities were highly localized or that past investigators mistook the local limestone for heat-altered or fragmented rock.

Significantly, no temporally diagnostic artifacts were recovered at LA 51095, and no chronometric samples were recovered from subsurface contexts. Consequently, the site cannot be placed with any confidence into a known time period or cultural tradition. Large-scale areal surveys in the vicinity of LA 51095 may some day help to resolve issues relating to space-time systematics and past human occupation of the local region. Until such surveys are conducted, however, no additional work can be justified or is warranted at LA 51095.

Evaluation and Data Potential

Since all three investigations at this site present a consistent picture of lithic reduction activities, no further work is recommended within the current right-of-way. However, because of the immense size of the site, other areas retain the potential to provide important information on the prehistory of the area.

CHAPTER 9

LA 117246

BY JESSE MURRELL

Environment and Condition

LA 117246 was recorded by SWCA in February 1997. The site is approximately 0.53 km east of the East Fork of Fivemile Draw on the southern slope of a gently rolling hill. U.S. 285 is adjacent to the site's western boundary. The site is in a grassland vegetation community that includes yucca, grama grass, and other grasses at an elevation of 1,285 m (Phillips et al. 1997:5.1).

In this area, soils are classified as belonging to the Alama-Poquita association. These soils are described as clay loams which formed in calcareous alluvium ranging from strong brown to reddish brown to reddish yellow to light red in color. The potential for water and eolian erosion is moderate and high (Lenfesty 1980:15-16).

The site's integrity has been adversely affected by wind erosion, the construction and maintenance of U.S. 285, and the construction of a ranch road east of the right-of-way. Disturbance from road construction is evident in the presence of ground stone fragments and fire-cracked rock in artificial berms created during road bed blading (Phillips et al. 1997:5-1).

Site Description

LA 117246 covers an area of 2,460 square meters. Site boundaries were established on the basis of surface artifact distribution. The site is partially bounded on the west by U.S. 285 and to the southeast by an excavated stock pond. The presence of the pond points to the possibility of additional disturbance of the site by cattle trampling. The site is a disperse scatter of 11 chert and quartzite chipped stone artifacts. No subsurface cultural material was encountered, and no cultural features or charcoal-infused soils indicative of cultural activity were apparent on the surface or encountered during excavation.

Data Recovery Results

The excavation methodology at LA 117246 follows the general methodology specified in the data recovery plan. This plan called for the contour mapping of the site, as well as the hand excavation of a minimum of four 1 by 1 m excavation units and auger tests. Overburden would be removed by a backhoe to expose any subsurface cultural deposits. Upon their exposure, excavation of these deposits would again proceed by hand. The number of excavation units and auger tests would vary according to the potential for maximizing contributions to the goals of the data recovery plan.

Excavation at LA 117246 was conducted between July 31 and August 6, 1997, and was directed by Stephen Lentz, assisted by C. Dean Wilson, Jim Quaranta, Eric Harkrader, and Macy Mensel. Site mapping was completed by Nancy Akins and Macy Mensel on December 2, 1997.

Five 1 by 1 m excavation units (EUs) were established near surface artifacts and roughly paralleling the right-of-way fence (Fig. 27). EUs 1, 2, and 3 lie 2 to 3 m west of the right-of-way fence, and EUs 4 and 5 lie 4.5 m east of the fence. Subdatums were established 10 cm above the present ground surface at the northeast corner of each unit to maintain vertical control. All units were excavated in 10-cm levels, and fill was screened through 1/4-inch hardware cloth. Three or four levels were excavated in each unit. All were then auger tested to limestone bedrock, with the exception of EU 4, which was discontinued before reaching bedrock. Soil profile maps were completed for each unit. With the exception of EU 4, all soil profiles reveal three strata (Figs. 28-29) that include loose topsoil, a substrata, and a thin layer overlying bedrock (Table 22). No subsurface cultural deposits were encountered during the excavation of these units.

A series of 51 auger tests were excavated. These were established approximately 2.5 m apart in two lines roughly paralleling the right-of-way fence. Auger Tests 1 through 32 were located 3 m west of the right-of-way fence, and Auger Tests 33 through 51 were located 6 m east of the fence. The average depth of the auger tests was 88 cm. No subsurface cultural deposits were encountered. A similar stratigraphy was revealed in the auger tests. Generally, three layers were described, including a loose, reddish brown, silty loam topsoil; a more consolidated, reddish brown, silty loam with disperse carbonate flecking and/or small nodules; and a

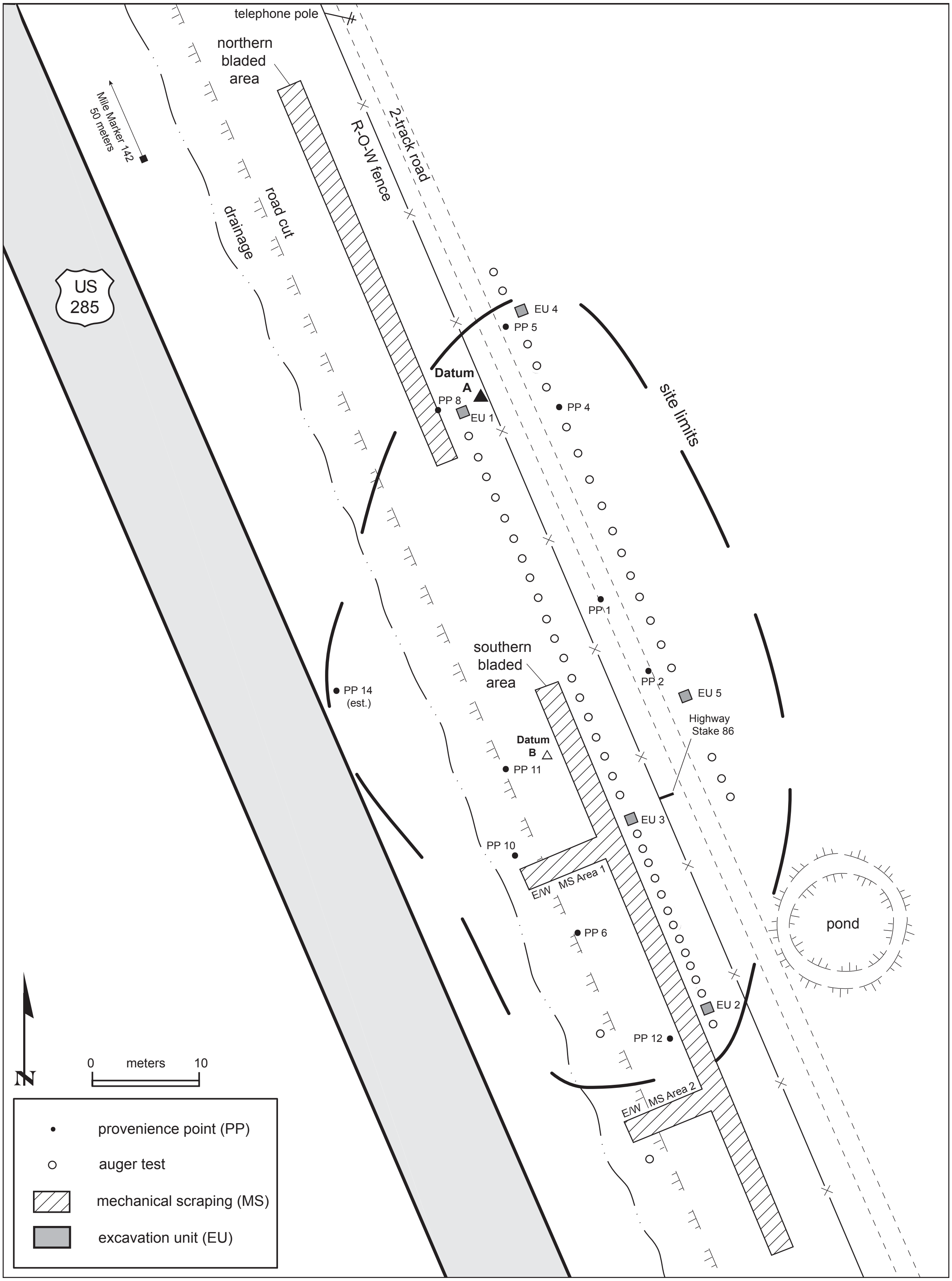

Figure 27. Plan of LA 117246.

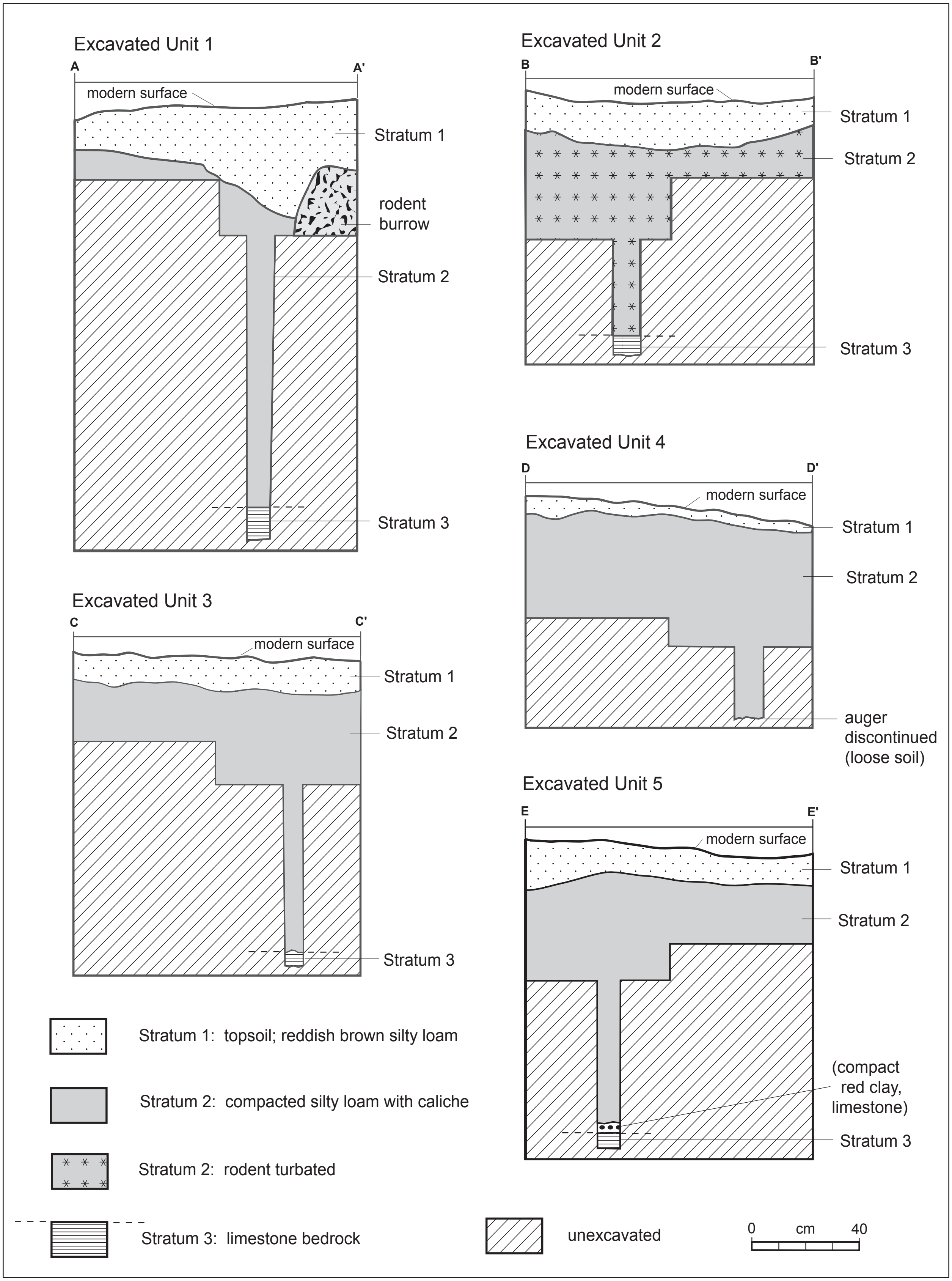

Figure 28. LA 117246, profiles of EU1 through EU5.

Table 22. LA 117246, Excavation Unit soil summary.

Stratum	Munsell Color	Soil and Consolidation	Maximum Depth of Lower Horizon (cm below subdatum)	Disturbance	Calcium Carbonate (Caliche)
			EU 1		
1	brown 7.5 YR 4/4	silty clay	47	root and rodent	absent
2	strong brown 7.5 YR 5/6	well-consolidated silty clay	144	rodent	present
3	reddish brown 7.5 YR 6/6	loose silty loam	154 (bedrock)	absent	present
			EU 2		
1	reddish brown 7.5 YR 6/6	silty loam	28	absent	absent
2	strong brown 7.5 YR 5/6	silty loam	90	rodent	-
3	reddish brown 7.5 YR 6/6	loose	96 (bedrock)	absent	present
			EU 3		
1	brown 7.5 YR 4/4	loose silty loam	20	root	absent
2	strong brown 7.5 YR 4/6	silty loam	96	rodent	present
3	-	-	100 (bedrock)	absent	present
			EU 4		
1	strong brown 7.5 YR 5/6	loose silty loam	12	absent	absent
2	light brown 7.5 YR 6/4	well consolidated	74 excavation discontinued	absent	present
			EU 5		
1	light brown 7.5 YR 6/4	loose silty loam	22	rodent	absent
2	Light brown 7.5 YR 6/4	well-consolidated sandy loam	98	rodent	present
3	strong brown 5 YR 5/8	well-consolidated clay	100 hit bedrock	absent	present

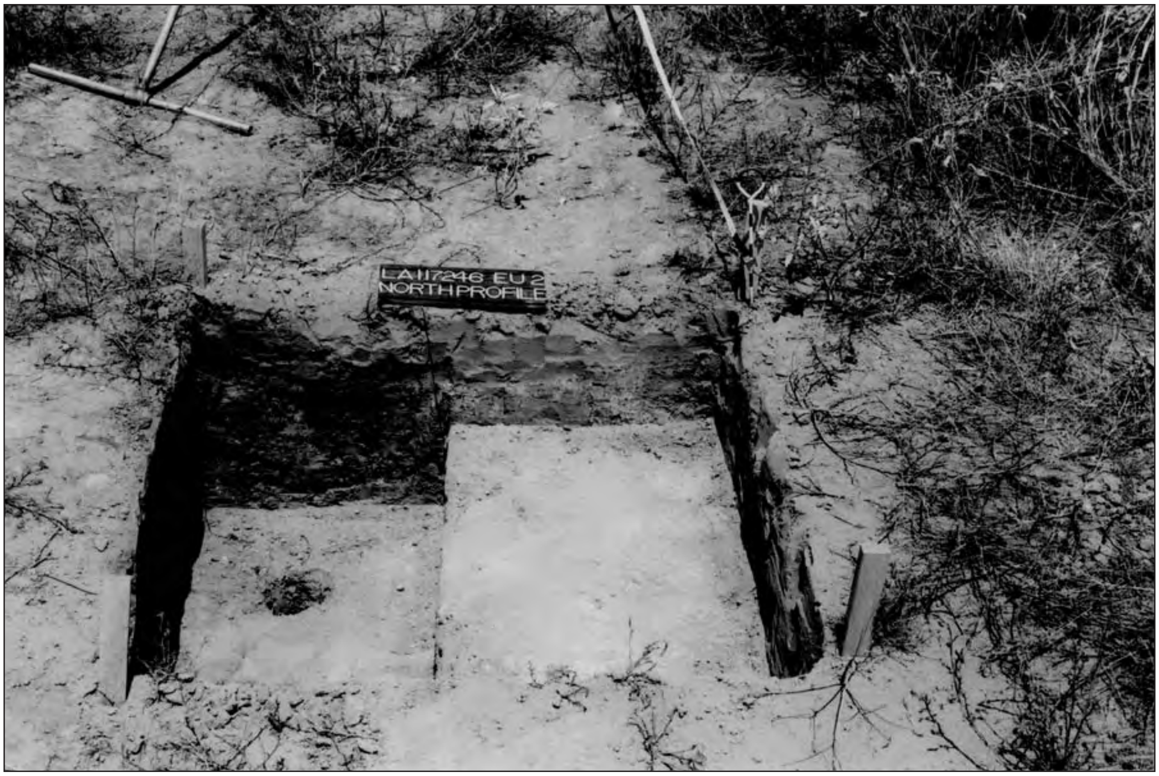

Figure 29. LA 117246, EU2.

well-consolidated, reddish brown clay loam with limestone chunks, which directly overlies limestone bedrock. The average depth of the lower horizon of the uppermost layer is 28 cm. Fourteen auger tests were excavated through the lower horizon of the substrata. The average depth of the lower horizon of this layer is 70 cm. Bedrock was encountered in 13 auger tests at an average depth of 1.07 m. Thirty-seven auger tests were terminated upon reaching the culturally sterile soil of the substrata.

Two areas of the site were scraped to a depth of 20 cm below the present ground surface using a backhoe. The northern scraped area measures 38 by 2 m and is 5 m west of the right-of-way fence. Scraping extends beyond the northern site boundary. The southern scraped area lies approximately 23 m southeast of the northern area and measures 58 by 2 m. It is situated 5 m west of the right-of-way fence. This scraped area extends beyond the southern site boundary. In the southern area, the berm was investigated by two scrapes oriented perpendicularly to the main scrape. These extensions measured 8 by 2 m. No cultural deposits were encountered.

Material Culture

The artifact distribution is dispersed and surficial. Artifacts consist of four core flakes, five pieces of angular debris, and two cores. All artifacts are chert or quartzite (Table 23). Nine of eleven artifacts have cortex, and the majority (n=8) have 1 to 50 percent cortex coverage. Two core flakes have single-facet platforms, one has a cortical platform, and one was broken during

Table 23. LA 117246 lithic artifacts, material type by artifact morphology.

Material Type	Angular Debris	Core Flake	Uni-directional Core	Multi-directional Core	Column Total
Chert	3 60.0%	2 50.0%	- -	1 100.0%	6 54.5%
Quartzite	2 40.0%	2 50.0%	1 100.0%	- -	5 45.5%
Row total	5 45.4%	4 36.4%	1 9.1%	1 9.1%	11 100.0%

manufacture. Two core flakes are whole. The multidirectional core is a blocky piece of fine-grained chert with eight complete negative flake scars originating from multiple platforms. The core retains 40 percent waterworn cortex and does not appear to be exhausted. These artifacts appear to represent limited primary core-reduction activities. There is no evidence of bifacial tool production or maintenance.

Summary and Interpretation

Due to the lack of diagnostic artifacts and features from which chronometric samples could be collected, interpretations regarding site age and cultural affiliations may not be feasible. The lack of features limits interpretations of site function. There is evidence of primary core reduction activities presumably geared toward the production of flakes suitable for expedient tool use or as flake blanks, although these were not discarded on-site. A limited lithic resource procurement function is tentative but suggested by the presence of unmodified lithic raw material and the expedient nature of the assemblage.

Evaluation and Data Potential

Excavations at LA 117246 yielded little information. Interpretations are limited by low artifact density and the absence of cultural features. The site's data potential is exhausted, and no further studies are recommended.

CHAPTER 10

LA 117250

BY JESSICA BADNER

LA 117250 was first recorded by SWCA in February 1997 as a low-density artifact scatter consisting of three Jornada Brown ware sherds, two unifacially ground sandstone fragments, and one chert reduction flake, all of which were found in eroded areas. Three artifact classes, their placement, and dense ground cover obscuring the ground surface led SWCA to record this artifact scatter as a site rather than a group of isolated occurrences. Data recovery was recommended (Phillips et al.1997:5.8-5.10).

Environment and Condition

LA 117250 is on the west side of U.S. 285 approximately 1 km south of Townsend East (LA 34150). The site covers an area of 400 square meters, 20 m north to south and east to west. The western site limit, which is outside of the right-of-way, is extrapolated from Phillips's survey map (Phillips et al. 1997:5.11). LA 117250 sits on the north slope of a gently rolling hill south of Salt Creek. Ground cover is dense and includes mesquite, yucca, thistle, wild mustard, dropseed and other grasses, and weedy annuals. Disturbance consists of wind and water erosion and also resulted from the construction and maintenance of U.S. 285. A drainage ditch extends 6 m west from the pavement edge.

As at Townsend East, soils are classified as Reakor silt loam by the Chaves County Soil Survey. These soils typically consist of a pale brown and yellow brown silt overlaying a light yellowish silty clay loam (Lenfesty 1980:55). However, in this locale, soils are described by archaeologists as silty sand with 25 percent caliche topped by a 6 cm to 8 cm cap of brown silt loam. Auger tests in soils near the eastern edge of the site were so sandy that soil would not adhere to the auger sleeve. The presence of this sand is best explained by disturbance caused by highway maintenance and erosion.

Site Description

LA 117250 is a small artifact scatter of extremely low density. Five artifacts were found: two pieces of lithic debitage, one ground stone fragment, and two Chupadero Black-on-white sherds. Although two brown ware sherds were noted on the west side of the right-of-way fence, they were not collected. No features or evidence of cultural horizons are present. Ground cover is densest in the highway drainage ditch. Two of the five artifacts were found along the drainage ditch bank; however, others could have been obscured by vegetation cover.

Data Recovery Results

The data recovery plan proposed that the site be mapped using an electronic total station. A minimum of two 1-by-1-m hand units and a series of auger holes would be excavated, mechanical equipment would be used to strip remaining overburden and a trench excavated to ensure that no deeply buried cultural deposits existed (Lentz et al. 1997:16-17). Hand excavations at LA 117250 were carried out from August 28 to 30, 1997, and again on December 4, 1997. Work in August was directed by Stephen Lentz, who was assisted by Eric Harkrader, Macy Mensel, and Dean Wilson. In December, the results of the mechanical scraping were examined and a site map were completed by Nancy Akins, Jessica Badner, and Macy Mensel.

In order to map the site and maintain horizontal control, a main datum was established at the approximate center of the site along the right-of-way fence and designated 100N 100E. Surface artifacts were located, point provenienced, and collected (Fig. 30). Two excavation units (EU 1 and EU 2) were established parallel to the fenceline with subdatums at the northeast corner of each grid. Both units were excavated in arbitrary 10-cm levels. All fill was screened with 1/4-inch hardware cloth. Each grid was excavated to Level 3. Because of extremely consolidated soil and the lack of artifact content, each unit was subsampled. Half of each unit was excavated in Level 2, and a quarter of each unit was excavated in Level 3. After excavation, the south wall of EU 1 and the north wall of EU 2 were profiled. Because of the lack of artifact density or any other indications of cultural activity, these test units were not expanded.

EU 1 was placed near the southern boundary of the site in a small artifact scatter that consisted of the two Chupadero Black-on-white sherds and one ground stone

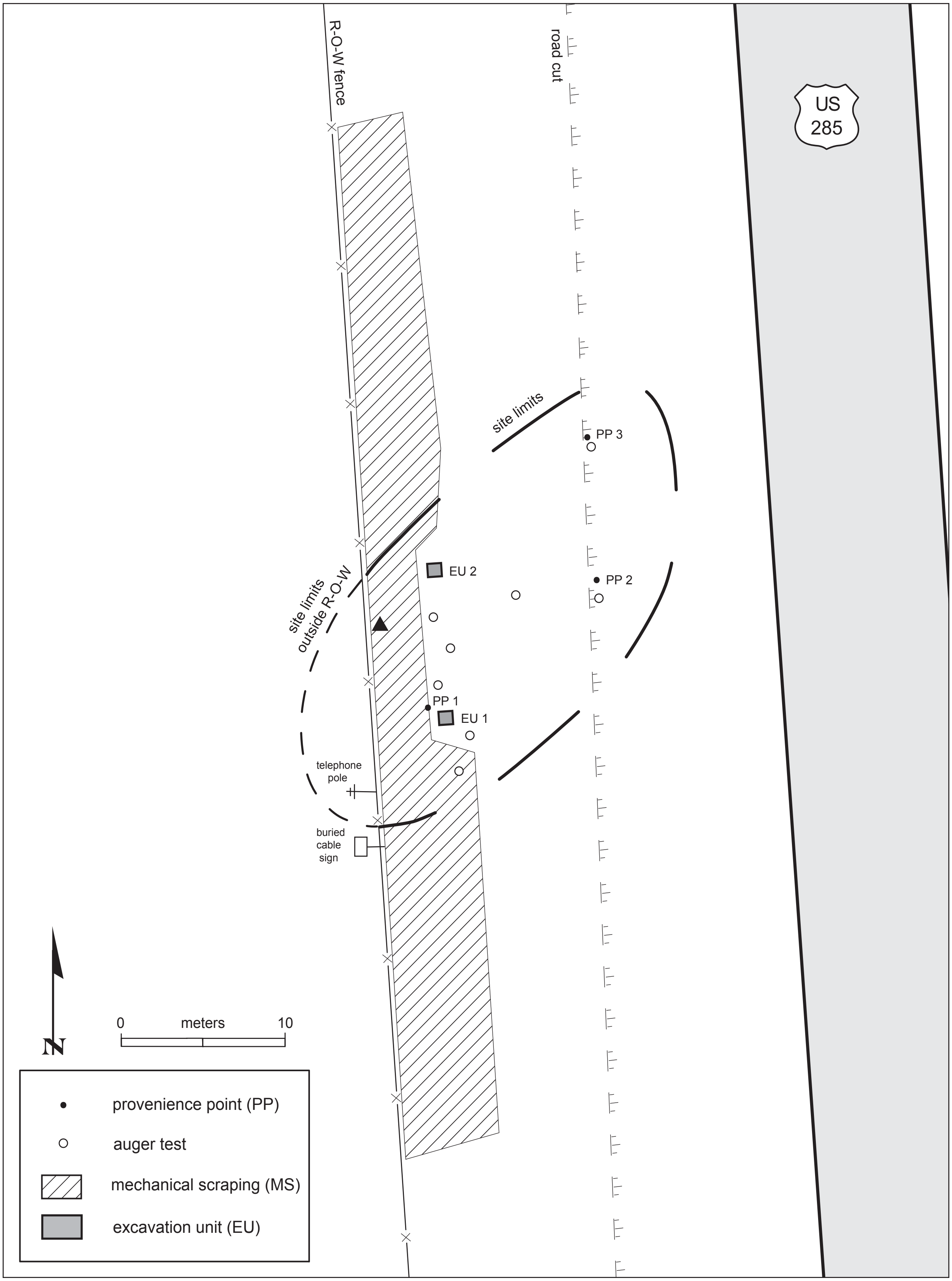

Figure 30. Plan of LA 117250.

Table 24. LA 117250 auger test summary.

Test	Surface Elevation (cm bgs)	Depth Excavated (cm)	Upper Silt Loam and Duff Layer (cm)	Alluvial Noncultural Fill (cm)	Loose Sand
AH1	00	120	0-9	9-120	
AH2	14	100	0-9	9-100	
AH3	17	100	0-6	6-100	
AH4	25	100	0-6	6-100	
AH5	19	80	0-5	5-80	
AH6	90	indeterminate			x
AH7	81	indeterminate			x
AH8	61	indeterminate			x

fragment (Point Provenience 1) immediately adjacent to the east. This unit was excavated to a depth of 41 cm bgs in three 10-cm levels which consisted of two strata. Stratum 1 was a duff layer made up of a strong brown silt loam (7.5 YR5/4) with root networks and local grasses. Stratum 2 was described as a extremely consolidated reddish yellow silty sand (7.5YR 6/4) with 25 percent carbonate inclusions present to the base of the unit. This stratum continued in an auger test at the base with up to 7 cm carbonate nodules present to the bottom of the hole at 1.14 m bgs. Both strata were culturally sterile. No charcoal flecking or staining was present, and other than the two sherds collected from the surface, no cultural material was recovered.

EU 2 was placed near the northern end of the site boundary, 8 m north of EU 1. This unit was excavated in three levels to 48 cm bgs and then augered. Stratigraphically, it is similar to EU 1. The surface stratum consists of up to 4 cm of strong brown duff which is eroded in the western half of the grid. Stratum 2 is the same as in EU 1 and is present to the base of excavation and in auger tests to 1.10 m bgs. This unit was culturally sterile.

Eight auger tests were placed between the artifacts and in excavation units to ensure that no intact features were overlooked. All auger tests were culturally sterile. Auger Tests 6 through 8 could not be excavated past 30 cm bgs because loose sand would not adhere to the auger sleeve. Auger test results are shown in Table 24.

Mechanical excavation was conducted after manual excavations at LA 117250 failed to yield artifacts or evidence of features. The site was scraped to a depth of up to 20 cm parallel to the right-of-way fence in a swath measuring 62 by 5.5 m (Fig. 31).

Material Culture

Cultural material recovered from this site consists of five artifacts, all of which were recovered from the surface. Artifacts include two Chupadero Black-on-white jar body sherds from the surface of EU 1, an internal fragment of ground stone (Point Provenience 1; Murrell, this volume), a lateral core fragment of coarse-grained quartzite and 70 percent waterworn cortex and no wear or retouch (Point Provenience 2), and a piece of medium-grained chert angular debris with 30 percent nonwaterworn cortex and no retouch or utilization (Point Provenience 3).

Summary and Interpretation

LA 117250 is an ephemeral surface scatter on a disturbed road shoulder. Excavations yielded no positive evidence of cultural activity. Although three artifact classes are present at LA 117250, the small number of artifacts in each class precludes any meaningful interpretation. Lack of cultural features, surfaces, or staining coupled with a lack of depth to this artifact scatter call artifact context into question. It is impossible to determine whether the artifacts are associated with each other, and it is unclear whether they were deposited in this location by prehistoric humans, by natural activities such as erosion and bioturbation, or by both. Although inferences can be made about individual artifacts, such as the two Chupadero Black-on-white sherds (A.D. 1050-1100), or primary core reduction, from each piece of lithic debitage, these artifacts do not constitute an interpretable assemblage.

Evaluation and Data Potential

Excavations at LA 117250 yielded very little information. Given the low artifact density and shallow overburden, it is highly unlikely that any deeply buried cultural deposits or features exist. The data potential of this site has been exhausted, and no further work is recommended within the right-of-way.

Figure 31. LA 117250 after scrape.

CHAPTER 11

Townsend West (LA 34150W)

The area north of Salt Creek and west of U.S. 285 is the Townsend site as originally defined, and is referred to Townsend West throughout this report. The site was first recorded in 1982 by NMSHTD archaeologists, who found surface deposits of chipped stone and ceramics and bone eroding from the banks of Salt Creek. At that time, it was estimated to cover an area 320 by 160 m with deposits up to 1.5 m deep, all west of U.S. 285 (Maxwell 1986:1-2). Prior to rechanneling the arroyo, which makes a sharp bend just west of the bridge, a testing plan was initiated. Eventually, the rechanneling plans were discarded, and the area tested was not directly affected by construction (Maxwell 1986:7).

The 1982 testing began by placing a horizontal grid system over the site area and collecting surface materials within 9-square-meter grids. A series of backhoe- and hand-excavated trenches investigated areas referred to as the Campsite and the Bison Cutbank (Fig. 32). Test locations were chosen on the basis of surface concentrations of artifacts, fire-cracked rock, or ash stains. Hand-excavated units were screened through 1/4-inch hardware cloth. Three hearths were found in the Campsite and radiocarbon dated 490-250 B.C., A.D. 460-600, and A.D. 660-820 (Maxwell 1986:7, 22). The Bison Cutbank produced little in the way of cultural remains directly associated with bison; however, the procurement of bison was not ruled out (Maxwell 1986:89). Brown ware ceramics and the later radiocarbon dates, attest to continued use of the site area (Maxwell 1986:91).

South of Salt Creek, only the current highway right-of-way falls within the project area. Beyond the fence is an irrigated field that, according to informants, once contained hearths, stone rings, and an abundance of projectile points. In 1982 the field had a light scatter of lithic and ceramic artifacts with no evidence of hearths or structures (Maxwell 1986:1).

When SWCA revisited the site in 1997, the Townsend site was expanded considerably when features east of U.S. 285 were included with the area previously recorded. The west area north of Salt Creek (Townsend West), Locus 3, is described as an area dominated by lithic material, with two metates and a ceramic artifact also observed. Very-large-mammal bone was exposed in the bank of a small drainage cut (Phillips et al. 1997:4.3-4.5).

Environment and Condition

Townsend West is badly dissected by erosional channels, some caused by the 1982 backhoe trenches. Within the right-of-way, the road shoulders have a cap of gravel and dense grass. Large concrete stabilizers cap the bank and slope beneath the bridge for much of the area within the right-of-way. Vegetation beyond the fence (Fig. 33) is a variety of grasses, sedges, annuals, and scattered mesquite and yucca (McBride and Toll, this volume). Grass is especially dense in the bottoms and along the dissected areas.

The earlier work at the site identified three geological terraces in the area. The upper and oldest of the terraces, a gently rolling plain, lies outside of the site area. This upper terrace is cut by an intermediate terrace, which forms the main portion of the site and the agricultural fields south of Salt Creek. The intermediate terrace is from 3 to 5 m above the base of the creek. Fill is a thick layer of reddish brown, fine to very fine sand overlying a lighter, very fine to fine yellowish red sand. The youngest or lower terrace is actively forming and cutting into the intermediate terrace above the level of the creek base. The terraces are formed by alluvial deposition and represent similar geological processes but different geological events (Maxwell 1986:16-18).

Soils at the site are classified as Reakor silt loam, a deep, well-drained soil formed in calcareous alluvium with some eolian material, derived mainly from limestone. In this association, the surface layer is typically a pale brown and yellow brown silt overlying a light yellowish brown silty clay loam, then pink silty clay loam (Lenfesty 1980:55,114).

Site Description

The bed of U.S. 285 is elevated about 1.5 m above the surrounding plain in the site vicinity. This elevation and a drainage berm have essentially buried or obliterated the site between the highway and the right-of-way fence. Because the fence deviates from the actual right-of-way as it slopes up to meet the bridge, a portion of the site was preserved within the right-of-way but outside of the right-of-way fence. Bank stabilization in the

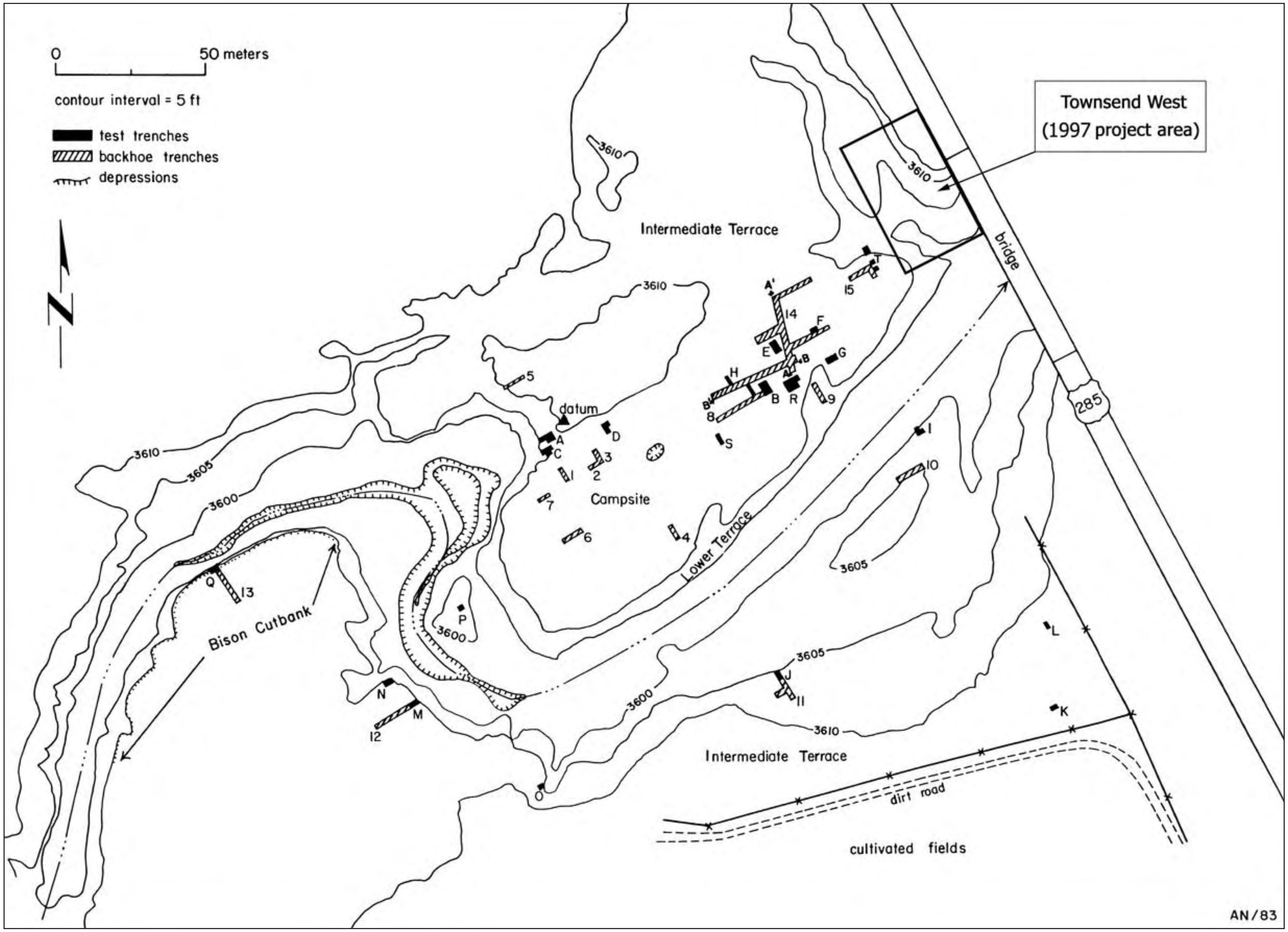

Figure 32. Townsend West as recorded during 1982 excavations (after Maxwell 1986:3).

Figure 33. Vegetation at Townsend West, looking north from the Bison Area.

form of a concrete apron under and alongside the bridge and fill dirt capping the area next to the apron have modified the area adjacent to the creek. In addition, evidence of an earlier ford or road bed and material from prior bridge construction have greatly disturbed the area, leaving few intact deposits within the project area, which is limited to the right-of-way on this side of U.S. 285.

Outside the project area is a considerable lithic and fire-cracked rock scatter within an area that is badly dissected by erosion. Artifacts, pieces of bone, and charcoal are exposed in several of the erosional cuts. Within the project area, the small area of fairly intact soil has few exposed artifacts. A partial bison cranium and other large-mammal bones were exposed in the base and bank cut. Water flowing off the concrete apron and from the road berm has enlarged this cut, and active erosion exposed the bone.

Little intact soil from the intermediate terrace remains within the project area (Fig. 34). Much of the project area is occupied by a heavily vegetated grassy channel formed by erosion of the intermediate terrace. Fill at this level is largely below the cultural deposition. Essentially the only intact fill is along the bank of Salt Creek beneath a cap of disturbed soil and the small peninsula of intermediate terrace fill just west of the right-of-way fence.

Data Recovery Results

The data recovery plan for Townsend West proposed to map the site, plotting any significant bison remains, and remove the overburden from the area of exposed bone. Mechanical trenching would be used to determine whether the bison remains extend beyond the area adjacent to the bank of Salt Creek (Lentz et al. 1997:16-17).

Data recovery efforts were concentrated on the intact intermediate terrace material (the Pit) and the area adjacent to Salt Creek where the bison was exposed (Bison Area). A backhoe trench linked the two areas (Fig. 34). Work on Townsend West, carried out between July 28 and August 23, was directed by Rusty Greaves and Nancy Akins, assisted by Jessica Badner, Eric Harkrader, Macy Mensel, Sarah Morris, Jesse Murrell, Chris Sparks, Bob Sparks, Jennifer Ware, John Ware, and Dean Wilson.

A primary datum was established on a high point southwest of the Bison Area. The datum was designated 100N 100E and assigned an elevation of 4.64 m for

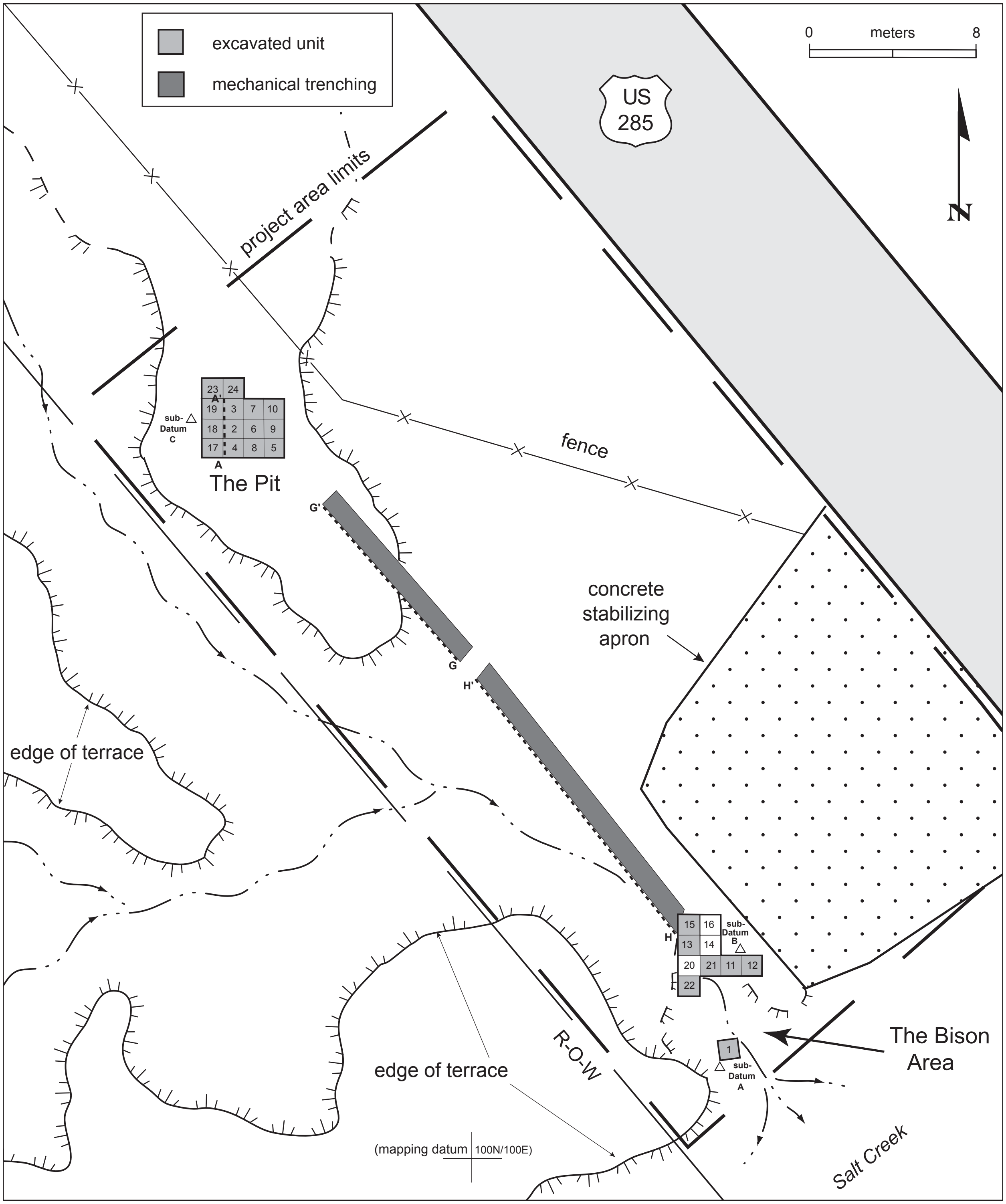

Figure 34. Plan of Townsend West.

Figure 35. Townsend West Pit Excavation.

mapping purposes. Elevations are all tied into this datum, which is tied to the main site datum, east of U.S. 285 at the NMSHTD permanent marker. Excavation units were numbered sequentially (EU 1-24).

The Pit

Excavations in what appeared to be intact soil of the intermediate terrace just beyond the right-of-way fence began with two 1 by 1 m excavation units oriented to magnetic north and called EU 2 and EU 3, in keeping with standard methodology for the project. The two pits were between 20 and 23 m from the edge of U.S. 285. EU 2 was excavated to a depth of 2.9 m bgs or from 5.18 to 2.28 m below the main Townsend site datum (bd). Ultimately, 14 units were excavated to varying depths for safety and access (Fig. 35). Fill was removed in arbitrary 10-cm levels and screened through 1/4- or 1/8-inch hardware cloth. The larger screen size was generally used, with portions of some levels passed through the smaller size. As it became obvious that upper fill was recent and disturbed, this fill was removed without screening. Table 25 schematically illustrates the relative depths and lithic artifact counts by 10-cm level.

Fill was profiled and described for the west wall of EU 4-EU3 (Fig. 36). The upper three layers (A1-A3) are recent deposits containing asphalt, concrete, glass, and metal. These probably represent recent eolian sediments and disturbed soils that were deposited after mechanical equipment removed soil and vegetation from the area. Beneath the A horizons are two B horizons that are probably remnants of the older soil that was truncated during road construction. The total absence of ceramic artifacts in these units suggests that, if such a component was present in this area, the upper Ceramic period soil was removed. Horizon B layers contain more clay than the other horizons. Most of the lithic artifacts, bone, fire-cracked rock, ash, and charcoal are within B2 and the cultural horizons. A major cultural horizon lies between 1 and 1.4 m below site datum (bsd) in these grids, and another between 1.7 and 2.1 m bsd, under a C horizon. Bioturbation from rodent and insect burrowing has displaced enough soil that it could not be determined whether these layers represent a single occupation or activity area, multiple occupations, or closely spaced reoccupations of the area. The upper cultural horizon was characterized by softer grayish brown soil with more charcoal staining and a very dark stain near the northwest corner of EU 2 (18 cm diameter), a large stain in the southwest corner of EU 3 (66 cm by 45+ cm), and another in the northeast corner of EU 3 (26 cm by 50+

Table 25. Townsend West, schematic representation of levels and lithic artifact densities for excavation units within the Pit (north to south and west to east).

Base of level	EU 23	EU 19	EU 18	EU 17	EU 24	EU 3	EU 2	EU 4	EU 7	EU 6	EU 5	EU 10	EU 9	EU 8
10														
20														
30							1							
40														
50														
60														
70						1	2							
80									1	4	1	4	1	
90	2				6	1	3		3	1	3	2	1	
100	1	2	6		4	3		7	5	2	3			
110	1	5	10	3	7	3	2	2	3	2		1		
120		6	8	1	8	27	6	1	2	2				
130		2	3	1	2	51	3			1				
140		1	2			49	4							
150		1	2	1		1	2							
160			3			2								
170			4			2	4		1					
180			8			2	3	4	7	22				
190			3			2	2	4	5	6				
200						3	2	3		9				
210						4	1	1						
220														
230														
240														
250														
260														
270														
280														
290														

——— top and bottom of excavation .... fill not screened above this level cm). Rodent burrows were scattered throughout both grids, but none were associated with the dark stains. An AMS sample (Beta 134637) from this horizon dated A.D. 320 (conventional) and A.D. 350 to 535 (calibrated). The lower cultural horizon was similar in that the fill was a gray charcoal-stained soil. This one, however, was more consolidated than the fill above it, and the fire-cracked rock seemed to sit on the same plane in the upper portion of the horizon (about 1.7 m bsd), suggesting it was a use-surface with charcoal and chipped stone worked into the soil below.

The upper C horizon represents a period of rapid deposition with little evidence of stability. Horizons C2-C5 could represent annual events or periodic flows or ponding suggestive of an ephemeral drainage. Layers C6 and C7 seem to represent a period of rapid deposition, possibly during drier conditions, because there is no evidence of alluvial deposition. Excavation contin-

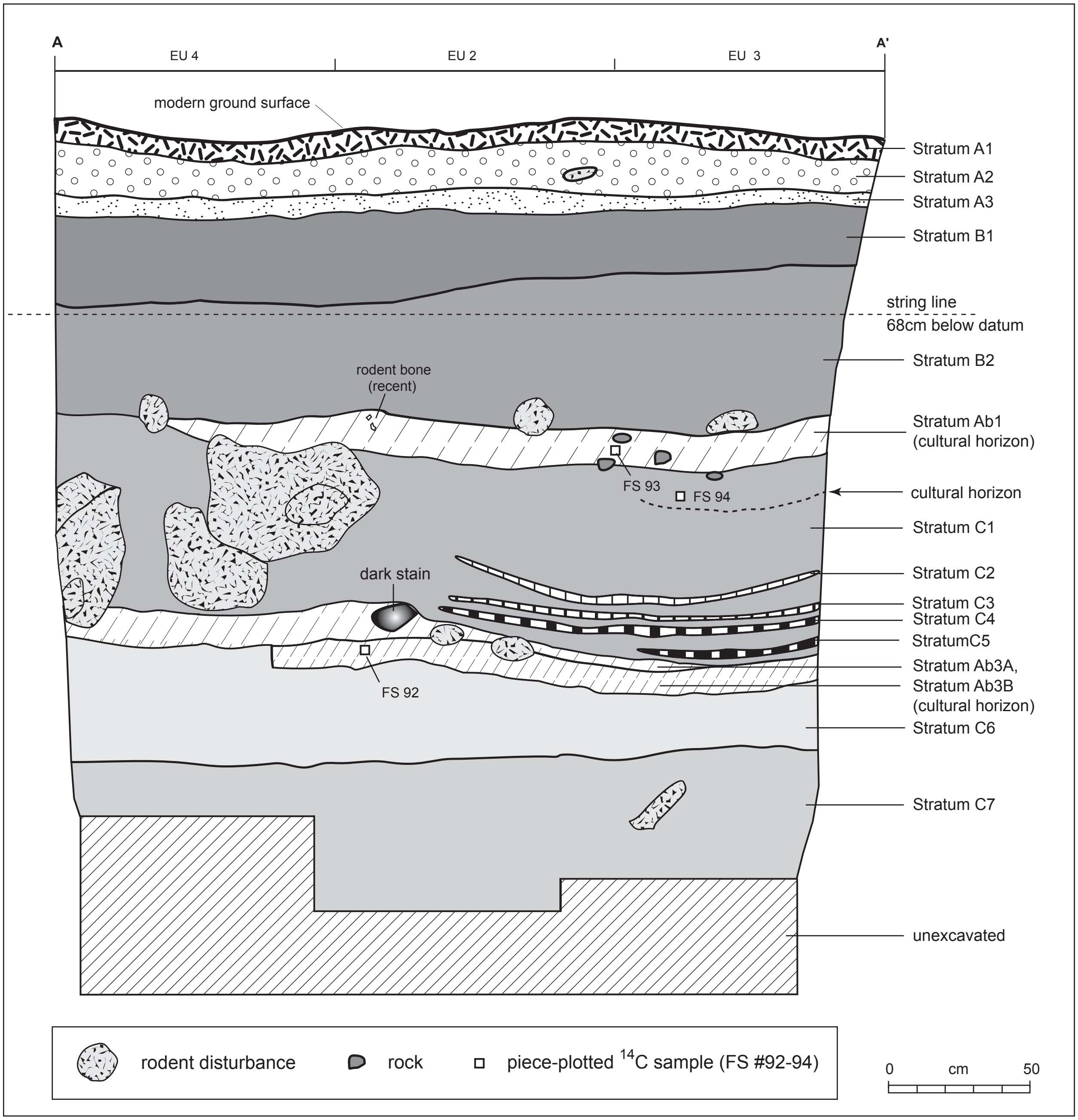

Figure 36. Townsend West Pit, west wall profile in EU4-EU2.

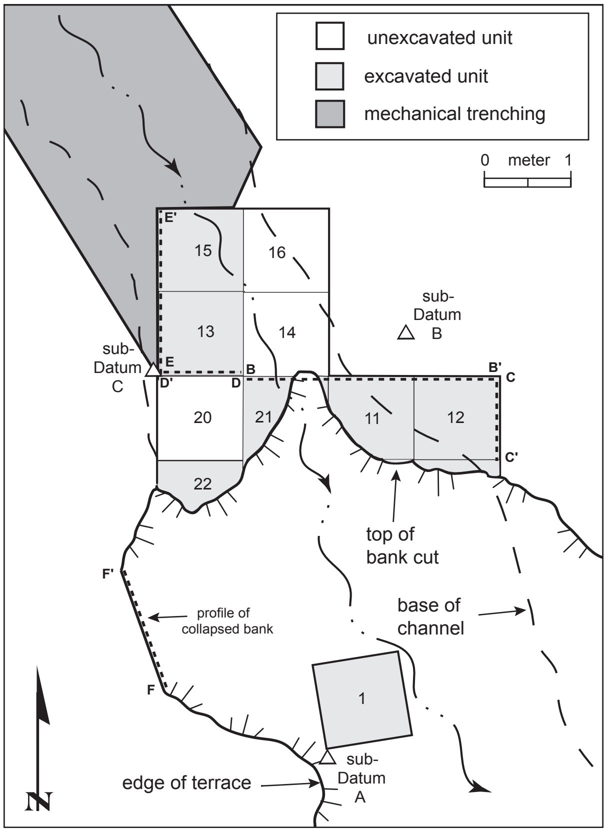

Figure 37. Plan of Townsend West Bison Area.

ued 60 cm to 90 cm below where artifacts were recovered because of charcoal flecking and occasional stains, such as a dark gray, less consolidated stain and charcoal concentration in EU 3 at 2.35 m bsd. This lower fill was screened through 1/8-inch mesh but produced no evidence of cultural deposition other than the charcoal. It is possible this resulted from rodent disturbance, but such disturbance was not evident in either the profile or plan views of the stain and concentration.

A higher cultural horizon may be indicated by an upright metate and mano found in the northwest corner of EU 7, oriented north to south. These were first exposed while excavating steps for entry into the excavation area. The base of the metate was at 1.03 m bsd. The mano was set in the trough, and the two had obviously been cached. There was no evidence of a pit.

Bison Area

Located in the actively forming lower terrace, seven units were investigated in the Bison Area (Fig. 37). The first of these (EU 1) was excavated in early May, well before the main work at this site. Rainwater rushing down a drainage channel (Fig. 38) threatened to wash away the bone, so it was removed on an emergency basis.

Figure 38. Townsend West Bison Area drainage before excavation.

Figure 39. Townsend West Bison Area, collapsed bank.

Before our arrival, the bank collapsed over the bone (Fig. 39). This collapsed upper fill was soil placed along the edge of the creek for bank stabilization. Asphalt and a gray brown soil readily distinguished this from the intact fill. About 30 cm of collapsed fill was removed without screening (Level 1), and a 1-square-meter unit oriented to true north was established.

The exposed bone was near the wall of the drainage cut so that the upper fill sloped down toward the channel base. In the second level, only a 70-cm area north to south and a 60-cm area east to west from the grid corner had intact soil. The remainder of the grid fill was from the collapsed bank. Fill containing most of the bone was removed in a 15-cm level (Level 2) and screened through 1/8-inch hardware cloth. The soil was a fine orange sand that was quite compact when dry and contained abundant precipitates but virtually no stone or other inclusions. An area of gray-stained fine sand with charcoal and precipitates occupied a 23-cm-diameter area at the northwest edge of the intact fill. This gray fill expanded in the next level (Level 3, 10 cm thick) so that the orange sand was confined to a small pocket about 45 cm in diameter then nearly disappeared in the following level (Level 4, 10 cm thick). The bone was very friable and was mainly from the cranium, with only two small pieces of noncranial bone found beneath the level of the skull pieces.

A bison humerus fragment was also removed from a cut in the bank to prevent it from washing away (Fig. 40). This piece was 75 cm below the surface, or rather, the base of the drainage channel before it dropped down to the level of the Salt Creek bed. The humerus fragment was encased in a gray clayey pocket of fill 46 cm in diameter. A piece of metal directly above the bone was 57 cm below the ground surface, and a distinct unconformity occurred 15 cm to 20 cm above the bone.

Returning to the area during the main project, overburden was removed from above where the humerus fragment had been removed from the bank. Obviously redeposit or bank stabilizing fill, because it contained asphalt, concrete, rope, metal, and other construction debris, it was shoveled away until the very hard and level surface or unconformity was reached. This surface consisted of 5 cm to 7 cm of gravel and probably represents a bypass used during bridge construction or a ford over Salt Creek. Two square-meter excavation units (EU 11 and EU 12) aligned with magnetic north were established in this area. Eventually, nine excavation units were laid out; however, EU 14, EU 16, and EU 20 were not excavated. Table 26 gives the subdatum used, number of levels excavated, and starting and ending elevations. Subdatum A is at 0.95 m below datum (mbd), and

Figure 40. Townsend West Bison Area, bison humerus eroding out of drainage bank.

subdatums B and C are at 1.77 mbd.

Fill was profiled (Fig. 41) and described across four units east to west, and one unit and two units north to south. Stratigraphy was quite complex and best described in table form (Table 27). Soils were not consistent between the profiles and may not be completely comparable in all profiles. This is especially true of soil color, due in part to length of exposure, type of exposure, and quality of light.

Bone was relatively sparse for the amount of fill removed (Fig. 42). Dip and strike was measured in enough grids to determine that the bone was randomly oriented, as if tumbled. This and the virtual lack of cultural material suggest it was a natural death rather than a deposit left by humans. The animals could have died in or at the edge of a pounded area near the creek, and the bones could have become scattered through natural processes.

Table 26. Townsend West Bison Area datum, level, and elevations (meters with respect to the site datum).

Excavation Unit	Sub-datum	Levels Excavated	Beginning Elevation (m)	End Elevation (m)
EU 1	A	4	0.95	0.60
EU 11	B	8	1.51	0.57
EU 12	B	10	1.37	0.37
EU 13	C	6	1.51	0.97
EU 15	C	6	1.56	0.96
EU 21	C	10	1.69	0.67
EU 22	C	7	1.47	0.77

Bank Profile

A portion of the bank on the west side of the drainage where the bison was excavated was cleaned and profiled (Fig. 43) to provide a description of the fill closer to Salt Creek. Upper fill was a series of recent sedimentary and mechanical deposition units related to road construction and contouring the north bank of Salt Creek. Numerous large pieces of construction debris, asphalt, nylon line, and metal occur in the A horizons. These overlie older intact deposits. Table 28 summarizes the fill characteristics. C1 corresponds to the “orange” layer described for EU 1, and probably to AB2, the gray soil layer. No bone was visible in the profile face.

Backhoe Trench

The backhoe trench originated at the southwest corner of EU 13 and, to allow backhoe access, extended 28 m to just south of the Pit excavations with a 2 m break due to the presence of very large chunks of construction debris (see Fig. 34). Massive disturbance, probably a barrow pit or erosional cut filled with construction debris, was revealed in all but about 10 m of the profile (Fig. 44), indicating that most of the area within the right-of-way has been disturbed.

Outside of the disturbed area, the upper fill is soil used for contouring, overlying what appears to be eolian and alluvial or overbank deposits that form the lower terrace (Fig. 45 and Table 29).

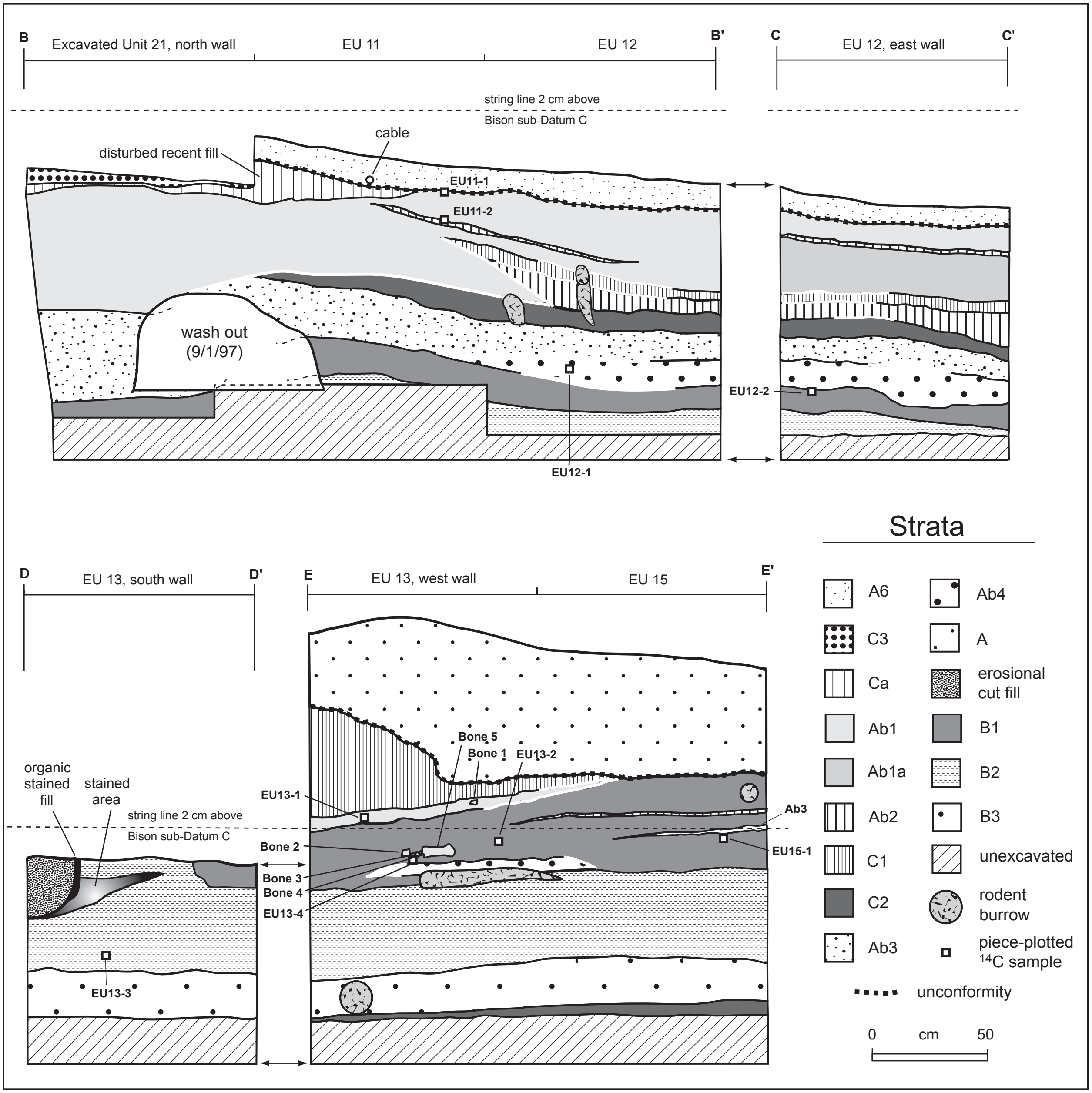

Figure 41. Townsend West Bison Area, profile of fill.

Auger Tests South of Salt Creek

A series of auger tests was placed between the highway and right-of-way fence 3 m from the fence. Most were at intervals of 20 m. Table 30 lists the tests and fill observed. No evidence of intact cultural deposits was encountered. A single lithic was recovered from within a gravel lens in Auger Hole 5. The abundance of gravel in this particular fill suggests the context was disturbed.

MATERIAL CULTURE

Lithic Artifacts

A total of 408 lithic artifacts were recovered from the Pit (Tables 31-34). Core flakes are by far the most numerous, followed by angular debris. Formal tools are rare, as are utilized flakes (n=4) and cores (n=5). Most of the artifacts were recovered between 100 and 140 cm bsd

Table 27. Townsend West Bison Area stratigraphic descriptions.

Horizon	Munsel Color Dry; Moist	Texture	Consistency	Boundary	Comments
A	disturbed overburden probably deposited during construction or bank stabilization				
A6	recent gravel on top of bladed surface; poorly sorted gravel				
AB1	10YR4/4; 7.5YR3/4 to 10YR3/4	fine silt loam	slightly hard to hard	clear to abrupt and smooth	bone appears in upper surface; abundant precipitate filaments
AB2	10YR4/3 to 4/4 to 5/8; 7.5YR3/4 to 4/6 to 10YR2/2	fine silt loam	slightly hard to hard	clear to abrupt and smooth	fair amount of charcoal flecks; few to many precipitate filaments
AB3	10YR4/4 to 4/6; 7.5YR4/6 to 10YR3/3	fine loam	soft to hard	clear to abrupt and smooth	abundant precipitate filaments
AB4	10YR4/4 to 5/4; 10YR3/4 to 4/4	fine loam to fine silt loam	soft to hard	clear to abrupt to gradual and smooth	few to abundant precipitate filaments
B1	10YR4/4 to 5/4; 7.5YR3/4 to 10YR3/4	fine clay loam to fine silt loam	slightly hard to very hard	clear to abrupt and smooth	many to very abundant precipitate filaments, almost nodules
B2	10YR4/4 to 5/4; 10YR3/4 to 3/6	fine loam to fine clay loam	slightly hard to hard	clear and smooth	very abundant precipitate filaments, almost nodules
B3	10YR4/3; 10YR4/4	fine sandy loam	soft to slightly hard	clear and smooth	many precipitate filaments
C1	7.5YR5/4 to 10YR5/6; 7.5YR4/4 to 4/6	fine silt loam	slightly hard to hard	clear and smooth	very few to abundant precipitate filaments
C2	10YR4/4 to 5/8; 10YR4/4 to 4/6	fine silt loam to fine sandy loam	soft to slightly hard	clear and smooth	abundant precipitate filaments

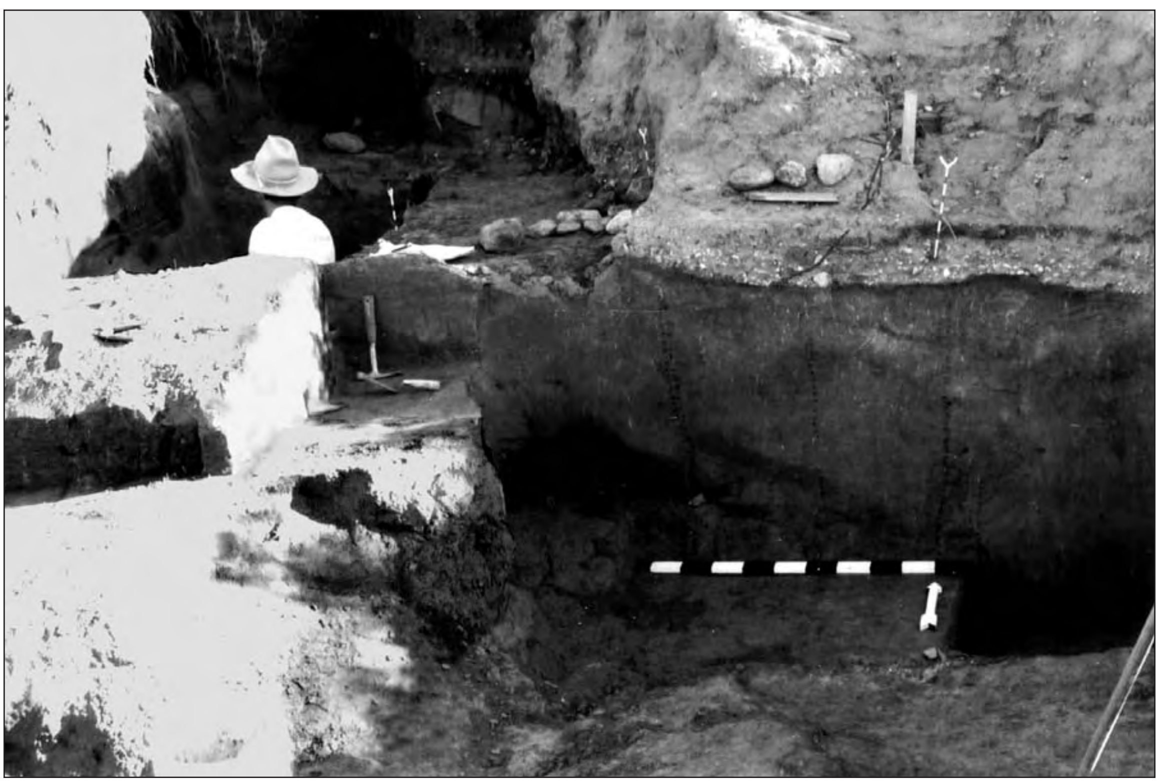

Figure 42. Rusty Greaves in the Townsend West Bison Area.

Table 28. Townsend West, arroyo west wall stratigraphic descriptions.

Horizon	Munsel Color Dry; Moist	Texture	Consistency	Boundary	Comments
A1	fine loam, very recent				
A2	poorly sorted gravely silt loam, recent				
A3	fine, slightly sandy loam, probably eolian material deposited after bridge construction but before bank recontouring				
A4	slightly clayey fine to coarse loam, recent				
A5	slightly clayey fine loam, recent				
C1 and C2	7.5YR6/6; 7.5YR 4/6	fine sandy loam	slightly hard to hard	abrupt and smooth	many precipitate filaments
AB1	10YR5/4; 10YR3/4	fine loam	slightly hard to hard	abrupt and smooth	many precipitate nodules; thin, lightly stained by organics with very fine charcoal flecking
AB2	10YR5/4; 10YR3/4	fine loam	slightly hard to hard	clear and smooth	abundant precipitate nodules; more pronounced and consistently stained with many charcoal chunks
B1	10YR5/4; 10YR3/4	fine loam	loose to slightly hard		abundant precipitate nodules; few charcoal flecks

(53.9 percent), with the proportion of angular debris decreasing in the lowest unit. This decrease in angular debris is undoubtedly related to material quality (Table 32). The proportion of fine-grained material generally is greatest in the two units with cultural horizons (1-1.4 and 1.8+ m bsd) while coarse-grained material is absent from both, and medium-grained is relatively rare. Chert and limestone comprise the majority of the material found (Table 34). Silicified wood, basalt, and rhyolites are confined to the upper 1.4 m of fill, and quartzite decreases with depth.

The 1 to 1.4 m bsd level is the most diverse in all respects, due in part to the large sample size. It contained most of the biface flakes, all but one of the cores, the biface, and one of the projectile points. Activities represented in the Townsend West assemblage are limited evidence of early-stage core reduction and informal tool use, good evidence that cores were reduced in this area and transported elsewhere. General hunting tasks are inferred (Moore, this volume).

The Bison Area produced only four pieces of chipped stone: two angular debris and two core flakes. EU 12, Level 6, contained a single piece of sandstone angular debris, while a piece of quartzite angular debris and two core flakes of limestone and chert were found in EU 15, Levels 1 and 4, respectively.

Ground Stone

Ground stone was sparse. Other than a one-hand mano and basin metate found in EU 7, only two indeterminate

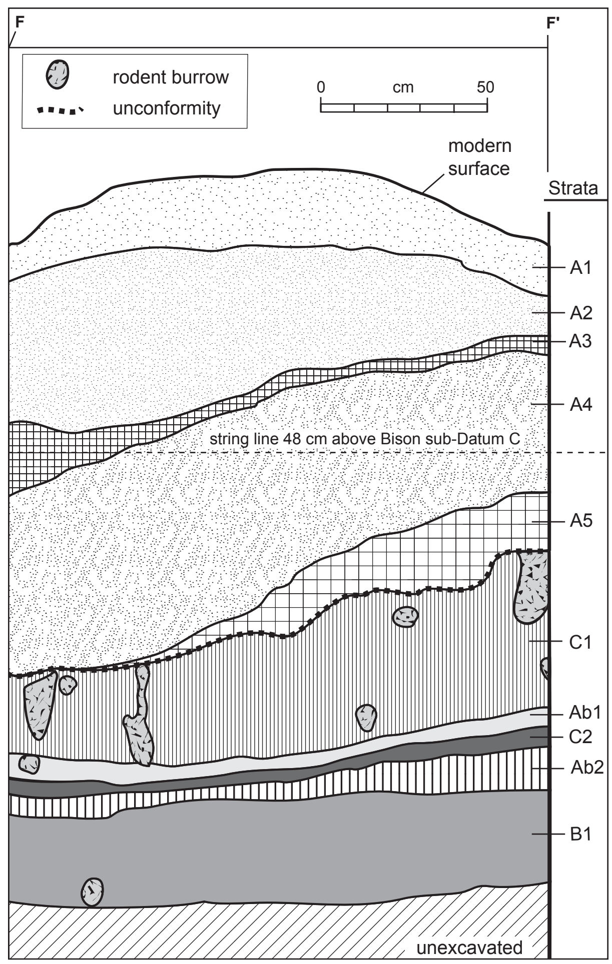

Figure 43. Townsend West Bison Area, profile of bank behind collapse.

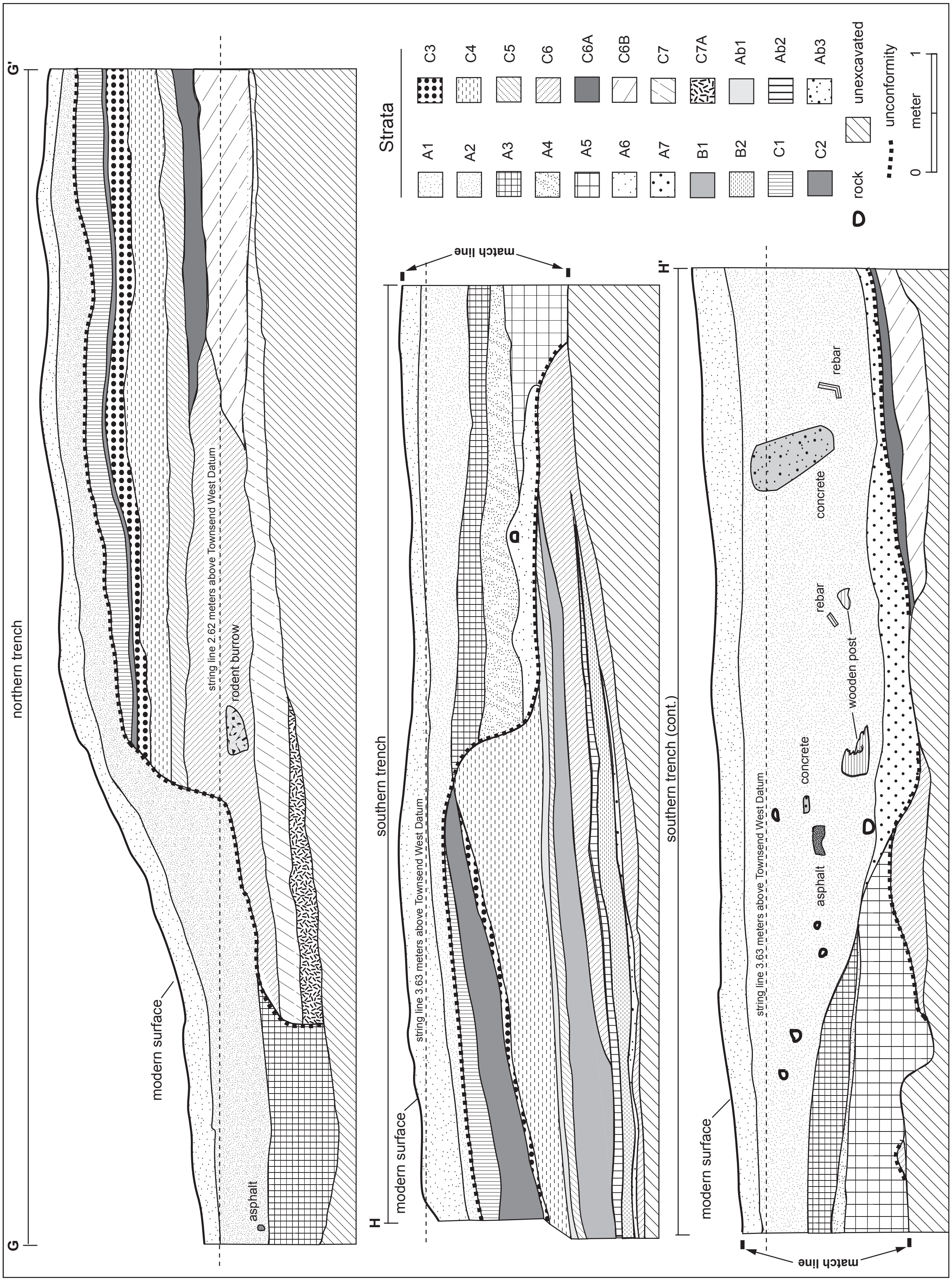

Figure 44. Townsend West profile of backhoe trench.

Figure 45. Townsend West, example of stratigraphy just north of Bison Area excavations.

fragments were found, made of sandstone and orthoquartzite from EU 3, Levels 12 and 13. One has red pigment adhesions (Murrell, this volume).

Fauna

Almost all of the fauna recovered from the Bison Area could be bison. However, because of the fragmentary nature of much of the sample, some pieces could only be considered medium to large mammal, large mammal, or very large mammal based on the minimum possible size of the animal represented. Six pieces (1.8 percent) from EU 21, Level 2, and EU 22, Level 5, are polished and rounded with a more recent look. Most appear quite old and are heavily etched or pitted from the soil (94.4 percent) or checked from exposure (3.8 percent). Many of the small cranial sinuses are completely filled with carbonate nodules.

Table 35 gives the distribution of taxa and parts by excavation unit. EU 1 has by far the largest counts and much of the bison. This is entirely due to the fragmented condition of the cranium. Since the breaks are old taphonomic breaks, each piece was counted even though they are from the same cranium. Of the identifiable elements, only the scapula and humerus pieces occur in more than one unit. Since no exact part is duplicated, there is no indication that more than one bison is represented.

With the exception of 12 of the bison specimens that comprise between 25 and 50 percent of those elements, all bones are fragmentary, representing less than 25 percent of the element. The cranium is incomplete, with the left frontal, orbit, and partial horn intact enough for identification. The horn was 55+ mm in diameter near but not at the base. Lack of rugosity suggests it was either young or a female. Few elements could be measured. The humerus removed from the wall (EU 12) measures as follows: A, 5.95 cm; B, 5.05 cm; C, about 3.19 cm (following Speth 1983:Fig. 58). The scapula glenoid measures 7.62 cm long and 5.88 cm wide. Humerus measurements generally fall within the range found in bison recovered at the Garnsey site (Speth 1983:Table 20).

Excavations in the Pit recovered 152 specimens (Table 36). Cottontail rabbits (27.0 percent) and small pieces of artiodactyl tooth enamel (27.0 percent) comprise much of the assemblage. Few specimens were found in the upper 1.0 m of fill, and the greatest faunal densities occurred in Levels 9 to 13, or between 1 and

1.4 m below the surface (Table 37). Small- and large-form counts are essentially equivalent for the highest and lowest levels. The upper cultural horizon is predominately small forms (80.4 percent), while that below it contained very few bones. Little of the bone at any elevation was burned—seven pieces overall, and only four heavily burned. All but one are small forms (two small-mammal, two cottontail, two jackrabbit, and one large-mammal), with one cottontail specimen exhibiting a roasting type of burn. Some of the assemblage is most likely the remains of postoccupational burrowers. Prairie dog (33.3 percent), pocket gopher (33.3 percent), kangaroo rat (100.0 percent), and cottontail (22.0 percent) bones are complete or nearly complete, often enough to suggest they may not be archaeological remains. No immature and only four bones from near-mature animals were found. This could be the result of poor preservation rather than an indication of the season when the deposit was formed.

Much of the bone was pitted or corroded from soil conditions (84.2 percent). Large forms are poorly represented, and all of the artiodactyl remains consist of pieces of tooth enamel. Root portions of these teeth are similar to those of bison but are not complete enough to

Table 29. Townsend West, horizon descriptions for the backhoe trench.

Horizon	Munsel Color Dry; Moist	Texture	Consistency	Boundary	Comments
A1	disturbed fill related to bridge construction and recontouring the Salt Creek bank				
A2	gravel mixed with silty soil probably overlying a blade cut; contains asphalt, concrete, wooden posts, rebar, and other construction debris; abrupt boundary, as if it rests on a blade cut				
A3-A7	recent fill with slightly different textures and consistencies				
AB1	10YR5/4; 10YR3/4	fine silt loam	slightly hard to hard	abrupt and smooth	many precipitate filaments; some charcoal flecks
AB2	10YR5/6; 10YR3/4	fine silt loam	slightly hard to hard	abrupt and smooth	abundant precipitate filaments
AB3	10YR5/6; 7.5YR4/6	fine silt loam	slightly hard to hard	abrupt and smooth	abundant precipitate filaments
B1	10YR5/4; 10YR3/4	fine silt loam	slightly hard to hard	abrupt to clear and smooth	abundant precipitate filaments
B2	10YR5/8; 10YR3/4	fine silt loam	slightly hard to hard	abrupt and smooth	abundant precipitate filaments
C1	10YR5/4 (N) to 6/4 (S); 10YR3/4 (N) to 4/4 (S)	fine silt loam	slightly hard to hard	abrupt to clear and smooth	
C2	7.5YR5/6 (S) 10YR5/4 (N); 7.5YR4/6 (S) 10YR3/4 (N)	fine silt loam	soft to slightly hard (S) hard (N)	abrupt and smooth	
C3	7.5YR4/6 (S) 10YR5/4 (N); 7.5YR4/4 (S) 10YR4/4 (N)	fine silt loam	slightly hard to hard	abrupt and smooth (S) clear to gradual and smooth (N)	abundant precipitate filaments (S)
C4	7.5YR5/4; 7.5YR4/6	fine silt loam	slightly hard to hard	abrupt and smooth	abundant precipitate filaments (S)
C5	10YR5/4 (N) 6/4 (S); 10YR3/4 (N) 4/4 (S)	fine sandy loam (S) fine silt loam (N)	loose (S) slightly hard to hard (N)	abrupt and smooth	few precipitate filaments
C6	10YR5/4 (N) 6/6 (S); 10YR4/4 (N) 4/6 (S)	fine sandy loam (S) fine silt loam (N)	loose to soft (S) slightly hard (N)	clear and smooth	
C7	10YR5/4; 10YR4/4	fine silt loam	slightly hard		

(N) = north end profile
(S) = south end profile

Table 30. Townsend West, auger tests south of Salt Creek.

Number	Depth below surface (cm)	Description
1	0-7	yellow brown sandy loam; 30 percent gravel
	7-24	yellow brown consolidated sandy loam, glass, and asphalt
	24	well-consolidated sandstone
2	0-10	dark yellow brown loam
	10-40	dark yellow brown consolidated sandy loam with sandstone chunks
	40	well-consolidated sandstone
3	0-10	dark yellow brown loam
	10-15	dark yellow brown consolidated sandy loam with sandstone chunks
	15	well-consolidated sandstone
4	0-10	dark yellow brown loam
	10-25	dark yellow brown consolidated sandy loam; 30 percent small gravel
5	0-8	dark yellow brown silty loam; 50 percent gravel
	8-15	dark yellow brown silty loam; 80 percent gravel
	15-41	dark yellow brown silty loam; 50 percent gravel; lithic at 41 cm
	41-56	dark yellow brown silty loam; <1 percent gravel
	56-71	dark yellow brown consolidated sandy loam; 5 percent gravel; carbonates increase with depth
6	0-24	dark yellow brown loam
	24-47	dark yellow brown silty loam; scant carbonates
	47-67	dark yellow brown sandy loam with increasing clay and carbonates
	67-110	brown silty loam with clay and carbonates
	110-125	caliche
7	0-35	dark yellow brown silty loam; lithic at 10 cm
	35-76	yellow brown consolidated sandy loam; 20 percent gravel; carbonates
	76-96	yellow brown silty calcareous loam; 25 percent gravel; carbonate encrusted
8	0-55	dark yellow brown silty loam; <1 percent gravel; glass
	55-67	yellow brown sandy loam; <1 percent gravel
	67-87	brown yellow silty loam; carbonates
9	0-40	dark yellow brown silty loam; <1 percent gravel
	40-56	yellow brown consolidated sandy loam
	56-74	same as previous with clay and carbonate bits; rock at base
10	0-42	yellow brown silty loam
	42-68	yellow brown consolidated sandy loam with clay and carbonates
	68-108	same as above with more carbonates
11	0-32	yellow brown silty loam
	32-64	same with clay and carbonates
	64-69	yellow brown fine silty loam
	69-105	same but slightly more consolidated with carbonates and small gravel
12	0-82	yellow brown silty loam; more clay at 40 cm; carbonates after 31 cm
	82-98	yellow brown fine silty loam
13	0-66	yellow brown silty loam
	66-70	yellow brown fine silty loam with clay and carbonate flecks

Table 31. Townsend West, lithic artifacts recovered from the Pit by EU and elevation.

EU	Elevation (cm bsd)	Angular Debris	Core Flake	Biface Flake	Core	Biface	Large Stemmed Point	Small Corner-Notched Point	Total
2	0-100	-	6	-	-	-	-	-	6
	100-140	2	12	-	1	-	-	-	15
	140-170	1	5	-	-	-	-	-	6
	170+	-	8	-	-	-	-	-	8
3	0-100	-	6	-	-	-	-	-	6
	100-140	25	102	-	2	1	-	-	130
	140-170	-	5	-	-	-	-	-	5
	170+	-	11	-	-	-	-	-	11
4	0-100	1	6	-	-	-	1	-	8
	100-140	-	3	-	-	-	-	-	3
	170+	4	8	-	-	-	-	-	12
5	0-100	1	6	-	-	-	-	-	7
6	0-100	-	7	-	-	-	-	-	7
	100-140	-	5	-	-	-	-	-	5
	170+	4	33	-	-	-	-	-	37
7	0-100	2	7	-	-	-	-	-	9
	100-140	1	3	1	-	-	-	-	5
	140-170	1	-	-	-	-	-	-	1
	170+	2	9	-	1	-	-	-	12
9	0-100	-	2	-	-	-	-	-	2
10	0-100	2	4	-	-	-	-	-	6
	100-140	-	1	-	-	-	-	-	1
17	100-140	-	3	2	-	-	-	-	5
	140-170	-	1	-	-	-	-	-	1
18	0-100	3	3	-	-	-	-	-	6
	100-140	5	18	-	-	-	-	-	23
	140-170	2	7	-	-	-	-	-	9
	170+	2	9	-	-	-	-	-	11
19	0-100	1	1	-	-	-	-	-	2
	100-140	4	9	-	-	-	-	1	14
	140-170	-	1	-	-	-	-	-	1
23	0-100	2	3	-	-	-	-	-	5
	100-140	-	2	-	-	-	-	-	2
24	0-100	-	8	2	-	-	-	-	10
	100-140	2	14	-	1	-	-	-	17
Total		67	328	5	5	1	1	1	408

Table 32. Summary of Townsend West Pit lithic artifacts by elevation.

Elevation (cm bgs)	Angular Debris	Core Flake	Biface Flake	Core	Biface	Large Stemmed Point	Small Corner-Notched Point	Row Total
0-100	12 16.2%	59 79.7%	2 2.7%	- -	- -	1 1.4%	- -	74 18.1%
100-140	39 17.7%	172 78.2%	3 1.4%	4 1.9%	1 0.5%	- -	1 0.5%	220 53.9%
140-170	4 17.4%	19 82.6%	- -	- -	- -	- -	- -	23 5.6%
170+	12 13.2%	78 85.7%	- -	1 1.1%	- -	- -	- -	91 22.3%
Column Total	67 16.4%	328 80.4%	5 1.2%	5 1.2%	1 0.2%	1 0.2%	1 0.2%	408 100.0%

Table 33. Summary of Townsend West Pit lithic artifact material quality.

Elevation (cm bsd)	Fine-grained	Fine-Grained Flawed	Medium-Grained	Medium-Grained Flawed	Coarse-Grained	Unit Total
0-100	47 63.5%	9 12.2%	12 16.2%	5 6.8%	1 1.4%	74 18.1%
100-140	172 78.2%	17 7.7%	24 10.9%	7 3.2%	- -	220 53.9%
140-170	17 63.9%	3 13.0%	- -	2 8.7%	1 4.3%	23 5.6%
170+	72 79.1%	2 2.2%	15 16.1%	2 2.2%	- -	91 22.3%
Total	308 75.5%	31 7.6%	51 12.5%	16 3.9%	2 0.5%	408 100.0%

Table 34. Summary of Townsend West Pit lithic material type.

Elevation (cm bsd)	Unknown	Chert	Silicified Wood	Igneous, Basalt, Siltite, Rhyolite	Limestone, Siltstone, Shale, Dolomite	Quartzite and Quartzitic Sandstone
0-110	- -	38[1] 51.3%	1 1.4%	5 6.8%	22 29.7%	8 10.8%
100-140	- -	97[2] 44.1%	- -	25 11.4%	74 33.6%	24 10.9%
140-170	1 4.3%	12[3] 52.2%	- -	2 8.7%	7 30.4%	1 4.3%
170+	- -	46 50.5%	- -	10 11.0%	31 34.1%	4 4.4%

[1]Includes one of Alibates chert.
[2]Includes two of San Andreas chert.
[3]Includes one of San Andreas chert.

positively identify this species. Low diversity, other than the probable postoccupational burrowers, and the lack of burning distinguishes this assemblage from deposits at Townsend East. The 1982 excavations (Rayl 1986a:80-84) report a sample of 217 pieces of bone (not including the bison or very large mammal). Like the Pit assemblage, the diversity is fairly low, preservation generally poor, and burned bone rare (6.9 percent).

Ceramics

The only ceramic recovered from the Townsend West excavations was a tiny piece of historic ironstone found in Level 6 of EU 15. This was in alluvial deposits and undoubtedly more recent than the bison remains from this area.

Flotation, Macrobotanical Samples, and Wood

Two flotation samples each were collected from the upper and lower cultural horizons of the Pit. Those from the upper horizon (1 to 1.4 m bsd) contained mostly unburned plant parts along with burned goosefoot. Neither of the lower horizon samples produced plant material. A single burned walnut shell was found between 80 and 90 cm deep, and unburned hackberry seeds were found at even deeper levels, between 140 and 180 cm bgs. The wood analyzed for the radiocarbon sample was largely saltbush/greasewood, followed by conifer, probably alder, and mesquite. Flotation samples from the Bison Area failed to recover any cultural plant remains (McBride and Toll, this volume).

Table 35. Townsend West, taxon and element distribution for the Bison Area (NISP).

EU	Taxon	Unknown	Long Bone	Flat Bone	Horn Core	Cranial	Scapula	Humerus	Radius	Ulna	Metatarsal	Phalanx 3	Total
1	Very large mammal	30	3	1	-	1	-	-	-	-	-	-	35
	Bison	-	-	-	13	88	1	2	-	-	-	-	104
11	Large mammal	-	3	-	-	-	-	-	-	-	-	-	3
	Very large mammal	5	70	6	-	-	-	-	-	-	-	-	81
	Bison	-	-	-	-	-	-	-	2	1	-	-	3
12	Medium-large mammal	1	1	-	-	-	-	-	-	-	-	-	2
	Large mammal	2	5	-	-	-	-	-	-	-	-	-	7
	Very large mammal	-	4	1	-	-	-	-	-	-	-	-	5
	Bison	-	-	-	-	-	1	2	-	-	-	-	3
13	Medium-large mammal	1	-	-	-	-	-	-	-	-	-	-	1
	Large mammal	3	2	5	-	-	-	-	-	-	-	-	10
	Very large mammal	-	16	-	-	-	-	-	-	-	-	-	16
	Bison	-	-	-	-	-	-	-	-	-	1	-	1
21	Large mammal	1	19	12	-	-	-	-	-	-	-	-	32
	Very large mammal	-	4	14	-	-	-	-	-	-	-	-	18
	Bison	-	-		-	-	-	-	-	-	-	1	1
22	Medium-large mammal	-	-	2	-	-	-	-	-	-	-	-	2
	Large mammal	2	8	5	-	-	-	-	-	-	-	-	15

Table 36. Townsend West, fauna recovered from the Pit.

Taxon	EU 2	EU 3	EU 4	EU 5	EU 6	EU 7	EU 8	EU 9	EU 10	EU 17	EU 18	EU 19	EU 23	EU 24	Totals
Small mammal/	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2
large bird	-	3.1%	-	-	-	-	-	-	-	-	-	-	-	-	1.3%
Small mammal	1	17	1	-	-	1	-	3	-	-	3	2	3	4	35
	7.7%	26.6%	8.3%	-	-	16.7%	-	60.0%	-	-	33.3%	66.7%	100.0%	80.0%	23.0%
Medium-large	3	1	2	-	1	-	2	-	-	2	-	-	-	-	11
mammal	23.1%	1.6%	16.7%	-	11.1%	-	28.6%	-	-	66.7%	-	-	-	-	7.2%
Large mammal	-	-	-	1	-	1	1	-	1	-	1	-	-	-	5
	-	-	-	14.3%	-	16.7%	14.3%	-	16.7%	-	11.1%	-	-	-	3.3%
Prairie dog	-	1	-	-	-	2	-	-	-	-	-	-	-	-	3
	-	1.6%	-	-	-	33.3%	-	-	-	-	-	-	-	-	2.0%
Plains pocket	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
gopher	23.1%	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0%
Ord's kangaroo	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
rat	-	1.6%	-	-	-	-	-	-	-	-	-	-	-	-	0.7%
Small rodent	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
	-	-	-	-	-	16.7%	-	-	-	-	-	-	-	-	0.7%
Cottontail	-	35	2	-	2	1	-	-	-	-	1	-	-	-	41
	-	54.7%	16.7%	-	22.2%	16.7%	-	-	-	-	11.1%	-	-	-	27.0%
Jackrabbit	1	6	1	-	-	-	-	-	1	-	-	-	-	-	9
	7.7%	9.4%	8.3%	-	-	-	-	-	16.7%	-	-	-	-	-	5.9%
Artiodactyl	4	1	6	6	6	-	4	2	4	1	4	1	-	1	40
	30.8%	1.6%	50.0%	85.7%	66.7%	-	57.1%	40.0%	66.7%	33.3%	44.4%	33.3%	-	20.0%	26.3%
Medium	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
artiodactyl	7.7%	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7%
Totals	13	64	12	7	9	6	7	5	6	3	9	3	3	5	152
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
# from flotation	-	2	-	-	-	2	-	-	-	-	2	-	-	-	6
% from flotation	-	3.1%	-	-	-	33.3%	-	-	-	-	22.2%	-	-	-	3.9%
Unburned	13	61	12	7	9	4	7	5	6	3	7	3	3	5	145
	100.0%	95.3%	100.0%	100.0%	100.0%	66.7%	100.0%	100.0%	100.0%	100.0%	77.8%	100.0%	100.0%	100.0%	95.4%
Burned	-	3	-	-	-	2	-	-	-	-	2	-	-	-	7
	-	4.7%	-	-	-	33.3%	-	-	-	-	22.2%	-	-	-	4.6%
>75% complete	1	11	-	-	-	-	-	-	-	-	-	-	-	-	12
	7.7%	17.2%	-	-	-	-	-	-	-	-	-	-	-	-	7.9%
<25% complete	12	48	11	7	8	4	7	5	6	3	9	3	3	5	131
	92.3%	75.0%	91.7%	100.0%	88.9%	66.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	86.2%
Pitted/	11	55	11	7	9	4	7	5	6	2	5	2	3	1	128
corroded	84.6%	85.9%	91.7%	100.0%	100.0%	66.7%	100.0%	100.0%	100.0%	66.7%	55.6%	66.7%	100.0%	20.0%	84.2%
Checked	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
	-	-	-	-	-	-	-	-	-	-	11.1%	-	-	-	0.7%
Polished	-	4	-	-	-	-	-	-	-	-	-	1	-	4	9
	-	6.3%	-	-	-	-	-	-	-	-	-	33.3%	-	80.0%	5.9%

Table 37. Summary of Townsend West Pit fauna by elevation.

Taxon	0-100 cm bsd		100-140 cm bsd		140-170 cm bsd		170+ cm bsd		Total	
	Count	Col. %	Count	Col. %	Count	Col. %	Count	Col. %	Count	Col. %
Small mammal/medium to large bird	-	-	2	2.0%	-	-	-	-	2	1.3%
Small mammal	5	17.9%	24	23.5%	2	25.0%	4	28.6%	35	23.0%
Medium to large mammal	3	10.7%	7	6.9%	-	-	1	7.1%	11	7.2%
Large mammal	2	7.1%	1	1.0%	1	12.5%	1	7.1%	5	3.3%
Black-tailed prairie dog	2	7.1%	1	1.0%	-	-	-	-	3	2.0%
Plains pocket gopher	-	-	3	2.9%	-	-	-	-	3	2.0%
Ord's kangaroo rat	-	-	-	-	-	-	1	7.1%	1	0.7%
Small rodent	1	3.6%	-	-	-	-	-	-	1	0.7%
Desert cottontail	1	3.6%	37	36.3%	2	25.0%	1	7.1%	41	27.0%
Black-tailed jackrabbit	1	3.6%	8	7.8%	-	-	-	-	9	5.9%
Artiodactyl	13	46.4%	19	18.6%	2	25.0%	6	42.9%	40	26.3%
Medium artiodactyl	-	-	-	-	1	12.5%	-	-	1	0.7%
Total	28	100.0%	102	100.0%	8	100.0%	14	100.0%	152	100.0%
Unburned	28	100.0%	98	96.1%	8	100.0%	11	78.6%	145	95.4%
Light to heavy	-	-	1	1.0%	-	-	1	7.1%	2	1.3%
Dry burn	-	-	1	1.0%	-	-	-	-	1	0.7%
Heavy or black	-	-	2	2.0%	-	-	2	14.3%	4	2.6%
Complete	-	-	8	7.8%	-	-	-	-	8	5.3%
>75% complete	-	-	3	2.9%	-	-	1	7.1%	4	2.6%
50-75% complete	1	3.6%	-	-	-	-	-	-	1	0.7%
25-50% complete	1	3.6%	5	4.9%	2	25.0%	-	-	8	5.3%
<25% complete	26	92.9%	86	84.3%	6	75.0%	13	92.9%	131	86.2%
From flotation	2	7.1%	2	2.0%			2	14.3%	6	3.9%
Environmental alteration	-	-	-	-	-	-	-	-	-	-
Pitted/corroded	25	89.3%	86	84.3%	7	87.5%	10	71.4%	128	84.2%
Checked/exfoliated	-	-	-	-	-	-	1	7.1%1	1	0.7%
Rounded/polished	-	-	9	8.8%	-	-	-	-	9	5.9%

Summary and Interpretation

The Pit

Excavation in the Pit removed fill from depths of up to 2.9 m with artifacts recovered from as deep as 2.1 m. Two concentrations of cultural material or cultural horizons were found. The upper horizon dates to the Late Archaic, and the deeper horizon remains undated. The upper horizon has more angular debris, fewer core flakes, and a greater diversity of artifact types. Proportionately more quartzite and less chert is found in the upper horizon, but the proportions of good quality (fine-grained) material are essentially equivalent in the two horizons. Overall, there is evidence of a number of typical camp activities, including core reduction, informal tool use, and general hunting tasks (Moore, this volume). Fauna, predominantly small mammals, are most abundant in the upper horizon, and sparse with poor preservation in the lower horizon. Reliance on small mammals could indicate opportunistic animal procurement while concentrating on plant resources growing along Salt Creek.

It is difficult to evaluate this portion of the site with respect to the earlier excavations (Maxwell 1986). Because of the nature of the sample, often limited test trenching, and disturbance, the lithic and faunal assemblages were not broken down into Archaic and Ceramic period deposits. A wide array of tools and material was recovered, suggesting a wide variety of camp activities over a long period of time.

Bison Area

Investigations in the Bison Area resulted in little, if any, evidence that humans were responsible for the bison remains. Not only were the bison remains relatively sparse, but also, none are burned or exhibit evidence of processing. Furthermore, the context is disturbed enough that the angular debris could be redeposited gravel, leaving only the two flakes. Excavation notes state that at least one of the flakes (the other was found in the screen) was recovered from the southwest corner of the grid in a recently deposited layer that also contained gravel, asphalt, concrete, wood, rebar, and other construction material. Orientation of the individual bones in the deposit indicates natural dispersal. Their location in the lower terrace indicates these deposits are younger than those of the Pit, which were formed along with the intermediate terrace and dated to the Late Archaic and probably to the late Ceramic period or later.

In the earlier excavations at this site, bison remains were recovered from Test Trenches I, J, M, P, and Q in the drainage bank and bottom, in the Bison Cutbank, and in Test Trenches O and Q and Backhoe Trench 14 at the Campsite (see Fig. 32). While only Test Trench I produced an artifact in association with bison remains, a projectile point near a skull, and no unequivocal evidence of processing on any of the remains, the number of individuals represented (based on age and spatial distribution of the bones), the parts found, and the possible presence in Campsite tests suggested that bison could have been killed and utilized at the site (Maxwell 1986:74-80, 88-90). While this may be true of some of the remains, the overall lack of associated material also suggests multiple sources for the bison remains. If bison utilized the area consistently enough to be repeatedly procured there, some could also have died natural deaths.

Evaluation and Data Potential

The data potential of the area within the right-of-way has been exhausted. Between the massive disturbance from road construction and the OAS excavations, a good portion of the intact fill has been investigated. The site extends well outside of the current right-of-way, and that portion should be protected from further erosion caused by the elevated roadway because it has the potential to provide additional information on the prehistory of this area.

CHAPTER 12

TOWNSEND EAST (LA 34150E)

As originally defined, LA 34150 was the area north of Salt Creek and west of U.S. 285. However, when SWCA surveyed the area, they included this large and discontinuous area as part of LA 34150. Disturbance from highway construction and long-term agricultural practices have obscured or destroyed any evidence of the site north of Salt Creek on the east side of U.S. 285 and south of Salt Creek on the west side of U.S. 285. Along the creek, bank recontouring and stabilization activities extend at least 300 m east of the bridge.

SWCA describes the newly defined Townsend site as a large (630 by 420 m) multicomponent Native American artifact scatter with features. Townsend East is characterized in terms of three loci. Lithic artifacts are distributed throughout the entire site area, but ceramics and ground stone have a more limited distribution. The northern portion of the site (Locus 1) extends east well beyond the project area and is described as having seven features (fire-cracked rock and artifact concentrations) and a possible midden or habitation. At the center of the site area is Locus 4, consisting of nine artifact concentrations with little fire-cracked rock and a relatively large number of ceramics. This, too, extends considerably beyond the project area. Finally, Locus 2 was defined as the area just north of the bladed road that defines the southern boundary of the site and as mostly outside of the project area. It consists of a cluster of lithic artifacts and six fire-cracked rock scatters with no ceramics (Phillips et al. 1997:4.3-4.5).

ENVIRONMENT AND CONDITION

Townsend East covers an area about 380 by 100 m. Most of the area between the right-of-way fence and the pavement is heavily disturbed by the road berm and recontouring for drainage. Weedy annuals and an occasional mesquite comprise the often dense vegetation. Like the right-of-way, the area between an east-west fence near the north end of the site and the creek bank is heavily disturbed and has a cover of grass including sideoats grama, galleta, vine-mesquite grass, three-awn, alkali sacaton, and ring-muhly, forbes, annuals such as white prickly poppy, nightshade, groundcherry, copper mallow, western peppergrass, yellow wooly-white, and Russian thistle, fourwing saltbush, soapweed yucca, prickly pear, cholla, and mesquite. The main site area has some topography, especially to the east outside the project area. The southernmost part of the site is up to 4 m higher than the site datum, while the creek edge is over 5 m lower. Grass, forbs, and scattered mesquite cover much of the area except where a two-track road has caused erosion. To the far south, a low ridge parallels the bladed road that forms the southern boundary of the site. Additional types of vegetation found at the margins and base of Salt Creek are devil's claw, stickleaf, cocklebur, thornapple, gumweed, composites, coneflowers, gaura, knotweed, thistle, and bindweed.

Like Townsend West, soils are Reakor silt loam (Lenfesty 1980:55). However, extended occupation of the area by humans, and rodent and reptile activity, have modified the upper fill considerably so that most of the soil is a disturbed silty loam that is a mix of eolian deposits and disturbed culturally modified soil. This overlies the culturally sterile pink silty clay loam.

SITE DESCRIPTION

Townsend East is an immense artifact scatter. Fire-cracked rock and lithic artifacts are by far the most common cultural materials, but ceramics, ground stone, and freshwater mussel shell are also evident. Large areas of the site are fairly intact. The site has not been plowed and has not been heavily modified except within the highway right-of-way, along the creek bank, and at the far south edge. A two-track road and the installation of a number of telephone poles, a fiber optic line, and an AT&T cable have caused localized disturbance in the area between the right-of-way fence and project boundary. Grazing cattle have disturbed the surface, resulting in some erosion. Wind, weather, and bioturbation have also damaged the archaeological resources. Virtually all of the surface manifestations, like the concentrations of fire-cracked rock, are deflated, with little or no remaining cultural fill. Rodents, reptiles, and insects have taken advantage of soil softened by human occupation, churning the upper fill and damaging the subsurface features.

We were unable to completely map or determine the site boundaries. The private land owner required we stay within the project area (15.2 m or 50 feet from the pavement). The southern portion of the site is New Mexico State Trust land, which allowed us to map the extent of the southern artifact cluster.

Excavation Methods

Data recovery efforts proposed for Townsend East include hand-excavated units, auger tests, and mechanical scraping to locate features outside of the hand excavations. Work at Townsend East was carried out between September 2 and December 5. Nancy Akins directed the excavations, assisted by Jessica Badner, Byron Hamilton, Eric Harkrader, Macy Mensel, Jessie Murrell, Jim Quaranta, Jennifer Ware, Dean Wilson, and Regge Wiseman.

For horizontal and vertical control, a site datum (100N 100E, elevation 10.0 m) was established at a NMSHTD permanent highway marker, and a north-south base line paralleling the right-of-way fence at the north end of the site was staked at 10 m intervals. A series of east-west base lines were laid out with a transit, generally at 50 m intervals, and staked. This grid system extended from 80N to the creek bank just beyond 302N. South of 80N, where artifacts were sparse and the fiber optic line caused considerable disturbance, artifacts and features were located with the total station. An independent grid system was established for the far south area. Here, the subdatum was designated 500N 500E to readily distinguish it from the more northern areas. The elevation (13.81 m) is in relation to the site datum.

Cultural material was collected and fire-cracked rock counted by 1 m grid within the project area for the area from 80N to 302N in the north and from 467N to 501N in the south. Artifacts between these two areas were located on an individual basis with the total station. Counts for the lithic artifacts, ground stone, ceramic artifacts, other cultural material, and fire-cracked rock from the northern area were entered into a computer mapping program (Surfer 32), and densities were plotted. Artifact densities were used to select grid units for initial excavations. Given the immense area within the right-of-way, the strategy was to maximize our efforts by concentrating on areas within dense artifact concentrations but to also investigate areas that had few or no artifacts. Ultimately, about 216 one-meter grid units were excavated for a total of 409 levels of up to 10 cm each. These included the initial exploratory grids and units that exposed features, stains, or structures. In addition, auger tests were placed at 10 m intervals along the 100E base line, on the 275N line, and at the bases of some hand-excavated grids.

Hand excavations were generally in 10-cm levels within 1 m grids. As we learned the site stratigraphy and became confident that the hard, pinkish soil was indeed sterile, excavations were stopped when this soil was reached. Once a feature or structure was defined, it became the unit of investigation. When the feature was of sufficient size to view a profile, fill was removed from half of the feature and the fill profiled. Most structures were divided into quadrants for excavation. Most structure and all feature fill was screened through 1/8-inch hardware cloth. Features and structures were numbered sequentially for the entire site. Fine screen was also used in extramural areas where small lithic artifacts that would have passed through the larger screens were observed.

Excavations and findings are described in three areas (Fig. 46). Area A is the northernmost portion of the site and extends from 200N to the creek bank. Area B is south of Area A, and Area C is the southernmost area. Area C is sufficiently removed from the more northern manifestations that it could have been a separate site. Within the main site area, surface ceramics from Area A are almost all brown wares, while in Area B, later black-on-white types are common and suggest a logical division between the areas. Subsurface ceramics indicate that a better division would have been at 210N so as to include Structure 4 in the later component. Chipped stone and fauna were analyzed with the area between 210N and 200N, treated with Area B.

Area A Data Recovery Results

The surface plots (Fig. 47) indicate relatively dense fire-cracked rock and lithic artifact concentrations between 225N and 250N from along the fence to the edge of the project area. Ceramics are rare in the surface collection but show a slight concentration in the area between about 235N and 245N.

Hand-Excavated Units

About 22 units ranging from single grids to large areas were excavated by hand (Table 38, Fig. 48). Exploratory units were placed from just south of the creek bank at 283N to 228N. Some were intended to investigate fire-cracked rock concentrations or possible deflated hearths, others were in artifact concentrations or placed to provide stratigraphic profiles, and still others were placed to ensure that all areas of the site were investigated. After these initial excavations, selected areas were surface stripped by hand, looking for evidence of features and structures. None of these initial efforts were

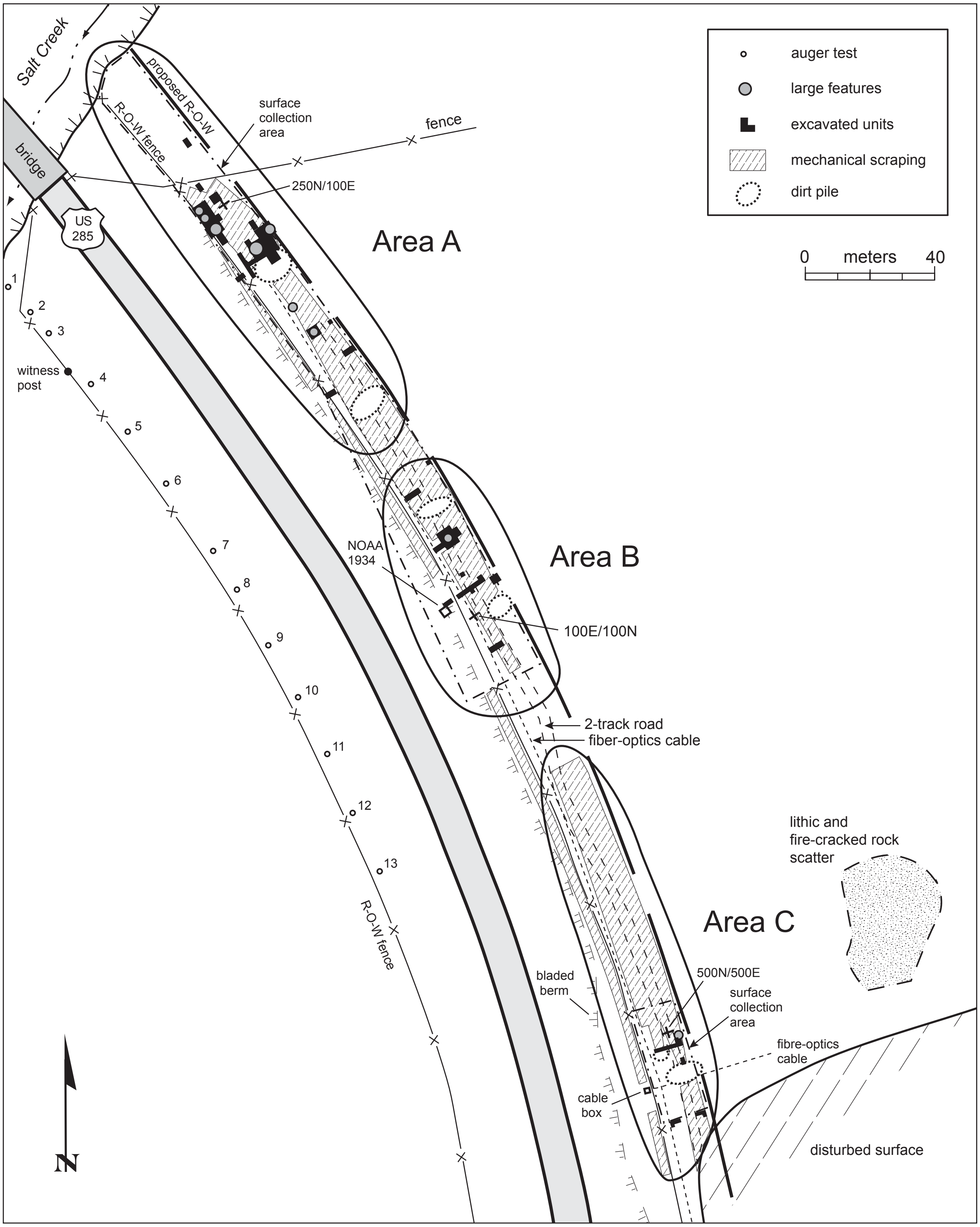

Figure 46. Plan of Townsend East and auger tests west of U.S. 285.

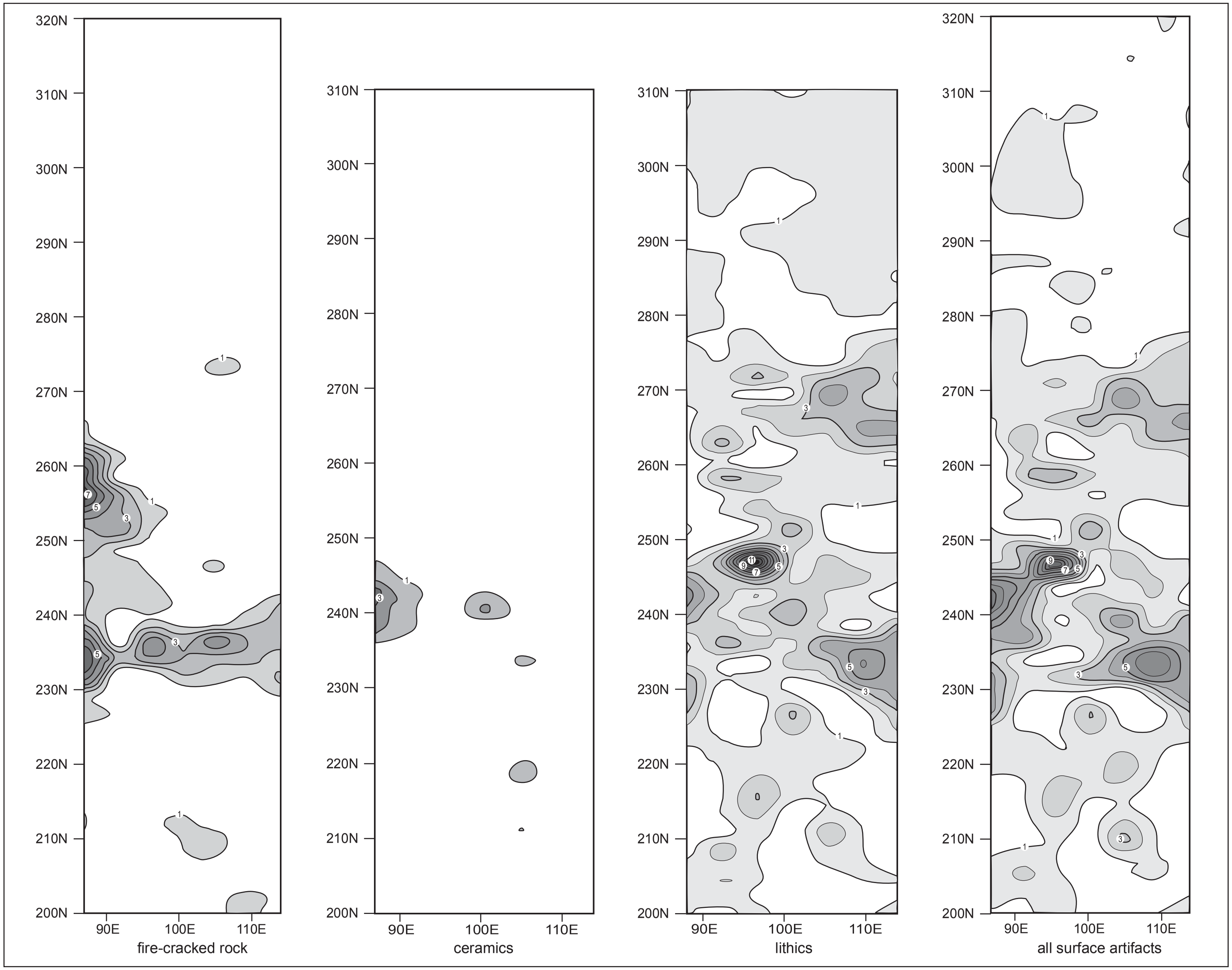

Figure 47. Townsend East Area A surface artifact distribution.

Table 38. Hand-excavated units in Area A of Townsend East (north to south).

Location	No. of Levels	Top and Bottom Elevations (mbd)	Comments
283N 101E	3	5.68-5.40	exploratory; disturbed fill from bank stabilization; auger test to 4.03 m; silty clay at 4.95 m
272-273N 103E	2	5.90-5.72	exploratory; disturbed fill from bank stabilization
258-259N 97E	2-3	6.52-6.25	artifact and fire-cracked rock concentration
251-252N 98-99E	1	6.72-6.70	defining Feature 26; after scrape
252N 91-92E	1	6.87-6.78	defining Structure 7
248-251N 93-95E	1	NW 6.88-6.85 SE 6.96-6.93	defining Features 22, 24, 25, 47, 48; after scrape
249-250N 91-92E	1	NW 7.03-6.93 SE 6.94-6.86	defining feature (F 45)
248N 92E	1	7.30-7.23	defining Feature 43
247N 92-95E	1	W 7.20-7.00 E 6.78-6.67	exploratory under fence
245-246N 95-96E	1-3	NW 7.04-6.84 SE 7.01-6.97	exploratory at fire-cracked rock scatter and defining Feature 2; north half of 245N 95E
243-246N 92-93E and 243N 94E	1-2	NW 6.70-6.74 SE 7.11-6.91	defining west half of Structure 3
239-242N 94-95E	2	NW 7.11-7.05 SE 7.29-7.10	exploratory at fire-cracked rock scatter (Feature 1); Features 3 and 4
232-240N 104-105E and 232-234N 106-107E	1-2	NW 6.94-6.84 SE 7.48-7.23	exploratory surface stripping at artifact scatter; Features 5, 6, 7, 13
236-237N 100-101E	1	7.32-7.25	defining Feature 28; after scrape
235-237N 106-108E	1-2	NW 6.95-6.88 SE 7.23-7.06	defining Structure 5; some after scrape
234N 108E	1	7.22-7.19	investigating stain
227-235N 96E	3	N 7.38-7.15 S 7.46-7.16	exploratory north-south profile trench; utility cable at base
232-235N 100-103E	1	NW 7.44-7.25 SE 7.40-7.25	defining Structure 2; after scrape
231N 92-93E and 96-107E	3-5	NW 7.37-6.79 NE 7.44-7.22	exploratory; west end, fire-cracked rock exposed in erosional cut; possible paleosurface in 93E; east-west profile trench; auger test in 231N 92E to 5.77 mbd
228-230N 104-106E and 230N 107E	2-4	7.60-7.39	exploratory at artifact concentration; Features 9-12
202-203N 103-104E	2	NW 7.66-7.48 SE 7.79-7.46	defining Structure 4; after scrape
203N 111E	1	8.08-9.95	investigate stain; after scrape

as productive as the mechanical scraping. All of the structures except Structure 7 and many of the features were revealed by mechanical scraping. Because the structures were not deliberately filled with trash, the artifact concentrations were offset toss-and-discard zones, and by investigating the artifact-rich areas, we missed the major features and structures.

Auger Tests

A series of auger tests (Table 39) at 10 m intervals along the 100E and 275N lines were placed to provide additional information on subsurface soils. These confirmed that the area north of the east-west fence is heavily disturbed. Silt and gravel dominate the fill, with the residual pink sterile soil quite deep, over 70 cm bgs. Gravel prevented reaching sterile soil in some tests. South of this fence, the stained cultural and eolian fill thins out to the east and is thickest to the west, at least within the project area. At the 100E line, these deposits range from about 10 to 30 cm thick, with the maximum thickness at 240N.

Surface Scrape

After investigating all of the features exposed by hand excavation, much of Area A was mechanically scraped (Fig. 48), avoiding the area of a buried AT&T cable that parallels the right-of-way fence. Thin scrapes were closely monitored, and any staining, fire-cracked rock concentrations, or potential evidence of cultural phenomena were flagged for investigation. If no evidence

Table 39. Townsend East, Area A auger test summary.

Location	Surface Elevation (mbd)	Depth Excavated (m)	Disturbed Upper Fill	Eolian/Cultural Fill (m)	Start Residual Soil (m)
305N 100E	4.64	0.55	silt and gravel	-	-
300N 100E	4.87	0.55	silt and gravel	-	-
290N 100E	5.35	0.15	silt and gravel	-	-
290N 95E	5.49	1.10	silt and gravel	-	-
275N 103E	-	0.95	silt and gravel	-	0.75
275N 90E	6.05	0.47	silt and gravel	-	0.40
275N 85E	6.08	0.34	silt and gravel	-	-
270N 100E	5.98	0.95	silt and gravel	-	0.52
265N 100E	6.24	1.50	silt and gravel	-	0.53
260N 100E	6.47	1.26	-	0-0.20	0.20
250N 100E	6.63	1.07	-	0-0.20	0.20
250N 95E	6.91	1.02	-	0-0.45	0.45
240N 105E	-	0.51	-	0-0.10	0.10
240N 100E	7.19	1.10	-	0-0.30	0.30
230N 100E	7.54	1.32	-	0-0.26	0.26
220N 100E	7.70	1.15	-	0-0.15	0.15
210N 100E	7.85	1.21	-	0-0.10	0.10
200N 100E	8.02	0.94	-	0-0.15	0.15

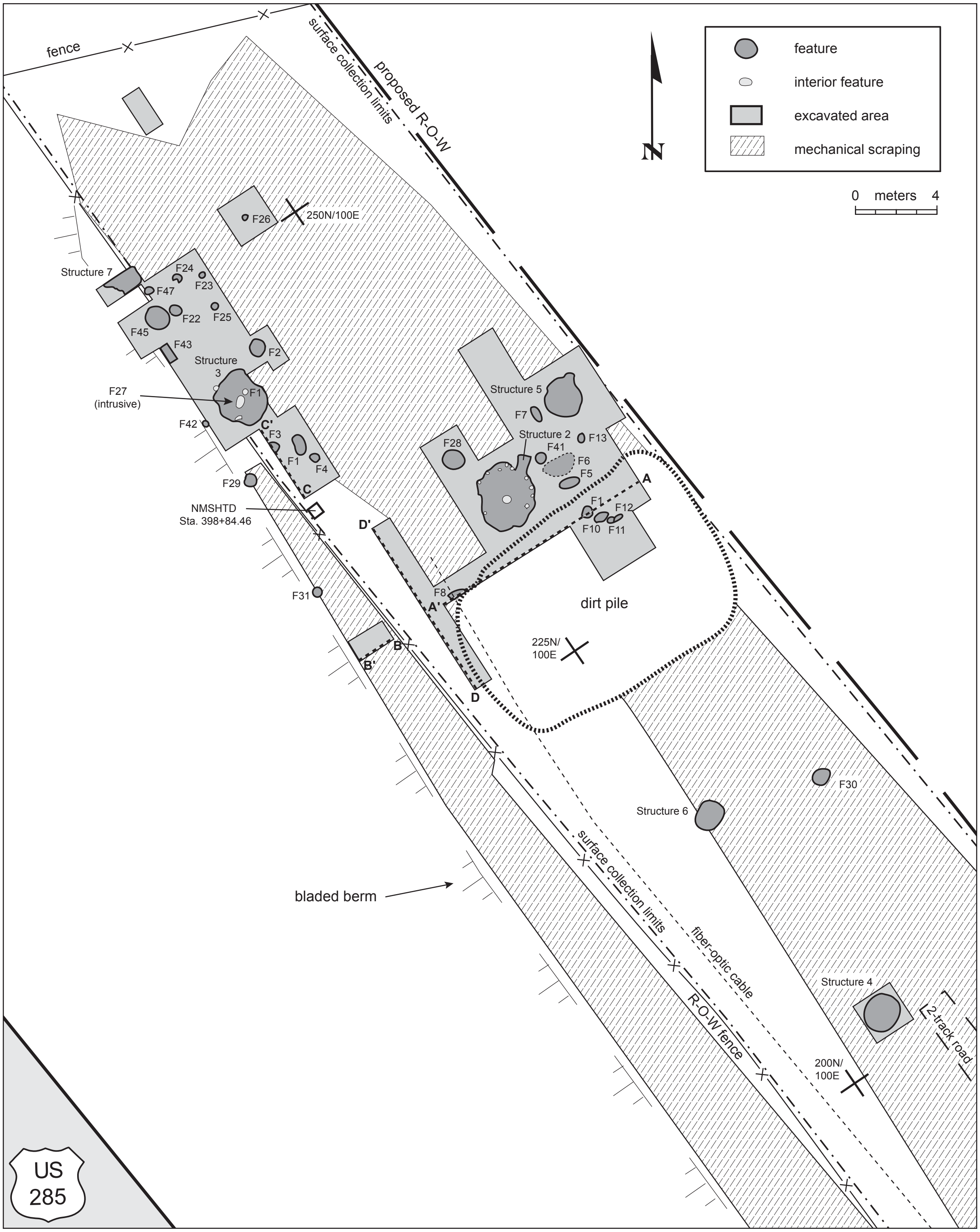

Figure 48. Plan of Townsend East Area A.

was found, the scraping procedure continued until the pink sterile soil was reached.

Stratigraphy

Stratigraphy within Area A was relatively simple. To the far north, where bank stabilization activities modified the natural deposits, fill at 283N 101E was 12 to 14 cm of brown silty loam with some gravel overlying 14 to 20 cm of similar soil with abundant (about 50 percent) gravel. Beneath this was about 1 m of sterile pink soil, then a coarse brown clay with large caliche chunks extending at least another 40 cm. By 273N these disturbed soils were mostly gone, and fill was 6 to 10 cm of eolian sand with small charcoal flecks and small pebbles overlying the pink sterile soil.

At 258-259N the soil has the more characteristic profile. Upper layer duff was 6 to 8 cm of loose eolian sandy silt that overlies 4 to 16 cm of charcoal-stained cultural horizon soil. As was found throughout the area, the upper boundary of the cultural horizon is fairly smooth and continuous, while the base undulates considerably from human, rodent, and insect activity and can be sharp and clear or somewhat mottled from the insect burrowing.

The main east-west profiles at 230N 292-293 and 295-107E (Fig. 49) and 233N 94-95E, and north-south profiles at 227-235N 96E (Fig. 50) and 239-242N 93E (Fig. 51) illustrate the undulating nature of the cultural horizon. The upper eolian fill ranges from 2 to 8 cm thick. This loosely consolidated layer of sandy to silty loam has abundant roots and contains some cultural material. The cultural layer is stained gray from powdered charcoal and occasional visible flecks. A sandy loam, it is moderately consolidated, with much rodent, reptile, and insect activity, causing the irregular lower boundary. The pink sterile soil is a compact silty clay loam with abundant calcium carbonate particles. Soils are more mottled on the east side of the project area, probably reflecting the disturbance caused when structures and features were excavated into the sterile pink soil.

Structures

All but one of the structures investigated are located in Area A. Table 40 summarizes the locations, dimensions, fill characteristics, and features for all structures.

Structure 2 is the largest of the structures and was just missed by the east-west profile trench to the south and by surface stripping to the east. Mechanical scraping revealed an ashy gray stain and led to its investigation (Fig. 52). Two levels of fill were removed by grid before a distinct outline emerged at a uniform depth. The fill to just above the floor was excavated in two levels by structure quadrants oriented to magnetic north. The uppermost fill was a single layer that ranged from well to loosely consolidated, grayish silty loam with dispersed calcium carbonate flecks and linear staining resulting from rodent burrows. Fire-cracked rock, ceramics, fauna, and chipped stone were common.

Structure 2 was shallow, probably not more than 20 cm deep. It had sloping walls (Fig. 53), and an entry to the north. Just inside the walls was a series of at least 10 postholes that could have held roof supports (Table 41). Extensive rodent burrowing made it difficult to determine if other spots were also postholes. Features called postholes had no signs of rodent intrusion and are found at fairly regular intervals around the perimeter. Other features (Fig. 54) were a shallow depression near the center of the structure (Feature 9) that contained dark ash and was burned, a shallow oval pit along the east wall (Feature 3), and another shallow pit between the hearth and entryway (Feature 6). The structure and features were excavated into the sterile pink layer.

The structure is roughly circular (Fig. 55) with scalloped edges. Some of the scallops contain postholes. Walls are a continuation of the floor at about a 38-degree angle and are unprepared, with ash and charcoal worked into the surface. Both are badly damaged by rodents in some areas, probably destroying or modifying features. The lack of wall slump, as well as the lack of evidence of soil loss and the presence of other features at about this same level, suggest the structure was never very deep and had a wickiup-like appearance.

None of the features were prepared beyond removing soil, and none had discernable evidence of remodeling. The hearth was a shallow oval depression with a small basin at the center. Soil was hardened and colored by burning on the sides and oxidized to an orange color at the base of the basin. No fire-cracked rock was attributed to the hearth, but some was removed from above where it was defined. Fill in the hearth was remarkably clean, with no charcoal, but it contained pieces of burned soil. An archaeomagnetic sample (SC1099) (Fig. 56) suggests the most relevant dates for this burn are between A.D. 665 and 725 or between A.D. 905 and 950.

The entryway (Feature 10) was a shallow, gently sloping, rectangular depression. Fill was the usual structure fill, with insect, rodent, and root intrusion. A number of extramural features are within 2 m of the structure's perimeter and could have been used in association with Structure 2.

A range of material was found on or near the floor surface. This includes end and edge fragments of a basin metate in the south half, an indeterminate fragment from

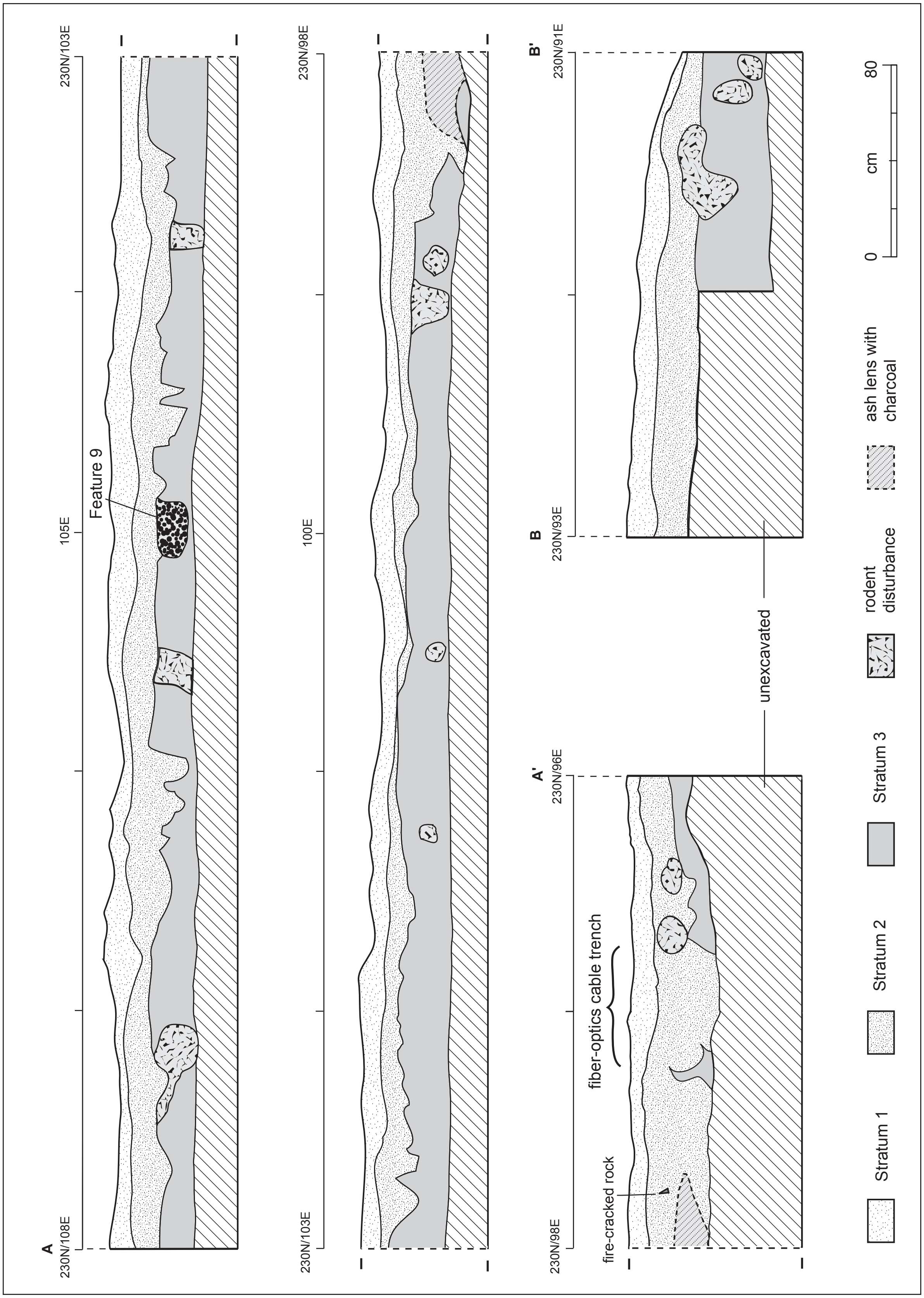

Figure 49. Townsend East Area A, east-west profile trench at 230N.

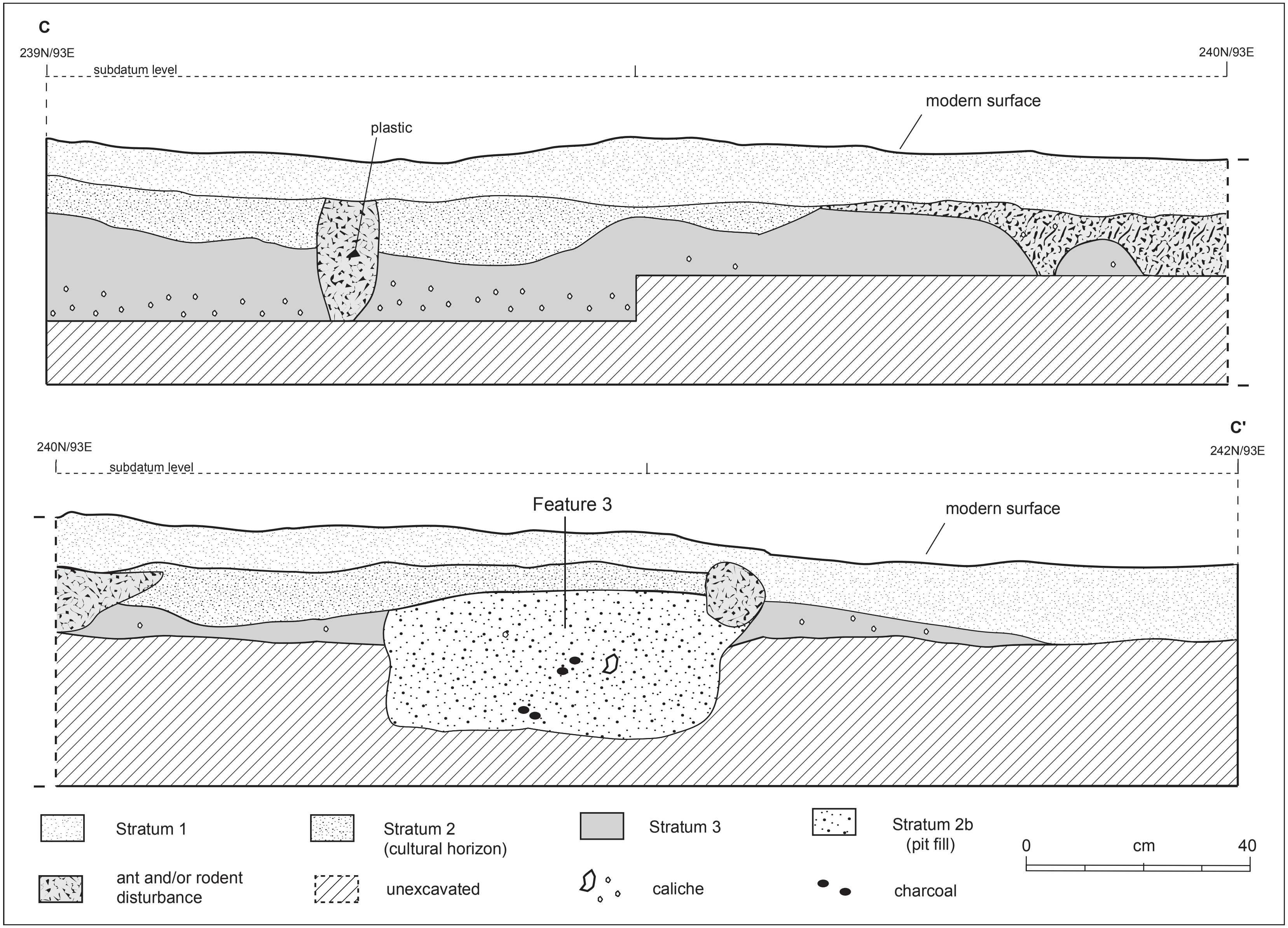

Figure 50. Townsend East Area A, north-south profile at 238-242N 93E.

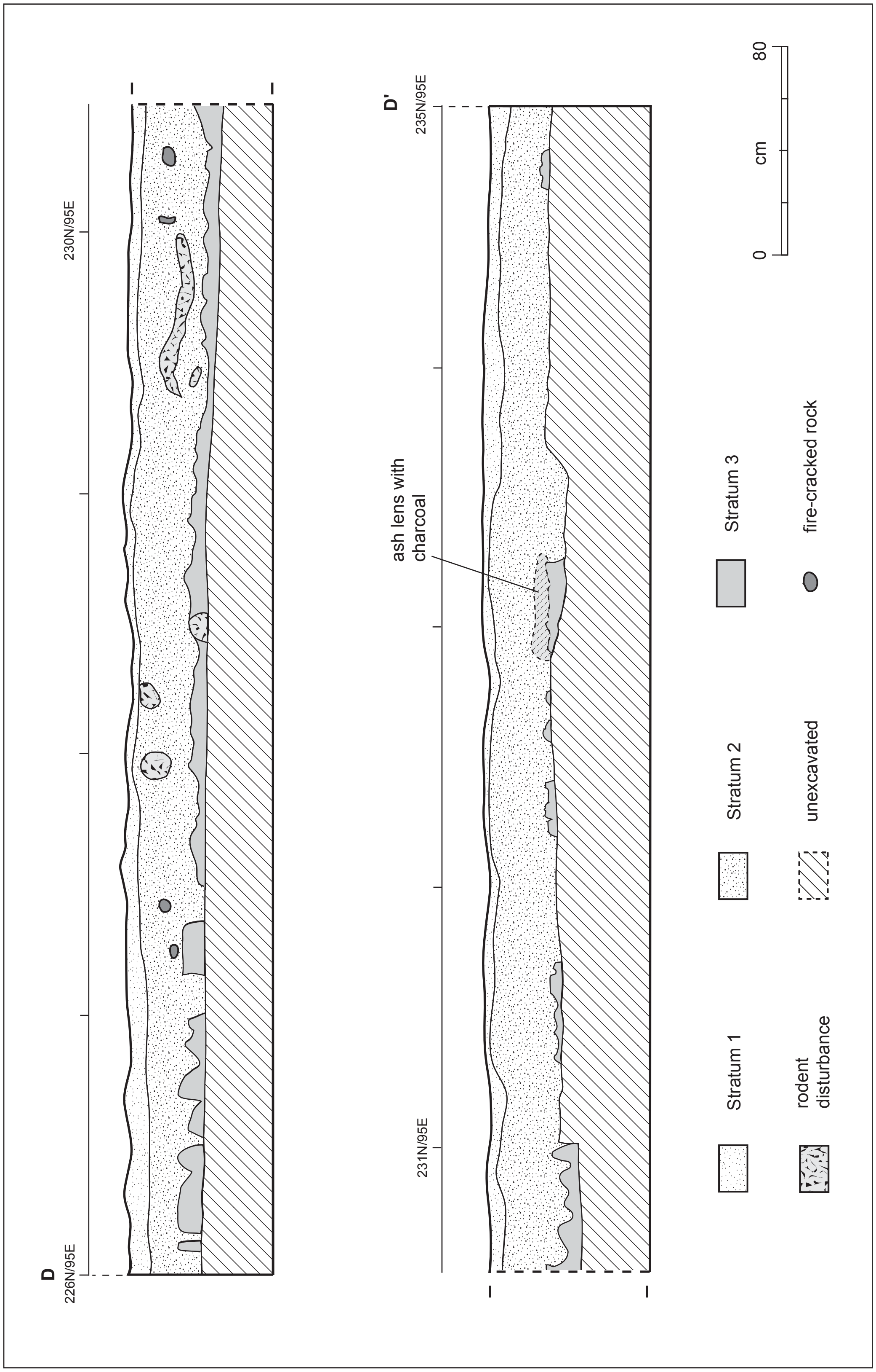

Figure 51. Townsend East Area A, north-south profile at 226-236N 95E.

the hearth, mano fragments from the northeast and northwest quads, and a polished cobble in the northeast quad. Upper fill produced an additional indeterminate fragment.

Ceramics were rare (n=34) in the shallow fill of this structure. Most (70.6 percent) were in the upper fill (Level 1). Wares include El Paso Brown (44.1 percent) or thin El Paso Brown (2.9 percent), Jornada-like El Paso Brown (2.9 percent), Jornada Brown (8.8 percent), and South Pecos Brown (41.2 percent). South Pecos Brown decreases proportionately with depth, while El Paso Brown increases.

Lithic artifacts were numerous (n=622) (Table 42), especially considering the shallow depth of Structure 2. Most are unutilized debitage, but a large corner-notched projectile point with a haft snap, a core used as a hammerstone, and two middle-stage bifaces, broken or discarded during manufacture, were found. Chert was the most common material type with appreciable numbers of limestone and quartzite. Activities that took place in

Table 40. Townsend East, summary of structure attributes.

Area and Structure	Location	Dimensions (m): North-South East-West Depth Area (sq. m)	Top and Bottom Elevations (mbd)	Fill	Features
			Area A		
Structure 2	233-236N 100-103E	3.25 2.90 0.18 7.1	7.36 7.18	fine silty sand with charcoal and small chunks of pink sterile soil	postholes: F 1, 2, 4, 5, 7, 8, 12, 13, 14, 15 shallow pits: F 3, 6 hearth: F 9 entryway: F 10
Structure 3	243-245N 91-94E	2.56 2.63 0.20 5.3	7.09 6.89	fine sand to fine loamy sand, sparse charcoal, and pink sterile soil	hearth: F 1 extramural pit F 27 in fill
Structure 4	202N 203E 103N 104E	1.68 1.69 0.74 & 0.82 2.2	7.80 S1 7.06 S2 6.98	0-30: light gray silty clay with charcoal flecks 30-60: same with wall slump S1 floor fill: similar with more slump, slightly darker and harder S2 floor fill: mostly wall slump with lenses of water-lain and eolian silts	S1 hearth: F 1 S2 shallow pit: F 2 S2 ash piles: F 3 & 4 human burial: base at 7.20 mbd
Structure 5	236-237N 106-108E	1.74 1.75 0.45+ 2.4	7.08 6.60	gray brown sandy loam with charcoal chunks and rare chunks of pink sterile soil	step entry: F 1 small pit: F 2
Structure 6 (Feature 33)	215N 101-102E	1.35 1.35 0.22 1.4	7.62 7.40	eolian with few charcoal flecks	none
Structure 7 (Feature 44)	252N 91-92E	1.00+ 1.47 0.40 1.7	6.81 6.41	fine silty sand with charcoal flecks and wall slump near floor	none; modern post or auger hole in SW, modern posthole SE
			Area B		
Structure 1	124-126N 105-107E	1.84 1.88 0.52 3.6	8.99 8.47	fill: slightly gray sandy loam with charcoal chunks S1-S2: compact sandy clay loam S2-S3: fine silty loam with powdered charcoal	modern posthole: F 1 rodent disturbance: F 2, 4, 5? S2 postholes: F 6, 7, 8 S3 posthole: F 9 below S3: F 10, 11

Table 41. Townsend East, summary of Structure 2 features.

No.	Type	Quad	Dimensions (cm)	Fill	Comments
1	posthole	NE	10 x 10 x 17	loose silty loam with charcoal flecks	
2	posthole	NE	12 x 18 x 15	loose silty loam with charcoal flecks	
3	pit	SE	29 x 18 x 7	sandy loam with charcoal flecks and chunks of pink sterile soil	
4	posthole	NE	11 x 15 x 8	loose silty loam, charcoal stained	
5	posthole	NE	7 x 9 x 6	loose silty loam with charcoal flecks	
6	pit	NE	13 x 9 x 3	silty loam with charcoal flecks	possible pot rest
7	posthole	NW	17 x 16 x 18	silty loam with charcoal flecks	
8	posthole	NW	14 x 11 x 10	silty loam with charcoal flecks	
9	hearth	SE	38 x 45 x 5	clean silty loam with hardened burned soil at base	
10	entryway	NE	75 x 50 x 8	charcoal-stained silty loam	shallow, gently sloping depression
12	posthole	SE	6 x 7 x 7	clean, loose silty loam	slanted toward center of structure
13	posthole	SW	11 x 11 x 13	silty loam with charcoal flecks	slanted toward center of structure
14	posthole	NE	10 x 10 x 15	loose charcoal stained silty loam	
15	posthole	NW	13 x 13 x 18	loose silty loam with fire-cracked rock and charcoal flecks	

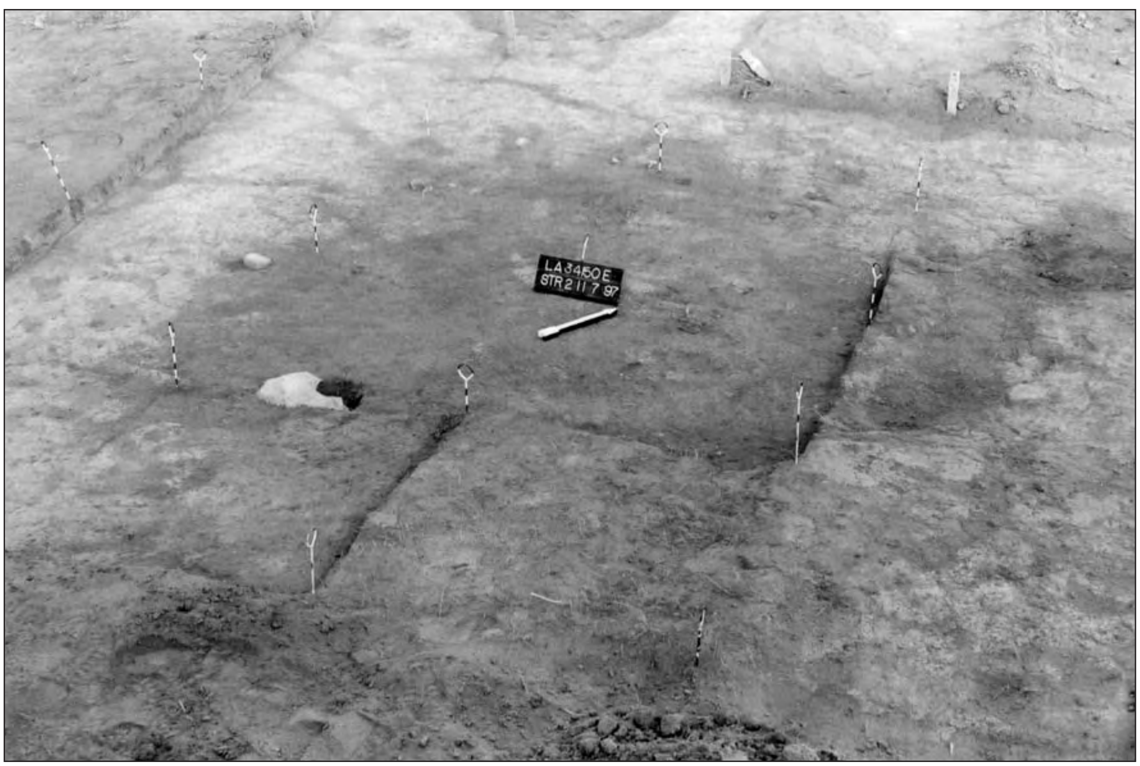

Figure 52. Townsend East Area A. Structure 2 stain.

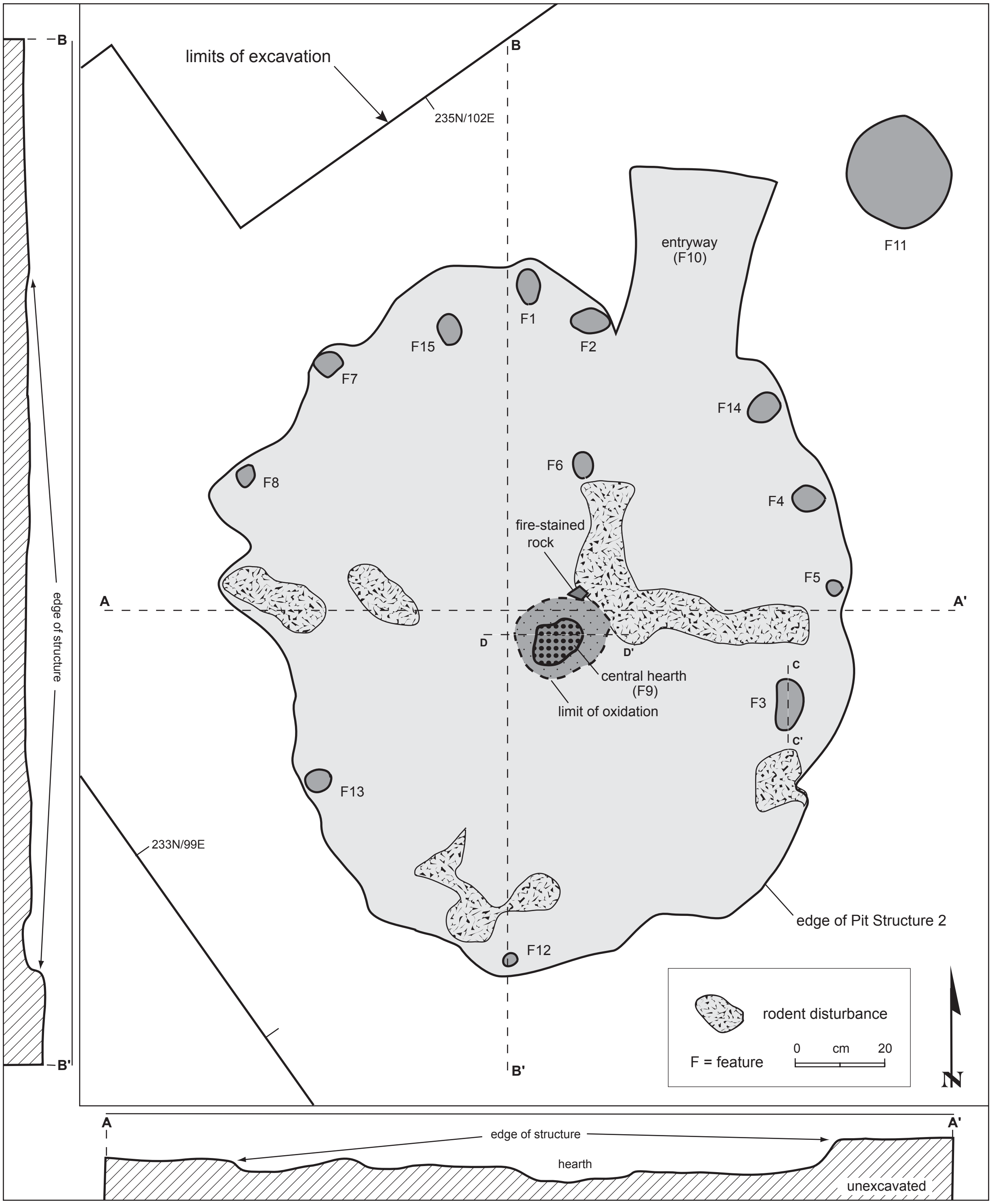

Figure 53. Townsend East Area A, plan and profile of structure 2.

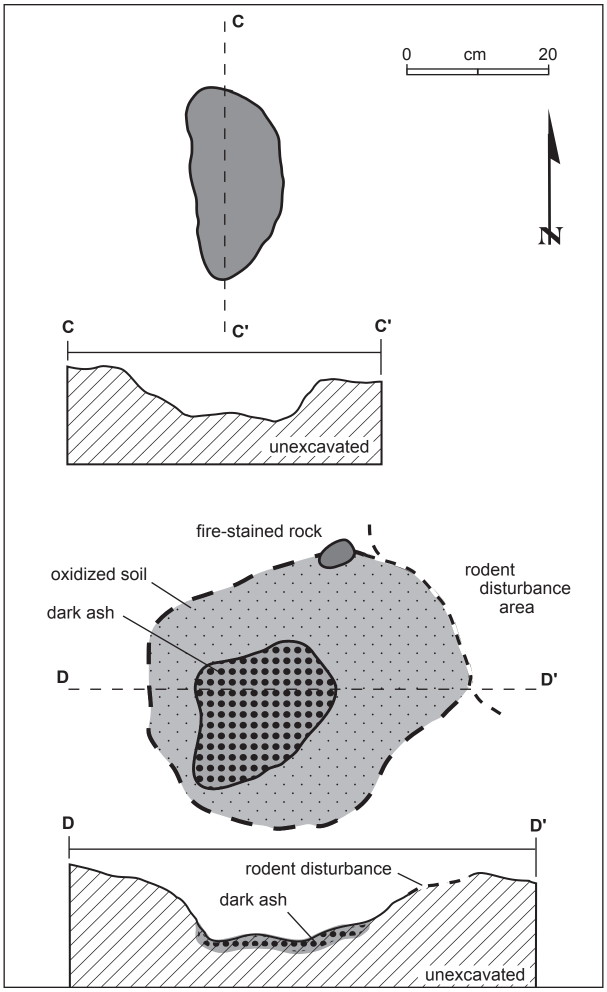

Figure 54. Townsend East Area A, plan and profile of Features 3 and 9 in Structure 2.

and around Structure 2 include general chipped stone reduction, large and small biface manufacture, cutting or chopping of a hard material such as wood, bone, or antler, recycling of lithic material, refurbishing projectile shafts, processing carcasses, and perforating hard or semihard materials (Moore, this volume).

Fauna (Table 43) was also fairly sparse (n=110), and 40.9 percent of the bone was recovered from flotation samples. Unidentified small-mammal bone (60.9 percent) is the most common taxon. No one species dominates the assemblage, but there is a definite predominance of small forms, including rodents. Much of the bone is fragmentary and burned. This suggests that preservation was definitely poor, probably due to the shallowness of the structure.

Flotation samples (McBride and Toll, this volume) produced very little in the way of cultural plant material. Burned goosefoot and prickly pear cactus were found in two of the postholes along with unidentifiable burned plant parts. Burned material collected for radiocarbon analysis was largely saltbush and greasewood, with small amounts of juniper, sagebrush, and unidentified material.

An AMS date on mesquite produced a conventional date of A.D. 680 ± 40 and a calibrated date of A.D. 670-870. For the site in general, where matched *Atriplex* and mesquite samples were dated, conventional *Atriplex* samples dated 40, 260, and 340 years later than mesquite dates from the same structure. This could suggest that the earlier of the two archaeomagnetic intercepts, A.D. 625-725, is too early, and that A.D. 905-950 may be more accurate.

Structure 3, another large, shallow structure, is about 10.5 m west of Structure 2, mostly east of the right-of-way fence. Excavations associated with Feature 2, a large amorphous pit, and exploratory units to the south failed to detect evidence of this structure. Mechanical scraping uncovered a dark stain that was the east half of the structure. Considerable fill (about 30 cm) overlay the unscraped areas along and west of the right-of-way fence. Feature 27 was excavated into the structure fill, attesting to the continued use of the site area. Fill was removed by grid until a discrete stain was visible (Fig. 57). Once the stain was well defined, quads oriented to magnetic north were established and the remaining fill removed in three levels by quad.

Fill within the structure (Fig. 58) was mostly grayish fine-grained sand to loamy sand with sparse charcoal, scattered fire-cracked rock, pieces of calcium carbonate, and chunks of the pink sterile soil. Near the walls, wall slump was composed of silty clay similar to sterile but with charcoal flecks. Extensive rodent disturbance was evident throughout the fill and caused considerable damage to the structure walls. Open burrows were found on the west side and in the north wall.

Structure 3 was almost circular but fairly irregular due to extensive perimeter damage caused by rodents (Fig. 59). Throughout the structure, the walls were often indistinct but appear to have been roughly smoothed in small, well-preserved areas and were nearly vertical rather than gently sloping, as in Structure 2. The structure's depth had been increased by banking clean sterile pink soil around the perimeter of the structure excavation (see Fig. 59). This could have functioned to deepen the structure or prevent water from entering the depression, or it could have helped anchor additional wall or roof material.

Generally, soil was removed until the grayish structure fill was gone or nearly gone, rather than encounter-

Figure 55. Townsend East Area A, Structure 2 after excavation.

ing distinct walls and floor. No postholes were found (Fig. 60). Little definite perimeter wall remained on the north and west sides. The east and south walls were more intact and lacked evidence of postholes. Any superstructure must have been on the surface outside the structure, but no evidence of postholes was detected by clearing around the perimeter. The only feature in Structure 3 was a roughly circular (25 by 27 cm) hearth, 10 cm deep. It was a basin-shaped pit containing loamy sand with charcoal and two pieces of fire-cracked rock. No burning was apparent.

No ground stone was recovered from this structure. Ceramics were fairly sparse (n=39). El Paso Brown was the predominant type (64.1 percent). Like Structure 2, most of the ceramic artifacts were in the upper level of fill (66.7 percent), decreasing with depth. Jornada Brown is fairly common (25.6 percent), and Jornada Plain Slipped Red (5.1 percent) and South Pecos Brown (2.6 percent) are rare.

Lithic artifacts were much more numerous (n=374) (Table 44). Again, most are debitage, but a small projectile point with a haft snap and three bifaces are among those found. Chert, limestone, and quartzite are the most common material types. Activities that took place in and around Structure 3 include large and small

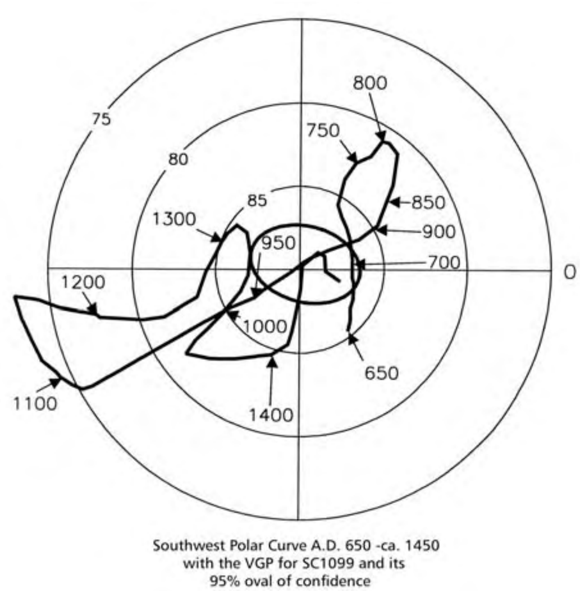

Figure 56. Archaeomagnetic curve for the sample from Townsend East, Structure 2.

Table 42. Summary of lithic artifacts from Townsend East, Structure 2.

Material	Angular Debris		Core Flake		Biface Flake		Notching Flake		Bipolar Flake		Pot Lid		Core		Bidirectional Cobble Tool		Middle-Stage Biface		Late-Stage Biface		Unworked Cobble		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Unknown	-	-	1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Chert	36	52.9%	390	76.2%	23	100.0%	1	100.0%	1	100.0%	-	-	8	72.7%	-	-	2	100.0%	1	100.0%	-	-	462	74.3%
San Andres chert	-	-	4	0.8%	-	-	-	-	-	-	-	-	2	18.2%	-	-	-	-	-	-	-	-	6	1.0%
Silicified wood	-		1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Obsidian	-	-	1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Igneous	-	-	1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Basalt	1	1.5%	2	0.4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.5%
Siltite	4	5.9%	13	2.5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	2.7%
Rhyolite	2	2.9%	2	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.6%
Sedimentary	-	-	1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Limestone	8	11.8%	46	9.0%	-	-	-	-	-	-	1	100.0%	-	-	-	-	-	-	-	-	1	100.0%	56	9.0%
Siltstone	-	-	8	1.6%	-	-	-	-	-	-	-	-	-	-	1	100.0%	-	-	-	-	-	-	9	1.4%
Dolomite	1	1.5%	3	0.6%	-	-	-	-	-	-	-	-	1	9.1%	-	-	-	-	-	-	-	-	5	0.8%
Quartzite	16	23.5%	38	7.4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	8.7%
Quartzitic sandstone	-	-	1	0.2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Row total	68	10.9%	512	82.3%	23	3.7%	1	0.2%	1	0.2%	1	0.2%	11	1.7%	1	0.2%	2	0.3%	1	0.2%	1	0.2%	622	100.0%

Table 43. Townsend East, summary of structure 2 fauna.

Taxon	Total Count	# From Flotation % From Flotation	Max MNI	Unburned	Burned	>75% Complete	< 25% Complete	# Mature
Unknown small	2 1.8%	2 100.0%	- -	2 100.0%	- -	- -	2 100.0%	2 100.0%
Small mammal	67 60.9%	26 38.8%	- -	8 11.9%	59 88.1%	- -	67 100.0%	62 92.5%
Small-medium mammal	2 1.8%	- -	- -	- -	2 100.0%	- -	2 100.0%	2 100.0%
Medium-large mammal	3 2.7%	- -	- -	1 33.3%	2 66.6%	- -	3 100.0%	3 100.0%
Large mammal	2 1.8%	- -	1	- -	2 100.0%	- -	2 100.0%	2 100.0%
Prairie dog	4 3.6%	2 50.0%	1	2 50.0%	2 50.0%	2 50.0%	1 25.0%	4 100.0%
Small rodent	2 1.8%	2 100.0%	1	1 50.0%	1 50.0%	- -	2 100.0%	2 100.0%
Medium-large rodent	12 10.9%	11 91.7%	1	- -	12 100.0%	- -	11 91.7%	12 100.0%
Cottontail	4 3.6%	2 50.0%	1	- -	4 100.0%	2 50.0%	1 25.0%	4 100.0%
Jackrabbit	5 4.5%	- -	1	1 20.0%	4 80.0%	2 40.0%	2 40.0%	5 100.0%
Mussel	7 6.4%	- -	- -	7 100.0%	- -	- -	7 100.0%	- -
Total	110 100.0%	45 40.9%	6	22 20.0%	88 80.0%	6 5.4%	100 90.9%	98 95.1%

biface manufacture, cutting or chopping of a hard material such as wood, bone, or antler, recycling lithic material, refurbishing projectile shafts, processing carcasses, perforating hard or semihard materials, and general cutting tasks (Moore, this volume).

Fauna was also sparse (n=40) and dominated by small-mammal bones and freshwater mussel shell (Table 45). Nearly half (47.5 percent) were found in flotation samples. Most of the smaller forms are burned, undoubtedly contributing to their preservation. Virtually all are fragmentary. The large amount of burning and breakage indicates that preservation was poor in this structure.

Flotation samples from the fill and floor (Level 3) produced a wide array of cultural plant material, including corn (McBride and Toll, this volume). Goosefoot was found in most of the samples. The hearth contained a variety of annuals and an unknown specimen. A single charred walnut shell fragment was found in a floor sample and a juniper seed in the general fill. Wood from the radiocarbon samples was largely saltbush/greasewood and mesquite, with a wide array of other brush and wood.

Two dates were obtained from this structure. An AMS date (Beta 133474) on mesquite dated A.D. 650 ± 40 (conventional) and A.D. 655-785 (calibrated). A conventional date (Beta 134631) on *Atriplex* dated slightly later at A.D. 690 ± 70 (standard) and A.D. 650-910 or 920-955 (calibrated).

The farthest south and latest of the Area A structures, Structure 4 was in an area with few surface lithic artifacts and no ceramics. Mechanical scraping uncovered a small oval stain containing a bison bone. Two levels of fill were removed before the structure could be defined. Level 3 was removed in mass down to a natural break in stratigraphy, a 40 to 50 cm level. This different fill, removed as Level 4, extended to Surface 1. Level 5 was the fill between Surface 1 and Surface 2. Control was maintained by grid through Level 3, as the

Figure 57. Townsend East Area A, Structure 3 stain.

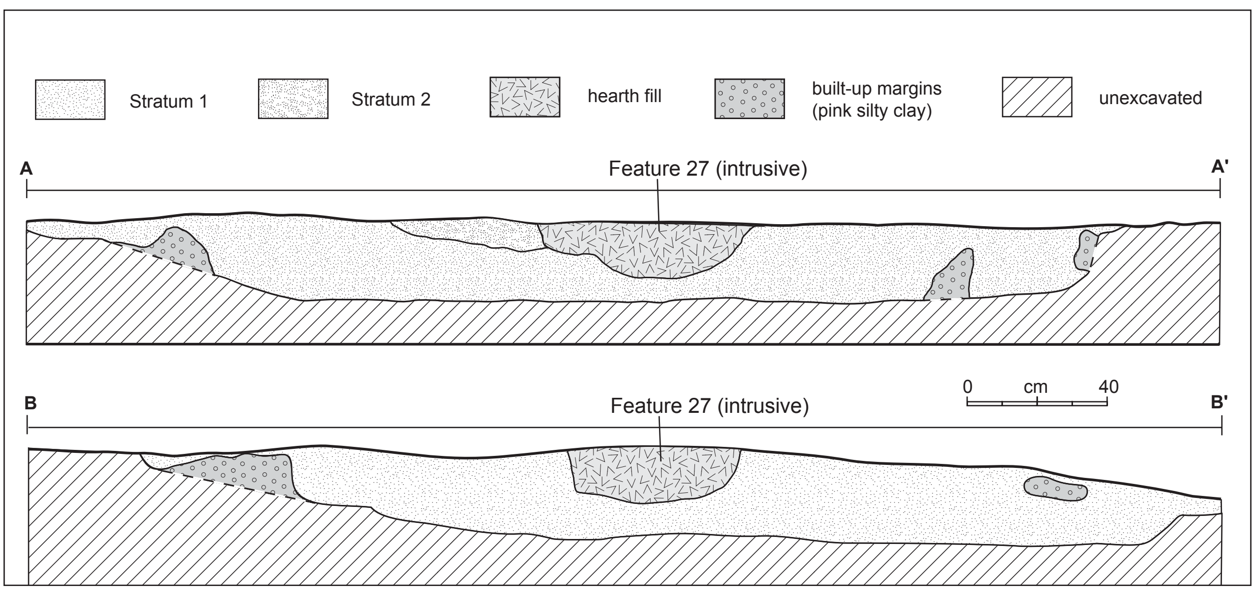

Figure 58. Townsend East Area A, stratigraphic profile of Structure 3.

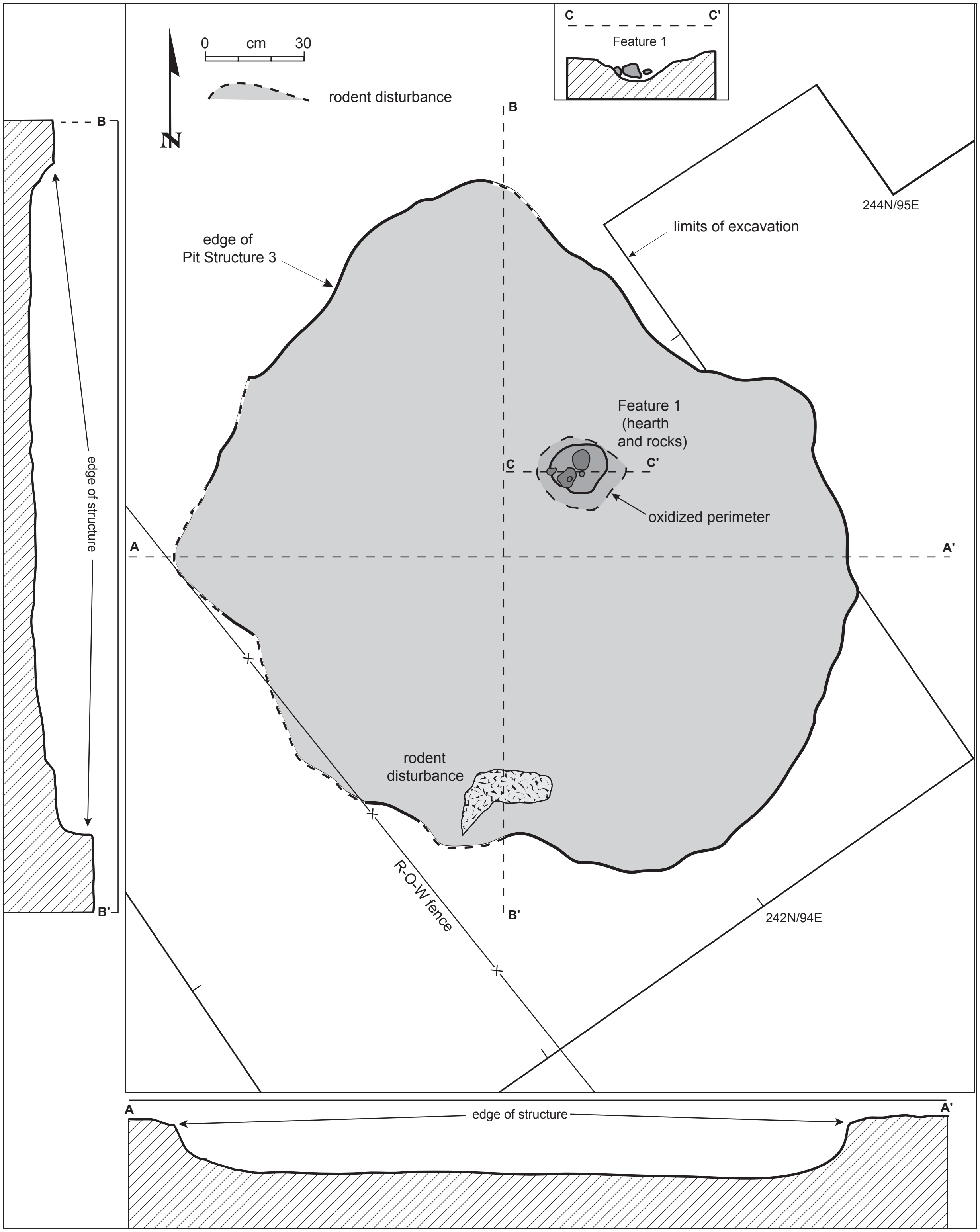

Figure 59. Townsend East Area A, plan and profile of structure 3.

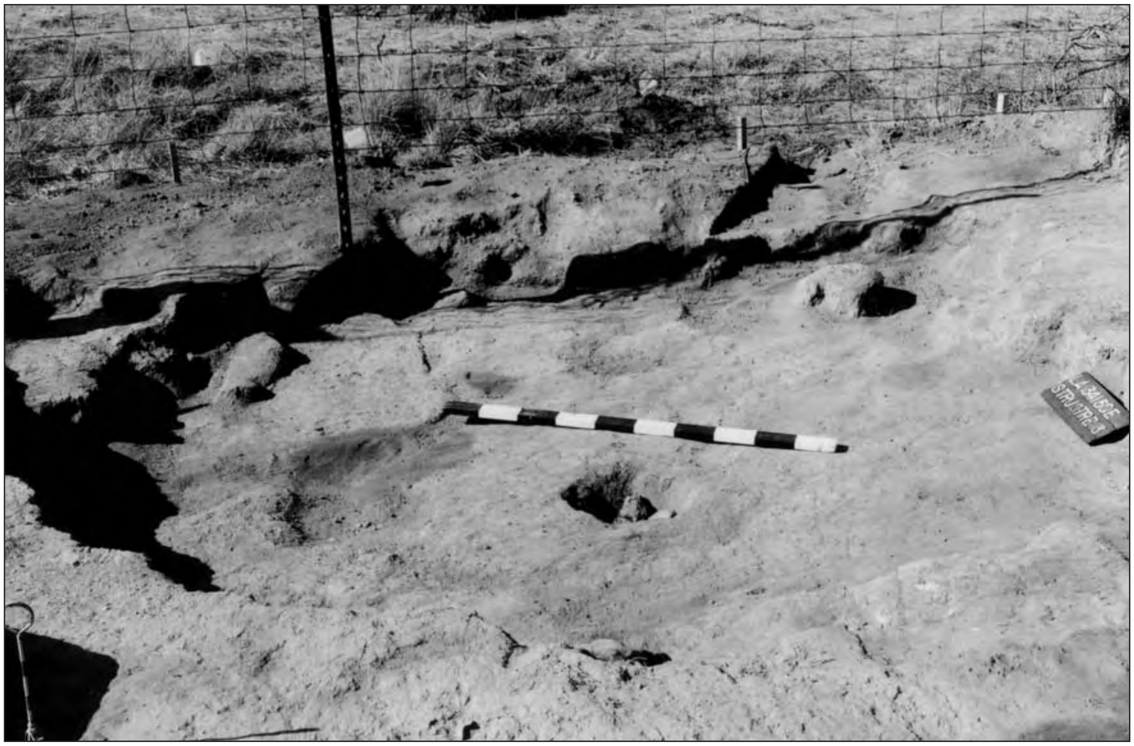

Figure 60. Townsend East Area A, Structure 3 after excavation.

grid lines essentially quartered the structure. In Levels 4 and 5, all artifacts were combined.

Fill (Fig. 61) was loose to compact fine-grained silty clay with a light scatter of charcoal flecks giving it a gray cast (Levels 1-3). Artifacts were sparse and mostly chipped stone. A Chupadero Black-on-white sherd from the northwest quad was found in a rodent burrow. In Level 4 the fill was similar but had more slumped sterile pink soil and a darker gray color from increased charcoal content, which could have resulted from burning of the superstructure. Fill between the surfaces was mostly slumped pink sterile soil with occasional lenses of water-lain and eolian silts. It was mostly clean, but charcoal staining was present in the northern half of the structure, mainly from extensive rodent burrowing in that area.

A human burial had been placed in the fill of the structure against the east wall. No evidence of a pit was discernable, so it could not be determined whether the burial was intrusive or placed in the structure as it filled. Wall melt covered much of the right knee and could have been part of the fill used to cover the burial, or it could have melted onto a scantily covered burial. There was no evidence of deliberately sealing the grave with soil or rock. No burial goods were found; however, a flotation sample from the burial contained a charred corn cupule. The base of the burial was about 15 cm above the level of Surface 1.

The individual was an adult female whose legs were so tightly flexed that she must have been bound. Her arms were straight to her sides and tightly bent at the elbows so that the left hand was behind the cranium and the right just down from the face. She was on her right side and suffered considerable damage from a mesquite root. The bone is in poor condition with considerable natural breakage and deterioration.

By far the deepest of the Townsend East structures (Figs. 62 and 63), the Structure 4 walls were essentially vertical and of sterile pink soil with scattered carbonate specks. No evidence of plastering or smoothing was observed. On the east side, where the mesquite root did considerable damage, a possible step entry extended about 30 cm back from the arc of the structure wall. The base was at the same level as that of the burial, and the east side is reminiscent of a bell-shaped pit. The burial could have been placed partially on the step, or the step could be the remains of a pit excavated to hold the burial. A large lens of sterile pink soil (see Fig. 61) could indicate removal of fill along and into the wall in order to accommodate the burial.

Table 44. Summary of lithic artifacts from Townsend East Structure 3.

Material	Angular Debris		Core Flake		Biface Flake		Notching Flake		Bipolar Flake		Tested Cobble		Core		Biface		Late-Stage Biface		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col%
Unknown	-	-	2	0.7%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.5%
Chert	36	81.8%	208	67.7%	7	87.5%	2	100.0%	2	66.7%	-	-	3	60.0%	3	100.0%	1	100.0%	262	70.0%
Alibates chert	-	-	1	0.3%	1	12.5%	-	-	-	-	-	-	-	-	-	-	-	-	2	0.5%
San Andreas chert	-	-	6	2.0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1.6%
Silicifiedwood	-	-	2	0.7%	-	-	-	-	-	-	-	-	1	20.0%	-	-	-	-	3	0.8%
Igneous	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3%
Basalt	-	-	3	1.0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.8%
Siltite	1	2.3%	16	5.2%	-	-	-	-	-	-	1	100.0%	-	-	-	-	-	-	18	4.8%
Rhyolite	-	-	4	1.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1.1%
Sedimentary	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3%
Limestone	2	4.5%	35	11.4%	-	-	-	-	-	-	-	-	1	20.0%	-	-	-	-	38	10.2%
Sandstone	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3%
Siltstone	1	2.3%	7	2.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	2.1%
Dolomite	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3%
Quartzite	4	9.1%	18	5.9%	-	-	-	-	1	33.3%	-	-	-	-	-	-	-	-	23	6.1%
Quartzitic sandstone	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3%
Row total	44	11.8%	307	82.1%	8	2.1%	2	0.5%	3	0.8%	1	0.3%	5	1.4%	3	0.8%	1	0.3%	374	100.0%

Table 45. Townsend East, summary of Structure 3 fauna.

Taxon	Total Count	# From Flotation % From Flotation	Max. MNI	Unburned	Burned	> 75% Complete	< 25% Complete	# Mature
Small mammal	18 45.0%	14 77.8%	-	8 44.4%	10 55.6%	- -	18 100.0%	18 100.0%
Small-medium mammal	2 5.0%	- -	-	- -	2 100.0%	- -	2 100.0%	2 100.0%
Medium-large mammal	3 7.5%	2 66.7%	-	2 66.7%	1 33.3%	- -	3 100.0%	3 100.0%
Large mammal	5 12.5%	1 20.0%	1	2 40.0%	3 60.0%	- -	5 100.0%	5 100.0%
Prairie dog	1 2.5%	1 100.0%	1	- -	1 100.0%	1 100.0%	- -	1 100.0%
Cottontail	2 5.0%	1 50.0%	1	- -	2 100.0%	- -	2 100.0%	2 100.0%
Jackrabbit	1 2.5%	- -	1	- -	1 100.0%	- -	1 100.0%	1 100.0%
Mussel	8 20.0%	- -	-	8 100.0%	- -	- -	8 100.0%	- -
Total	40 100.0%	19 47.5%	4	20 50.0%	20 50.0%	1 2.5%	38 95.0%	32 100.0%

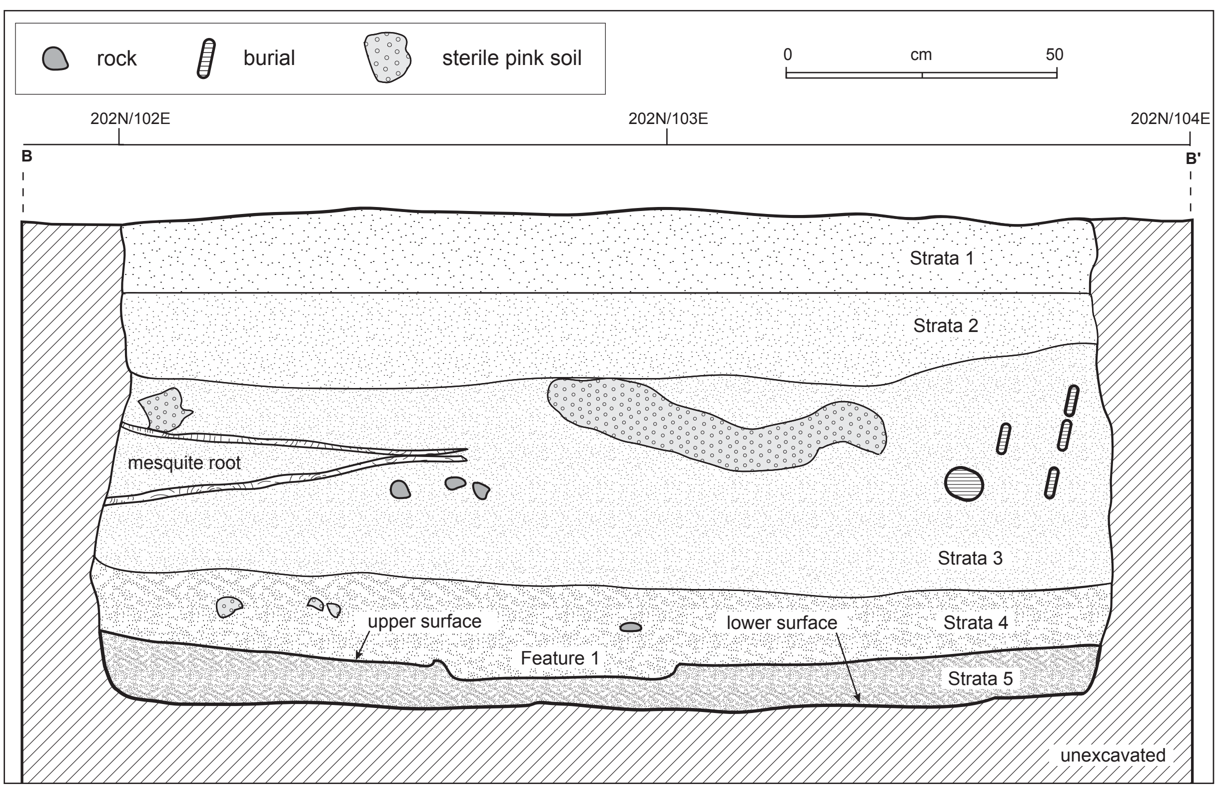

Figure 61. Townsend East Area A, Structure 4 stratigraphic profile

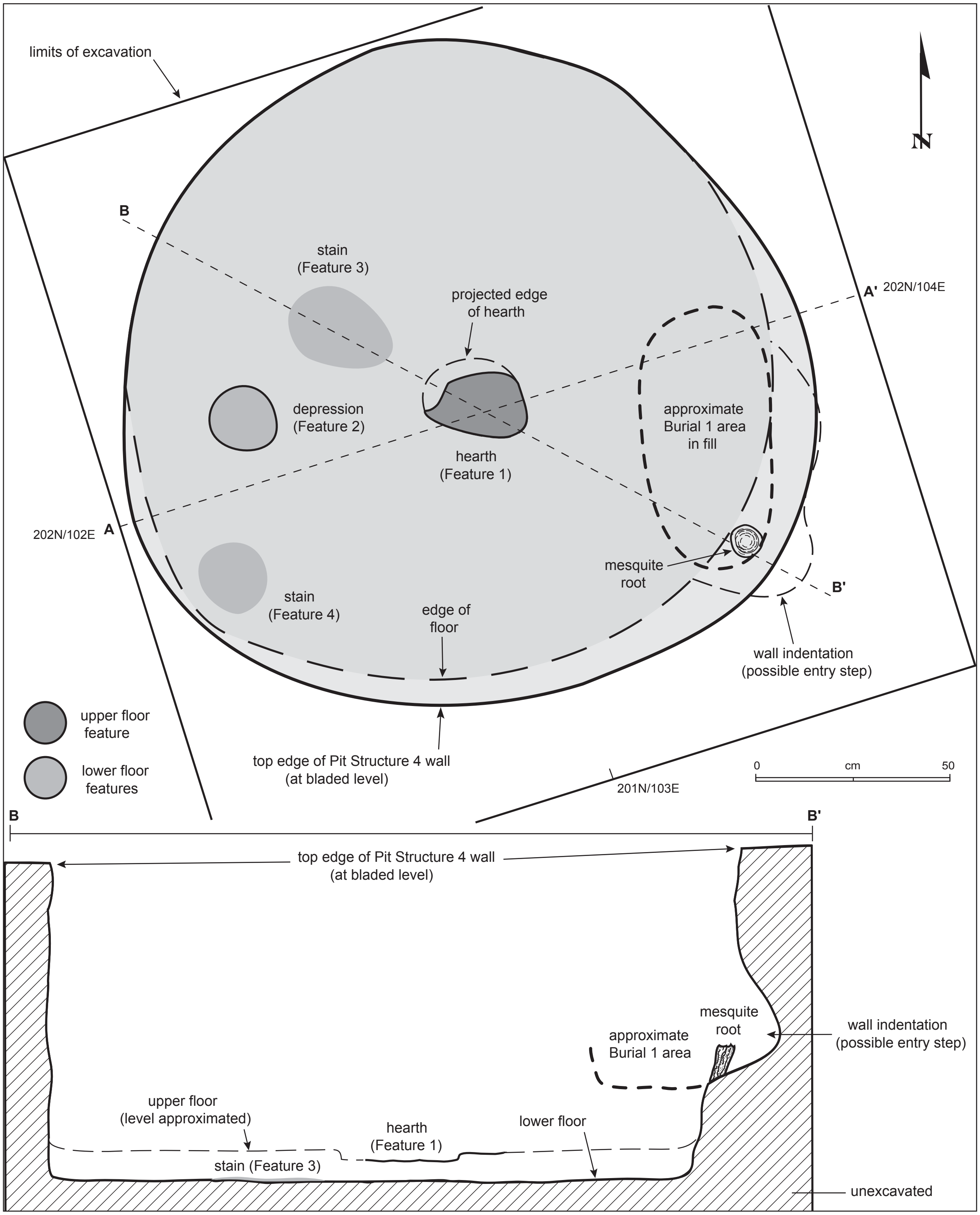

Figure 62. Townsend East Area A, Structure 4 plan and profile.

Figure 63. Townsend East Area A, Structure 4 after excavation.

Surface 1 was a slightly concave surface composed of smoothed wall slump in the southwest quadrant, but it was less substantial and destroyed or damaged by rodents elsewhere. The only feature was a shallow (25 cm diameter and 2 to 3 cm deep) ovoid hearth partially destroyed by rodents. The bottom was nearly flat and the sides vertical. Fill was ash and charcoal-stained soil. Surface 2 was intact sterile pink soil with charcoal flecks worked into the surface. No artifacts were attributed to the floor surface; however, a few lithic artifacts and bones were found in Level 5. Features include a small shallow pit (Feature 2) measuring 16 by 18 cm and 6 cm deep and two stains (Features 3 and 4), which were 30 by 20 cm and 16 by 18 cm and covered by 1 or 2 cm of burned soil and charcoal. The small pit was cone-shaped, with unsmoothed sides and bottom, and could have been used for supporting ceramic vessels.

Only six ceramics were recovered from Structure 4. Half are El Paso Brown, one an unpainted Chupadero Black-on-white, and two Jornada Brown. None were found in Level 1. Level 2 produced the Chupadero paste and the two Jornada Brown sherds. Levels 3 and 4 had only El Paso Brown.

Considerably more lithic artifacts were recovered, yet this is far fewer than in any of the other major structures (Structures 1-5), and this was by far the deepest feature. Lithic artifacts (Table 46) were fairly sparse (n=150). These are dominated by core flakes (81.3 percent), with small numbers of angular debris and biface flakes. One biface and a large projectile point complete the lithic artifact assemblage. Chert was by far the most common lithic material. The only activity indicated by the lithic artifacts recovered from Structure 4 is large biface manufacture and presumably general hunting (Moore, this volume).

Fauna was again fairly sparse (n=141) but unusual (Table 47). Structure 4 has the greatest concentration of larger-animal bones of any provenience at Townsend East. Elk, deer, and bison are all found, and the large-mammal and medium-to-large-mammal taxa have fairly large counts. Very little, if any, of this is from the human burial. Much of the large-mammal bone is more consistent with elk- or bison-sized animals, but the pieces are too small to say for sure. The snake and grasshopper mouse bones are probably from postoccupational burrowers. Burning is relatively rare in this assemblage, probably reflecting the origin of the deposits. Structures to the north were filled with soil darkened from fire pit fill and trash deposits, which is not the case here. Fewer bones were recovered from flotation samples (29.1 per-

Table 46. Summary of lithic artifacts from Townsend East Structure 4.

Material	Angular Debris		Core Flake		Biface Flake		Biface		Edge Bite		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Chert	14	87.5%	100	82.0%	10	100.0%	1	100.0%	1	100.0%	126	84.0%
San Andreas chert	-	-	1	0.8%	-	-	-	-	-	-	1	0.7%
Obsidian	1	6.3%	-	-	-	-	-	-	-	-	1	0.7%
Siltite	-	-	2	1.6%	-	-	-	-	-	-	2	1.3%
Rhyolite	-	-	1	0.8%	-	-	-	-	-	-	1	0.7%
Andesite	-	-	1	0.8%	-	-	-	-	-	-	1	0.7%
Sedimentary	-	-	1	0.8%	-	-	-	-	-	-	1	0.7%
Limestone	1	6.3%	10	8.2%	-	-	-	-	-	-	11	7.3%
Quartzite	-	-	6	4.9%	-	-	-	-	-	-	6	4.0%
Row total	16	10.7%	122	81.3%	10	6.7%	1	0.7%	1	0.7%	150	100.0%

cent), at least when compared to Structures 2 and 3.

What little was recovered by flotation was cultural plant material. Charred goosefoot and corn are the only taxa found. Burned material collected for radiocarbon analysis differed in quantities but not plant types. Saltbush/greasewood was far more prevalent than the second most common (undetermined nonconifer), with relatively little mesquite (15 percent) (McBride and Toll, this volume).

Dates obtained for this structure were later than expected but consistent with the unpainted Chupadero Black-on-white sherd. An AMS date (Beta 133475) on mesquite dates to A.D. 790 ± 40 (conventional) and A.D. 775-980 (calibrated). A standard date on *Atriplex* (Beta 134632) is considerably later—A.D. 1050 ± 80 (conventional) and A.D. 995-1275 (calibrated)—indicating the mesquite was old wood collected from the site area.

Structure 5, a small, moderately deep structure, lies just over 2 m north of Structure 2 and has a small step entry oriented the same direction. It, too, was missed by extensive surface stripping to the west and south and was revealed as a dark stain during the backhoe scrape. Fill just above the structure was a mixture of mottled soil similar to the structure fill. It was thicker to the southeast, where it had not been scraped. Upper fill was removed by grid in a single level anywhere from 2 to 14 cm thick to a uniform depth where the structure walls were well defined (Fig. 64). Fill within the structure was excavated in four levels by quadrants oriented to magnetic north.

Upper fill was up to 16 cm of gray fine sandy loam with moderate to abundant charcoal and fire-cracked rock (Fig. 65). This graded into a similar fill that also contained chunks of the pink sterile soil, giving it a lighter color and finer texture. Charcoal was still present. This graded into a still lighter-colored fine sandy silt with fewer but larger pieces of charcoal. Bone and lithic artifacts were abundant, while ceramics numbered only 30. Lithic artifacts (n=133) and ceramic artifacts (n=13) are most abundant in Level 1, and fauna in Level 3 (n=237).

Structure 5 is a circular basin-shaped structure with a relatively flat floor and a step to the north (Fig. 66). It was excavated into the sterile pink clay with no attempt to completely smooth or finish the walls. Like Structure 3, the walls were located by removing the darker fill to expose the pink sterile soil with carbonates. Rodent disturbance was much less evident than at the other structures, with only minor damage in the southeast quad.

The floor slopes up slightly to form a rounded intersection with the walls and consists of pink sterile soil with numerous cracks and ashy fill trampled into the surface (Fig. 67). Features include the step to the north (Feature 1) and a small pit in the floor. The step is 45 cm long and up to 46 cm wide with a maximum depth of 16 cm. Fill was the same as the upper fill of the main structure. Feature 2 is a small (5.5 by 8.0 cm) and shallow (4.3 cm) pit offset from the center of the structure. Fill was the same as the lower fill of the structure. There were no evident floor burns or other evidence of a fire within the structure. However, pieces of apparently burned material that is hard but similar in color to the residual soil but containing small pieces of charcoal and precipitate but with twig impressions (Fig. 68) could be the remains of a superstructure that hardened from heat or burning.

No ground stone was recovered from Structure 5. Ceramic artifacts (n=30) are almost all El Paso Brown (90 percent), with a few Jornada Brown (10 percent). The lowest level of fill had two sherds of each. Lithic artifacts are mostly debitage but include three bifaces (Table 48). One biface was broken in production, and one is a midsection with a haft snap. Activities indicated for Structure 5 and the surrounding area include large and small biface manufacture, refurbishing projectile point shafts, processing carcasses, and general cutting tasks (Moore, this volume).

This structure (Table 49) contained more fauna than any other and produced over a third (35.3 percent) of the fauna recovered from Townsend East. Proportionately, few bones were recovered from flotation samples (10.2 percent). It also has the most diversity. All of the bird bone, as well as much of the turtle bone (84.6 percent), fish (88.9 percent), snake (83.3 percent), pocket gopher (75.0 percent), cottontail (64.6 percent), prairie dog

Table 47. Townsend East, summary of Structure 4 fauna.

Taxon	Total Count	# from Flotation % from Flotation	Max. MNI	Unburned	Burned	>75% complete	<25% complete	# Mature
Unknown small	6 4.3%	4 66.7%	-	6 100.0%	- -	- -	6 100.0%	6 100.0%
Small mammal	42 29.8%	12 28.6%	-	34 81.0%	8 19.0%	- -	41 97.6%	40 95.2%
Small-medium mammal	1 0.7%	- -	-	- -	1 100.0%	- -	1 100.0%	1 100.0%
Medium-large mammal	23 16.3%	12 52.2%	-	5 21.7%	18 78.3%	- -	23 100.0%	23 100.0%
Large mammal	29 20.6%	3 10.3%	-	29 100.0%	- -	- -	29 100.0%	29 100.0%
Prairie dog	8 5.7%	1 12.5%	2	7 87.5%	1 12.5%	3 37.5%	4 50.0%	7 85.7%
Grasshopper mouse	1 0.7%	- -	1	1 100.0%	- -	1 100.0%	- -	1 100.0%
Medium-large rodent	2 1.4%	2 100.0%	1	2 100.0%	- -	- -	1 50.0%	2 100.0%
Cottontail	14 9.9%	2 14.3%	2	12 85.7%	2 14.3%	2 14.2%	4 28.6%	13 92.9%
Jackrabbit	6 4.3%	- -	1	6 100.0%	- -	2 33.3%	2 33.3%	6 100.0%
Elk	1 0.7%	- -	1	1 100.0%	- -	- -	1 100.0%	1 100.0%
Deer	1 0.7%	- -	1	1 100.0%	- -	- -	1 100.0%	1 100.0%
Bison	2 1.4%	- -	1	2 100.0%	- -	1 50.0%	1 50.0%	2 100.0%
Snake	5 3.5%	5 100.0%	1	5 100.0%	- -	4 80.0%	- -	5 100.0%
Total	141 100.0%	41 29.1%	11	111 78.7%	30 21.3%	13 9.2%	114 80.9%	137 97.2%

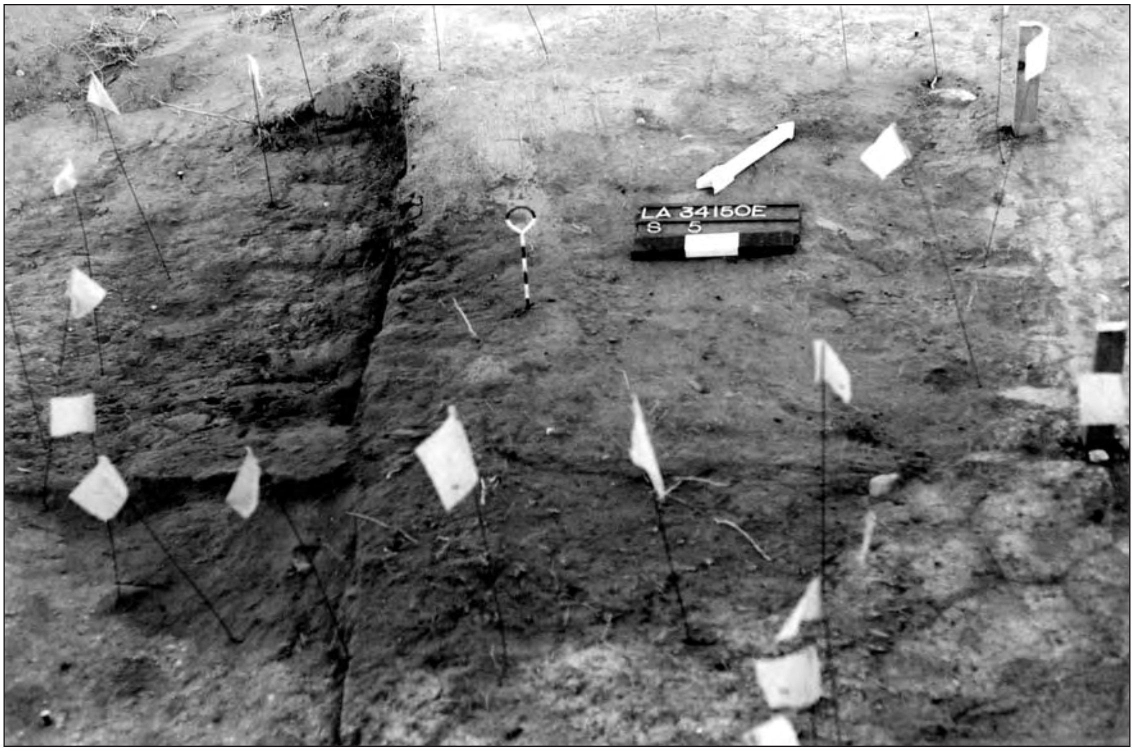

Figure 64. Townsend East Area A, Structure 5 stain.

(48.0 percent), and jackrabbit (48.3 percent) came from this structure. Less of the bone is burned than in most of the structures. In general, the animals found tend to be smaller forms, with few large animals represented. Complete bones are relatively rare, and most are from mature animals.

Flotation samples contained little burned plant material. Those with plant remains indicated use of at least goosefoot, grass, and mesquite. Burned juniper seeds were found in the lower fill of the northwest quad. Burned material collected for radiocarbon analysis was similar to that from Structure 4: that is, mainly saltbush/greasewood, with smaller amounts of mesquite and an undetermined nonconifer.

Two dates were obtained for Structure 5. An AMS date (Beta 134633) on mesquite dated A.D. 600 ± 60 (conventional) and A.D. 625-770 (calibrated). A standard date on *Atriplex* (Beta 134634) dated 940 ± 70 (conventional) and A.D. 890-1185 (calibrated).

Halfway between Structures 2 and 4, Structure 6 was revealed by mechanical scraping. Originally thought to be a large pit, it was labeled Feature 33. It was bisected, and fill was removed as a single level. Fill was eolian silt with two pieces of fire-cracked rock, occasional charcoal flecks, and sterile pink soil, possibly wall slump.

This shallow circular pit with vertical walls and a level floor (Fig. 69) was excavated into the sterile pink soil with no attempt to finish the floor or walls (Fig. 70). No features were evident, although a large wet spot at the center of the structure may have obliterated any subtle features. Ultimately, this feature (1.35 m in diameter) is not much smaller than Structures 4, 5, and 7, and it is larger and deeper than features named as such. It could be a small structure that had a temporary brush superstructure or a large shallow feature, possibly used for storage.

Artifacts were sparse. No ground stone was found. Only one ceramic was recovered, an El Paso Brown sherd. All of the lithic artifacts were unutilized debitage (Table 50). Fauna was also scarce, with only one pieces of freshwater mussel shell recovered by excavation and a calcined long-bone fragment from a small mammal found in a flotation sample. Burned cheno-ams were recovered by flotation. Burned fuel material was predominately saltbush/greasewood, with small amounts of alder, mesquite, and an undetermined nonconifer. An AMS date (Beta 134635) on *Atriplex* dated A.D. 570 ± 40 (conventional) and A.D. 615-690 (calibrated).

Structure 7, originally considered a feature (Feature 44), was located during the investigation of an area of dark fill exposed in a bank cut formed by NMSHTD

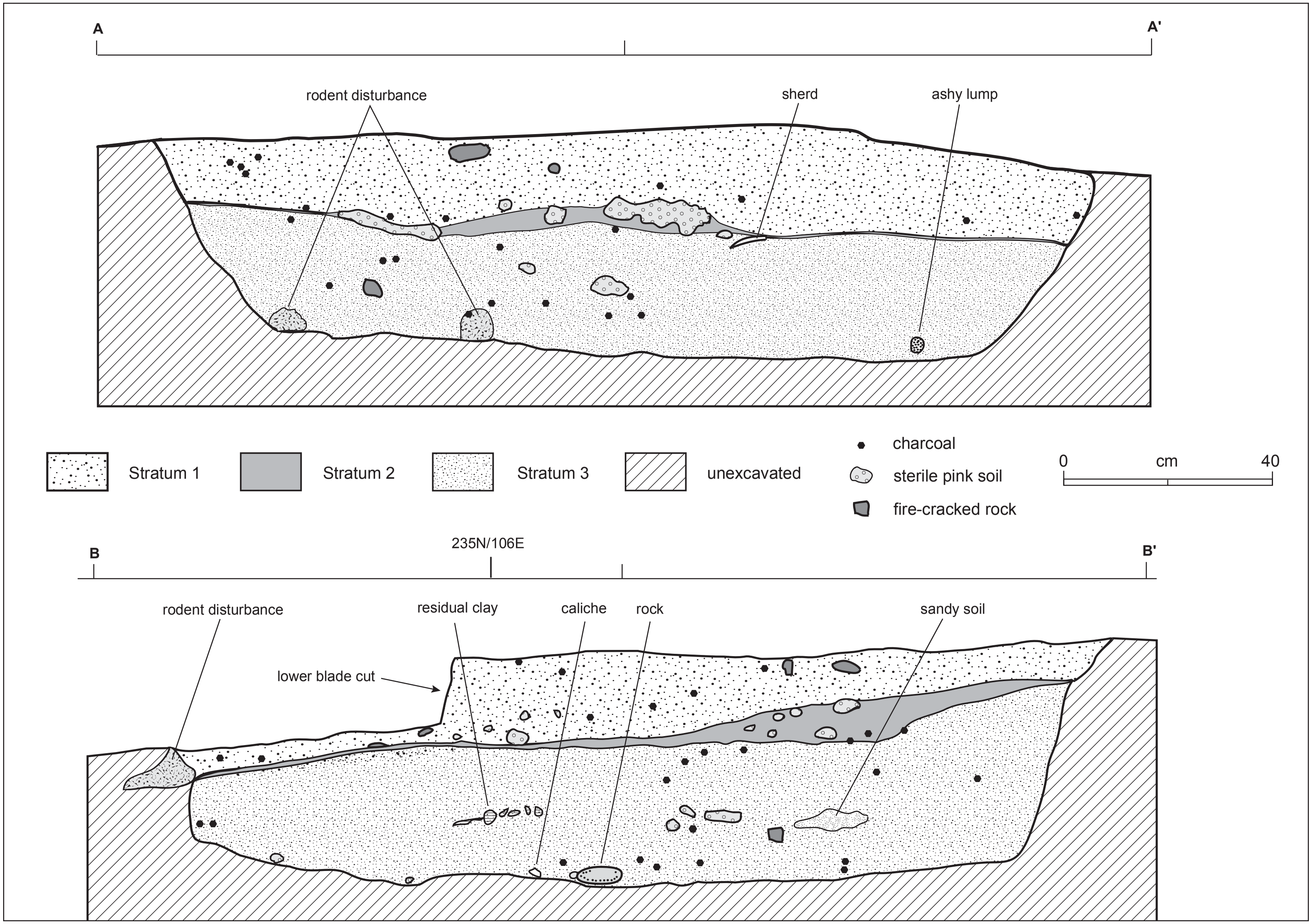

Figure 65. Townsend East Area A, Structure 5 stratigraphic profile.

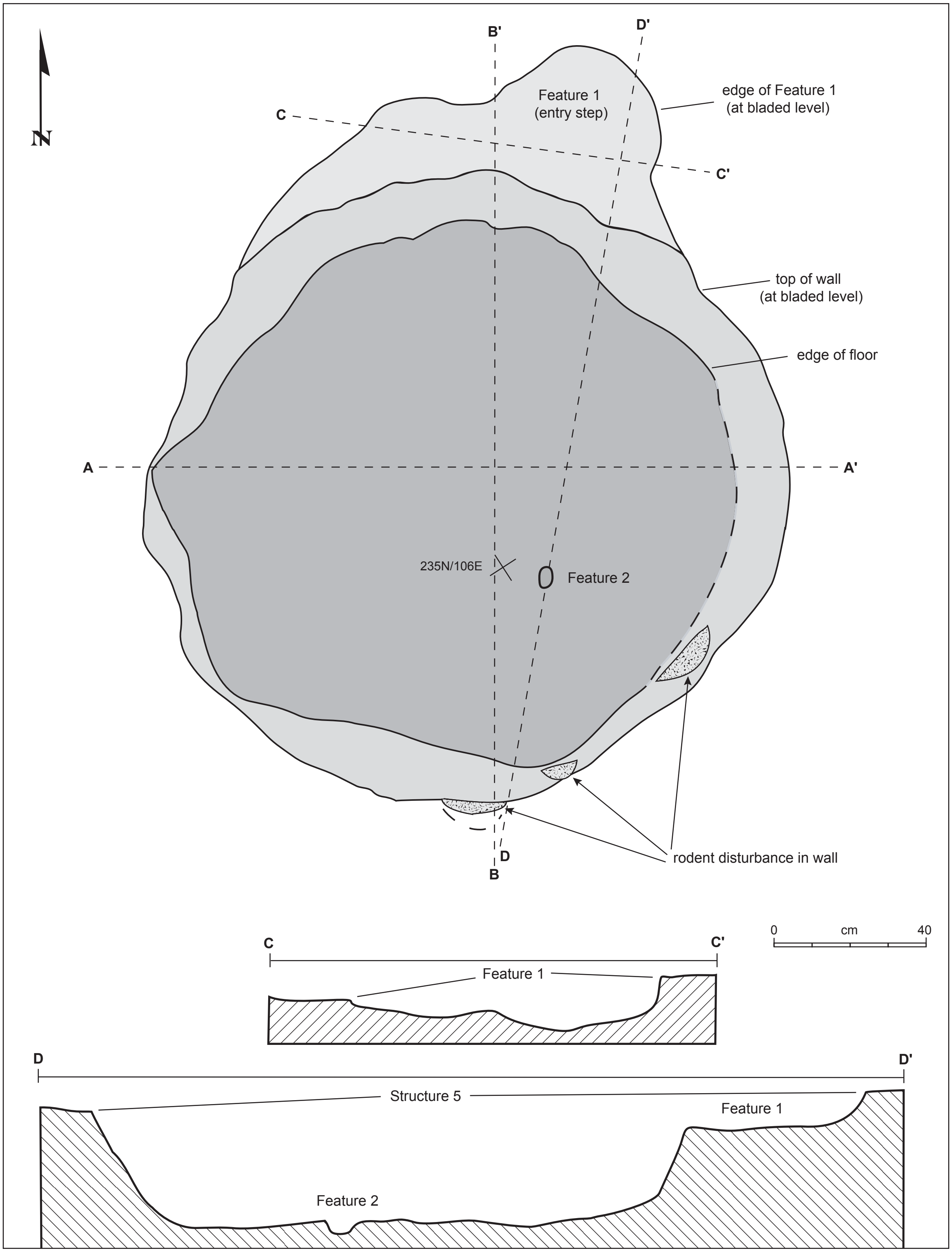

Figure 66. Townsend East Area A, Structure 5 plan and profile.

Figure 67. Townsend East Area A, Structure 5 after excavation.

contouring within the right-of-way. The structure was straddled by the right-of-way fence, and mechanical scraping was not deep enough to reveal a distinct outline. Extensive clearing just to the southeast also missed this structure. Because of the bank cut and soft eolian fill collecting along the fence, this area was badly disturbed by rodents and lizards taking advantage of the slope to burrow into the soft fill.

About 70 to 80 percent of the structure was excavated. Upper fill was removed in two levels by grid before it was designated a structure. Structure fill was also removed by the two grids that essentially formed a southeast and a southwest quad. The southeast was much larger than the southwest. Three and four levels of fill were removed, and the lowest level constituted the floor fill and floor contact material.

Structure fill (Fig. 71) was eolian fine-grained sandy silt with occasional pebbles, sparse carbonates, and some clay lenses from puddled water in the lower fill. Charcoal increased with depth, making it grayer but with no distinct breaks due to the loose to very loose nature of the fill. Fire-cracked rock occurred throughout the fill. In Level 3, fill became more consolidated and could represent a different fill episode with more alluvial lensing and greater clay content, or a use-surface. This was not discernable in the structure profiles, so it has not been considered a surface. Extensive churning by the burrowers thoroughly mixed the soil and damaged the walls and the floor.

The excavated portion of the structure suggests it was circular or ovoid (Fig. 72) with a basin-shaped profile. Walls were heavily disturbed by burrowing rodents

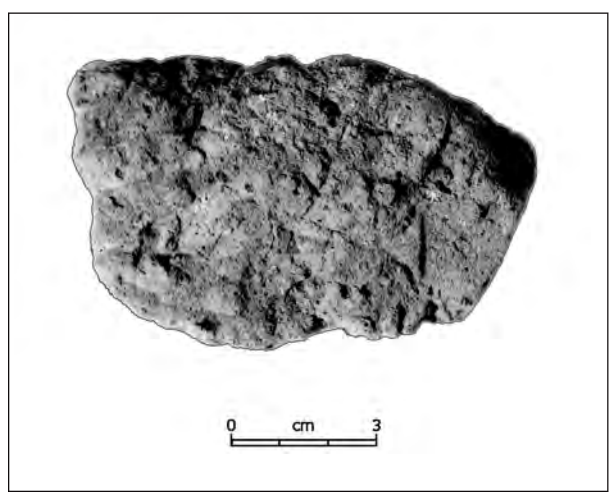

Figure 68. Adobe from NE quadrant of Structure 5 (FS 2485).

Table 48. Summary of lithic artifacts from Townsend East Structure 5.

Material	Angular Debris		Core Flake		Biface Flake		Pot Lid		Core		Biface		Late-Stage Biface		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Chert	10	52.6%	175	73.5%	11	91.7%	1	100.0%	-	-	-	-	1	100.0%	200	72.7%
San Andreas chert	1	5.3%	1	0.4%	-	-	-	-	1	50.0%	2	100.0%	-	-	3	1.1%
Silicified wood	1	5.3%	-		-	-	-	-	-	-	-	-	-	-	1	0.4%
Basalt	-	-	1	.4%	-	-	-	-	-	-	-	-	-	-	1	0.4%
Siltite	2	10.5%	4	1.7%	-	-	-	-	-	-	-	-	-	-	6	2.2%
Rhyolite	-	-	4	1.7%	1	8.3%	-	-	-	-	-	-	-	-	5	1.8%
Andesite	-	-	1	.4%	-	-	-	-	-	-	-	-	-	-	1	0.4%
Limestone	3	15.8%	34	14.3%	-	-	-	-	-	-	-	-	-	-	37	13.5%
Siltstone	-	-	3	1.3%	-	-	-	-	-	-	-	-	-	-	3	1.1%
Quartzite	1	5.3%	15	6.3%	-	-	-	-	-	-	-	-	-	-	17	6.2%
Quartzitic sandstone	1	5.3%	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4%
Row total	19	6.9%	238	86.5%	12	4.4%	1	0.4%	2	0.7%	2	0.7%	1	0.4%	275	100.0%

Table 49. Townsend East, summary of Structure 5 fauna.

Taxon	Total Count	# from Flotation % from Flotation	Max. MNI	Unburned	Burned	>75% Complete	<75% Complete	# Mature
Unknown small	7 1.2%	2 28.6%	-	7 100.0%	- -	- -	6 85.7%	7 100.0%
Small mammal/ large bird	7 1.2%	1 14.3%	-	2 28.6%	5 71.4%	- -	7 100.0%	7 100.0%
Small mammal	334 56.1%	41 12.3%	-	216 64.7%	118 35.3%	- -	328 98.2%	330 98.8%
Small-medium mammal	11 1.8%	4 36.4%	-	3 27.3%	8 72.7%	- -	11 100.0%	11 100.0%
Medium-large mammal	17 2.9%	1 5.9%	-	11 64.7%	6 35.3%	- -	17 100.0%	16 94.1%
Large mammal	9 1.5%	- -	-	5 55.6%	4 44.4%	- -	9 100.0%	9 100.0%
Prairie dog	24 4.0%	- -	2	21 87.5%	3 12.5%	9 37.5%	12 50.0%	23 95.8%
Yellow-faced pocket gopher	3 0.5%	- -	1	2 66.7%	1 33.3%	1 33.3%	2 66.7%	3 100.0%
Banner-tailed kangaroo rat	2 0.3%	- -	1	1 50.0%	1 50.0%	- -	1 50.0%	2 100.0%
Small rodent	1 0.2%	- -	-	1 100.0%	- -	- -	1 100.0%	1 100.0%
Medium-large rodent	10 1.7%	6 60.0%	-	3 30.0%	7 70.0%	- -	8 80.0%	10 100.0%
Cottontail	104 17.5%	4 3.8%	5	82 78.8%	22 21.2%	11 10.6%	76 73.1%	97 93.3%
Jackrabbit	31 5.2%	2 6.4%	3	21 67.7%	10 32.2%	4 12.9%	24 77.4%	30 96.8%
Artiodactyl	2 0.3%	- -	-	- -	2 100.0%	- -	2 100.0%	2 100.0%
Medium artiodactyl	3 0.5%	- -	1	3 100.0%	- -	- -	3 100.0%	3 100.0%
Large bird	1 0.2%	- -	1	- -	1 100.0%	- -	1 100.0%	1 100.0%
Medium-large bird	2 0.3%	- -	-	2 100.0%	- -	- -	2 100.0%	2 100.0%
Eggshell	1 0.2%	- -	-	1 100.0%	- -	- -	1 100.0%	- -
Turtles	5 0.8%	- -	-	3 60.0%	2 40.0%	- -	5 100.0%	1 20.0%
Ornate box turtle	5 0.8%	- -	1-2	5 100.0%	- -	1 20.0%	8 80.0%	4 80.0%
Softshell turtle	1 0.2%	- -	1	1 100.0%	- -	- -	1 100.0%	1 100.0%
Lizard	1 0.2%	- -	1	1 100.0%	- -	1 100.0%	- -	- -
Snake	1 0.2%	- -	1	1 100.0%	- -	- -	- -	1 100.0%
Fish	7 1.2%	- -	1	7 100.0%	- -	4 57.1%	- -	7 100.0%
Mussel	6 1.0%	- -	-	5 100.0%	- -	- -	6 100.0%	- -
Total	595 100.0%	61 10.2%	19-20	404 67.9%	191 32.1%	31 5.2%	526 88.4%	568 96.4%

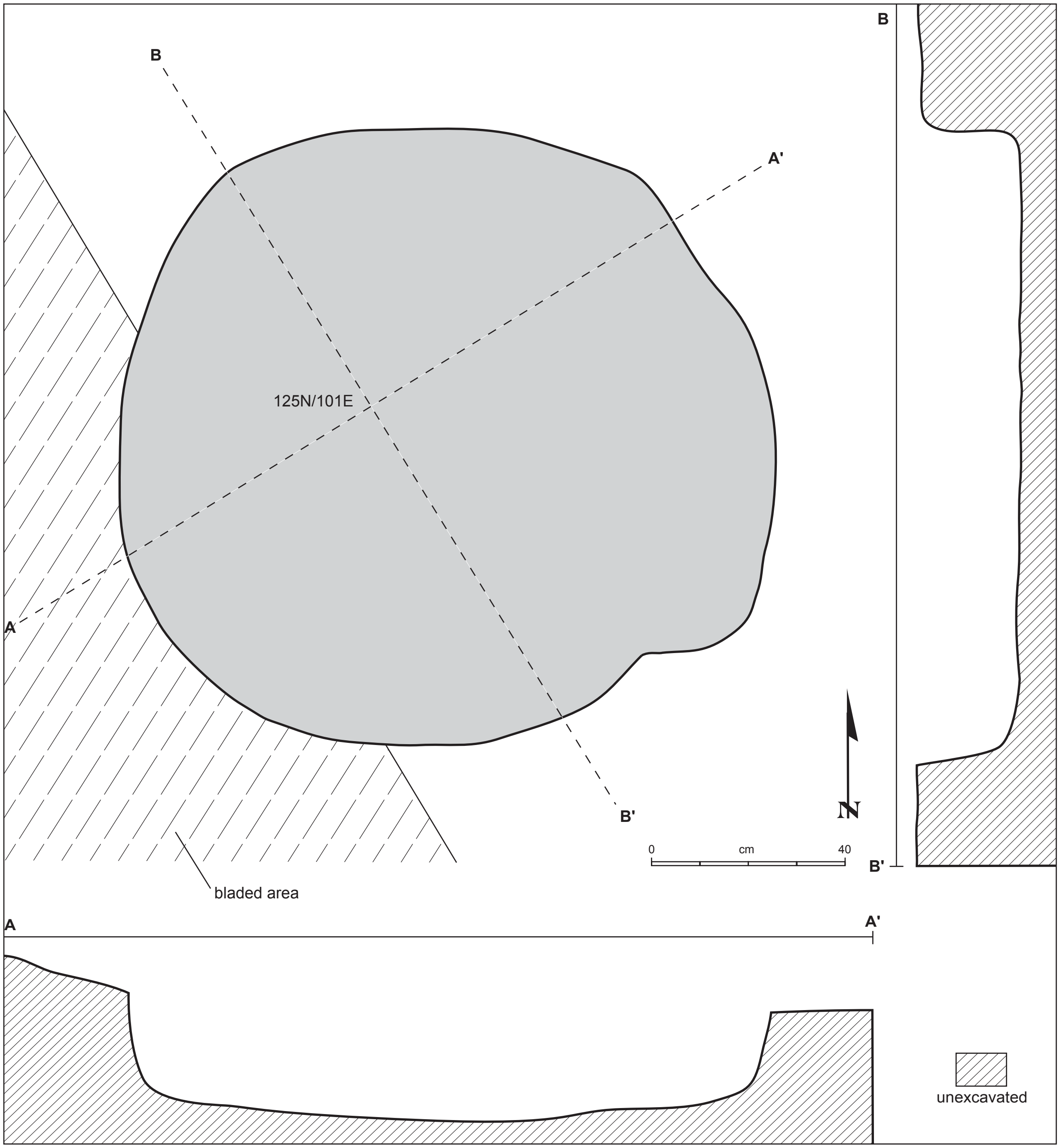

Figure 69. Townsend East Area A, Structure 6 plan and profile.

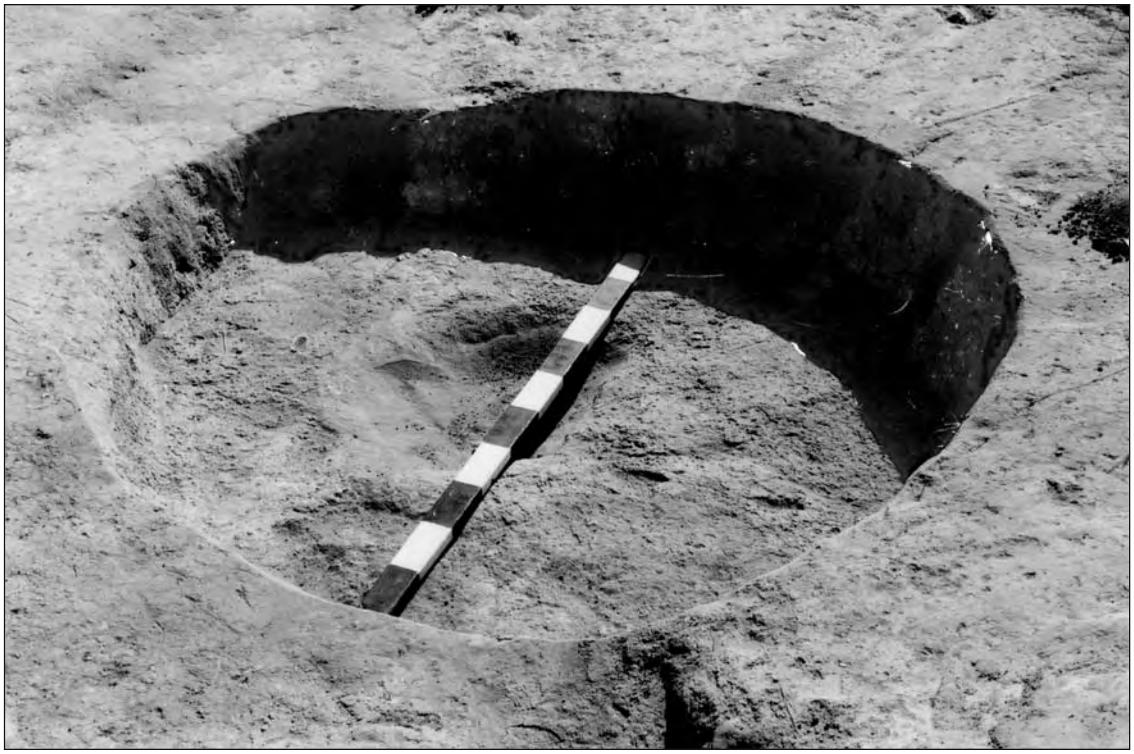

Figure 70. Townsend East Area A, Structure 6 after excavation.

and lizards, as was the floor. No features or floor burns were found in the portion of the structure excavated (Fig. 73).

Lithic debitage (Table 51) is the most abundant artifact type (n=190); ceramics are decidedly rare (n=4). Most (75.0 percent) are Jornada Brown, with a single El Paso Brown. All were found in Level 3. A single piece of a metate was recovered high in the feature fill.

A small sample of fauna (n=55) was recovered (Table 52) through screening and in flotation samples (27.3 percent), none identifiable beyond the size or type of animal. Almost all are fragmentary, and many are burned, probably contributing to their preservation. Burned goosefoot was found in all samples from this structure. The only other cultural plan was unidentifiable. Burned plant material collected for radiocarbon

Table 50. Summary of lithic artifacts from Townsend East Structure 6.

Material	Angular Debris		Core Flake		Biface Flake		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Chert	1	100.0%	14	77.8%	2	100.0%	17	80.9%
Igneous	-	-	1	5.6%	-	-	1	4.8%
Siltite	-	-	1	5.6%	-	-	1	4.8%
Andesite	-	-	1	5.6%	-	-	1	4.8%
Limestone	-	-	1	5.6%	-	-	1	4.8%
Row total	1	4.8%	18	85.7%	2	9.5%	21	100.0%

Table 51. Summary of lithic artifacts from Townsend East Structure 7.

Material	Angular Debris		Core Flake		Biface Flake		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Chert	9	81.8%	125	81.7%	25	96.1%	159	83.7%
Silicified wood	-	-	-	-	1	3.8%	1	0.5%
Siltite	-	-	5	3.3%	-	-	5	2.6%
Rhyolite	-	-	2	1.3%	-	-	2	1.1%
Limestone	2	18.2%	14	9.2%	-	-	16	8.4%
Metamorphic	-	-	1	0.7%	-	-	1	0.5%
Quartzite	-	-	6	3.9%	-	-	6	3.1%
Row total	11	5.8%	153	80.5%	26	13.7%	190	100.0%

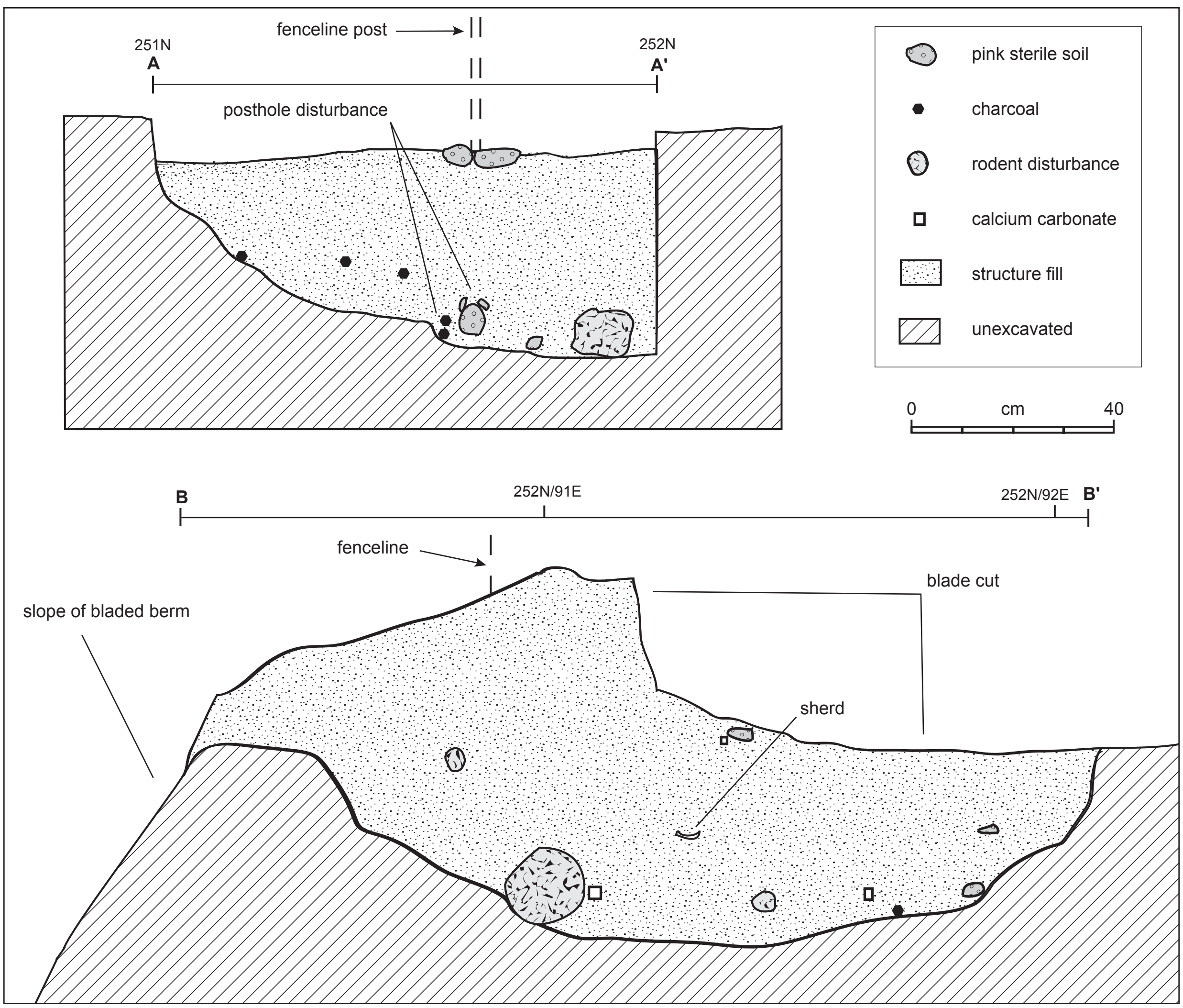

Figure 71. Townsend East Area A, Structure 7 stratigraphic profile.

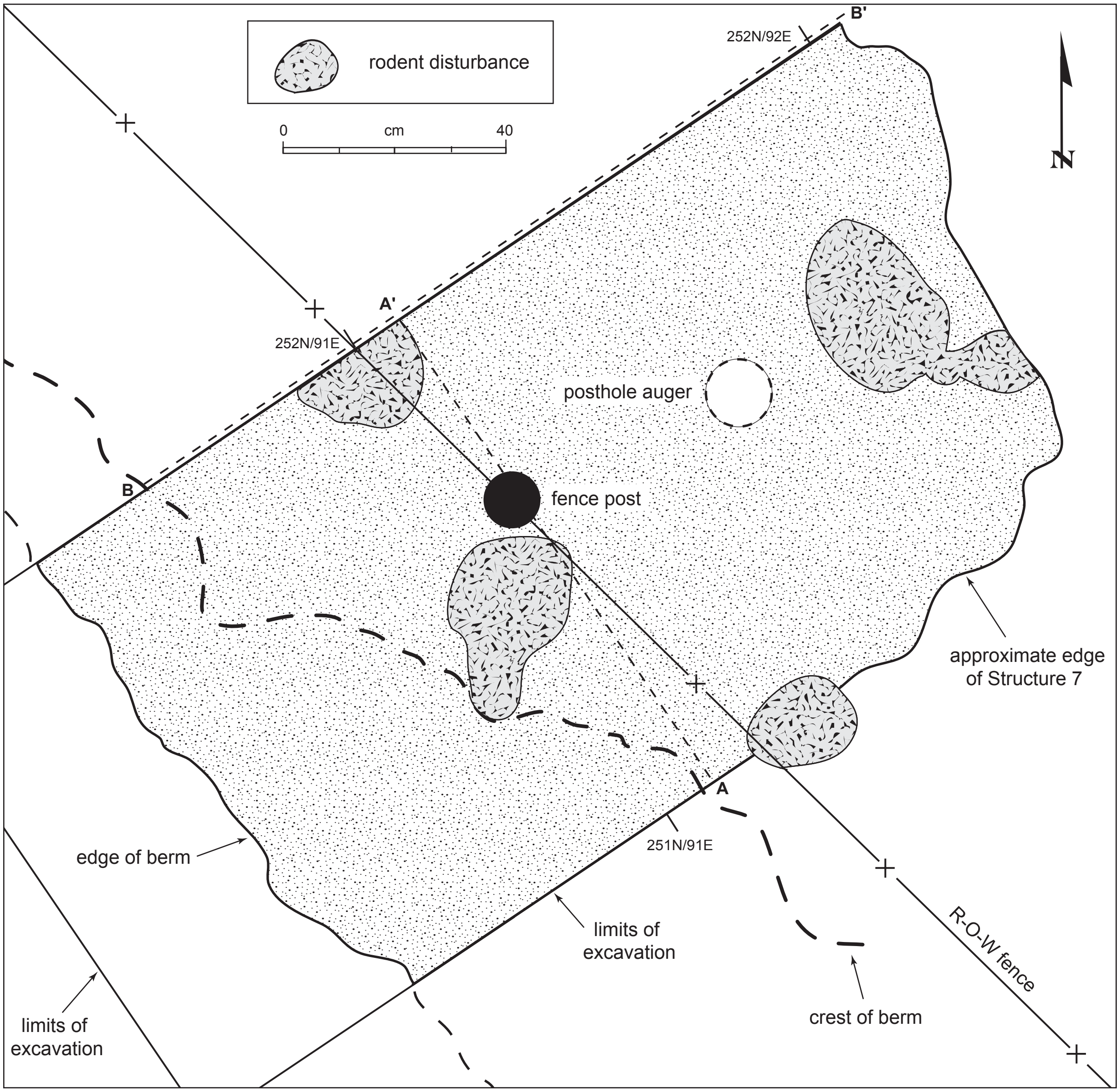

Figure 72. Townsend East Area A, Structure 7 plan and profile.

analysis was largely saltbush/greasewood, with smaller amounts of mesquite, alder, and an undetermined non-conifer.

An AMS date (Beta 134636) on *Atriplex* dated A.D. 720 ± 70 (conventional) and A.D. 660-980 (calibrated).

Features

A number of features and stains were investigated. Table 53 summarizes the information on those from Area A. All pits were expedient and relatively crude: that is, none were plastered or lined. Shape and size vary (Figs. 74 through 77). Most are probably thermal features. Nearly all contained some fire-cracked rock and dark, charcoal-stained soil. The iron content of the soil must be slight, because it was only after a heavy rain that any coloration indicating burning was observed.

Whether a pit was labeled thermal when excavated depended in large part on the recorder. As Table 54 shows, there is considerable overlap in size, depth, fill, and the presence of fire-cracked rock when pits over 50 cm in diameter are considered large and those less than that are considered small. Given the overall soil profiles for the site (a soft, dark, heavily churned fill overlying a hard clean residual soil and lack of burning), this diffi-

Figure 73. Townsend East Area A, Structure 7, south half after excavation.

culty is understandable. In many instances, only the bottoms of the pits were preserved, so our excavations often record only very bases of pits. Scatter plots using all site features other than postholes (Figs. 78-80) to compare diameter and depth by area, feature type, and whether a pit had no, little, or abundant fire-cracked rock illustrate a slight tendency for depth to increase with pit diameter. While there are no distinct clusters for thermal and nonthermal features, no pit deeper than 15 cm was considered thermal (Fig. 79). When the amount of fire-cracked rock is plotted (Fig. 80), those with no rock are on the extremes of the axis of the scatter plot, while those with some and much rock are scattered throughout the center of the plot.

What is clear is that none resemble long-term storage pits. They lack the depth, shape, and attempts at rodent and insect proofing characteristic of storage pits. Even the largest pits without rock (Features 30 and 46) are unconvincing as any more than short-term storage features. The former is filled with clean sandy loam and contained burned seepweed, suggesting it could have been used for plant processing. The other had pieces of burned clay, indicating it could be a thermal feature or may have had some sort of earth covering or superstructure. The only pits with anything like a cache or a distinct function are Features 2 and 5 (see Fig. 74). Feature 2, just north of Structure 2, had an unusual combination of minerals and chipped stones that suggest these could have been cached. Located east of Structure

Table 52. Townsend East, summary of Structure 7 fauna.

Taxon	Total Count	# from Flotation % from Flotation	Max. MNI	Unburned	Burned	>75% Complete	<25% Complete	# Mature
Small mammal	40 72.7%	13 32.5%	0-1	17 42.5%	23 57.5%	- -	40 100.0%	40 100.0%
Medium-large mammal	6 10.9%	1 16.7%	-	5 83.3%	1 16.7%	- -	6 100.0%	6 100.0%
Large mammal	3 5.5%	- -	1	3 100.0%	- -	- -	3 100.0%	3 100.0%
Medium-large rodent	1 1.8%	1 100.0%	1	1 100.0%	- -	- -	1 100.0%	1 100.0%
Turtle	1 1.8%	- -	1	- -	1 100.0%	- -	1 100.0%	1 100.0%
Nonvenomous snake	1 1.8%	- -	1	1 100.0%	- -	1 100.0%	- -	1 100.0%
Mussel	3 5.5%	- -	-	3 100.0%	- -	- -	3 100.0%	- -
Total	55 100.0%	15 27.3%	4-5	30 54.5%	25 45.4%	1 1.8%	54 98.2%	52 100.0%

Table 53. Townsend East, Area A feature summary.

No.	Location	Feature Type and Shape	Dimensions (cm)	Top and Bottom Elevation (mbd)	Fill	Comments
1	241N 94-95E	fire-cracked rock; deflated fire pit; amorphous	80 x 70 x 10-15	7.18 7.03	eolian silty sand; very little charcoal remains	microflakes in vicinity; possible activity area
2	245-246N 95-96E	pit; irregular ovoid	74 x 78 x 36	6.95 6.59	grayish sandy loam over mottled sandy loam and residual fill	fire-cracked rock; badly rodent disturbed
3	241-242N 93-94E	pit; circular	62 x 33+ x 20-22	7.11 6.89	grayish silty sand	scant fire-cracked rock; west half excavated; burned goosefoot, pigweed, and corn cupule
4	239N 95E	fire-cracked rock concentration; irregular	52 x 25 x < 10	7.25 7.22	grayish sandy silt; no definite charcoal stain	possible deflated fire pit
5	233-234N 104-105E	pit; ovoid	89 x 42 x 12-15	7.28 7.13	grayish silt with some charcoal	slab and mano in pit; grinding pit or cache; burned sandstone at base; burned corn kernel
6	234N 104-105E	fire-cracked rock scatter; amorphous	100 x 100 x <10	7.44 7.35	grayish sandy silt	fire-cracked rock limestone and fractured cobbles; >70 pieces
7	236N 105E	pit; irregular ovoid	84 x 38 x18	6.87 6.69	brown silt; little charcoal	scant fire-cracked rock; rodent disturbed; burned goosefoot and unknown plant rind
8	231N 97-98E	stain; irregular	46 x 34+ x 17	6.86 6.69	grayish sandy silty loam; charcoal and fire-cracked rock	cable trench west edge
9	230-231N 104-105E	pit; ovoid	33 x 16+ x 14	7.41 7.27	dark gray sandy loam	fire-cracked rock; south half excavated; burned goosefoot, purslane, seepweed, and unidentified plant
10	230N 105E	fire pit?; ovoid	30 x 60 x 6	7.43 7.37	dark gray sandy loam	rodent disturbed; burned goosefoot, purslane, and unidentifiable plant
11	230N 105E	pit; oval	33 x 33 x 10	7.44 7.34	dark brown sandy loam	burned sunflower and unidentifiable plant
12	230-231N 105-106E	rock-filled pit; ovoid	30 x 28 x 8	7.22 7.14	dark sandy loam with fire-cracked rock	no burn or charcoal; burned unidentifiable and unknown plant material
13	234N 106E	pit; circular	40 x 44 x 5	7.21 7.16	brown silty loam with small charcoal flecks	rodent disturbance
22	249-250N 93E	fire pit; circular	60 x 59 x 15	6.98 6.83	dark gray to black silty clay with fire-cracked rock	
23	250N 95E	fire pit; ovoid	26 x 19 x 3.5	6.86 6.83	dark gray silty clay; charcoal stained	top 10 or so cm probably eroded away
24	251N 94E	fire pit?; circular	42 x 45 x 5	6.86 6.81	dark gray silty clay; charcoal stained	top 10 or so cm probably eroded away; rodent disturbed; burned goosefoot and purslane
25	249N 95E	fire pit; circular	47 x 45 x 17	6.94 6.77	dark gray silty clay, charcoal stained with fire-cracked rock at edge of upper fill	rodent disturbed; burned goosefoot and mesquite
26	251-252N 98E	fire pit; circular	29 x 34 x 10	6.72 6.62	light gray silty clay, charcoal stained	no fire-cracked rock; top removed in scrape
27	244N 93-94E	fire pit; ovoid	76 x 43 x 15	7.11 6.96	sandy loam with charcoal and burned soil	in fill of Structure 3; fire-cracked rock at top; burned cheno-ams, goosefoot, and purslane
28	236-237N 100-101E	pit; circular	100 x 110 x 9	7.21 7.12	brown ashy silt; fire-cracked rock	after scrape; burned goosefoot and prickly pear cactus
29	240-241N 92E	pit; circular	72 x 56 x 7	6.97 6.90	brown sandy loam with charcoal and fire-cracked rock	rodent disturbed; burned goosefoot, seepweed, and unidentifiable plant
30	214N 107E	pit; circular	91 x 86 x 31	7.90 7.59	clean sandy loam	burned seepweed
31	234-235N 91-92E	pit; circular	41 x 43 x 3	7.14 7.11	dark gray silty loam	rodent disturbed
33						see Structure 6
42	244N 91-92E	pit?; ovoid	25 x 36 x 38	6,95 6.57	brown silt	rodent burrow?
43	248N 92E	stain; irregular	?4-6 cm thick	7.00 6.94	light brown clayey loam with ash	not a feature, just a lens on an undulating surface
44						see Structure 7
45	249-250N 92-93E	fire pit; circular	117 x 97 x 14	6.91 6.77	brown silty loam; much fire-cracked rock but little charcoal	burned goosefoot, seepweed, and bulrush
47	251N 92-93E	fire pit; circular	34 x 36 x 10	6.85 6.75	charcoal-stained sandy loam	scant fire-cracked rock; burned edge; rodent disturbed; burned unknown and unidentifiable plants
48						base of Feature 24
49	234N 104E	pit; circular	47 x 45 x 14	7.21 7.07	grayish silty loam with charcoal; fire-cracked rock	just outside and possibly associated with Structure 2; burned corn cupule and kernel

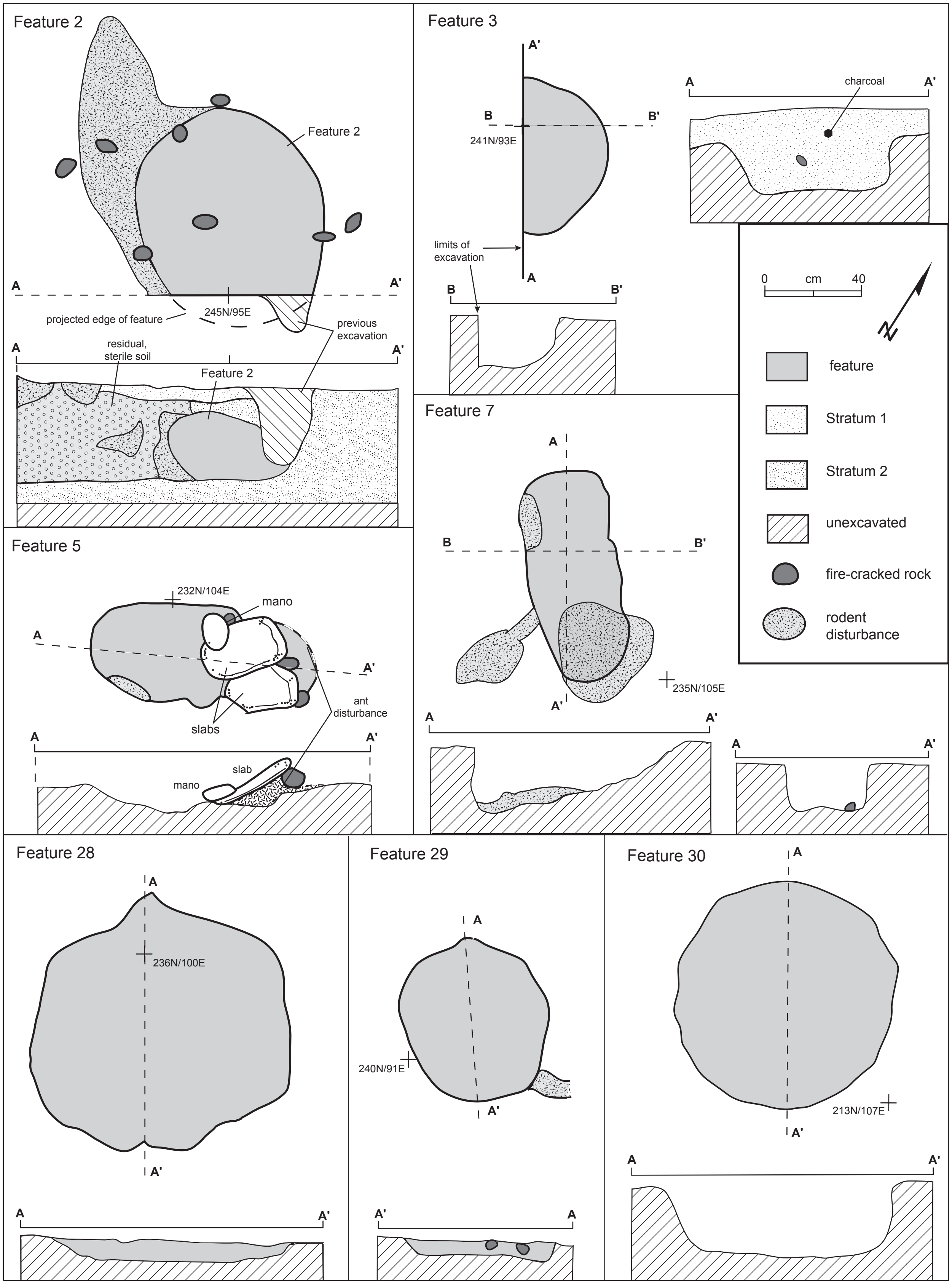

Figure 74. Townsend East Area A, large pits.

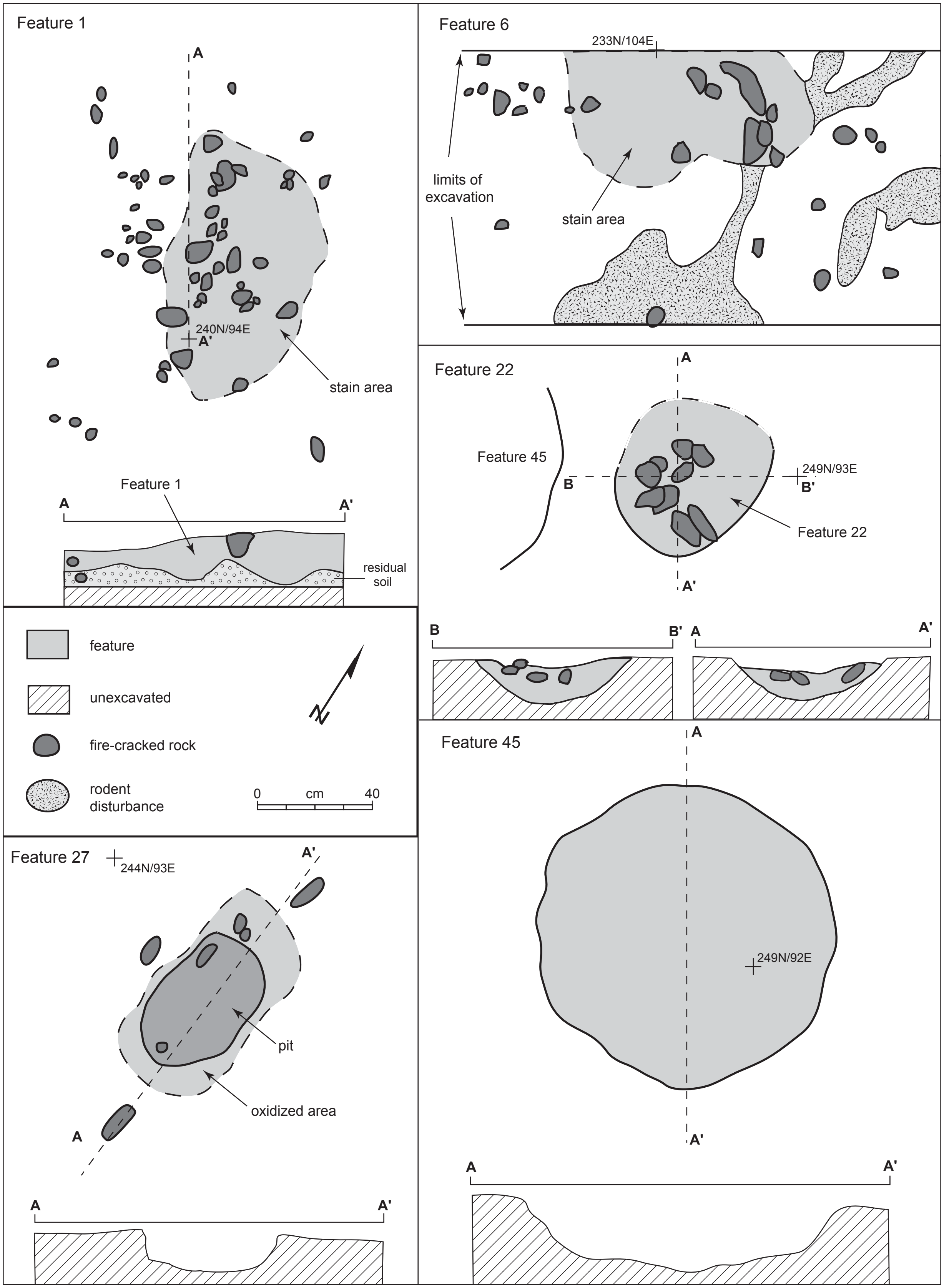

Figure 75. Townsend East Area A, large thermal pits.

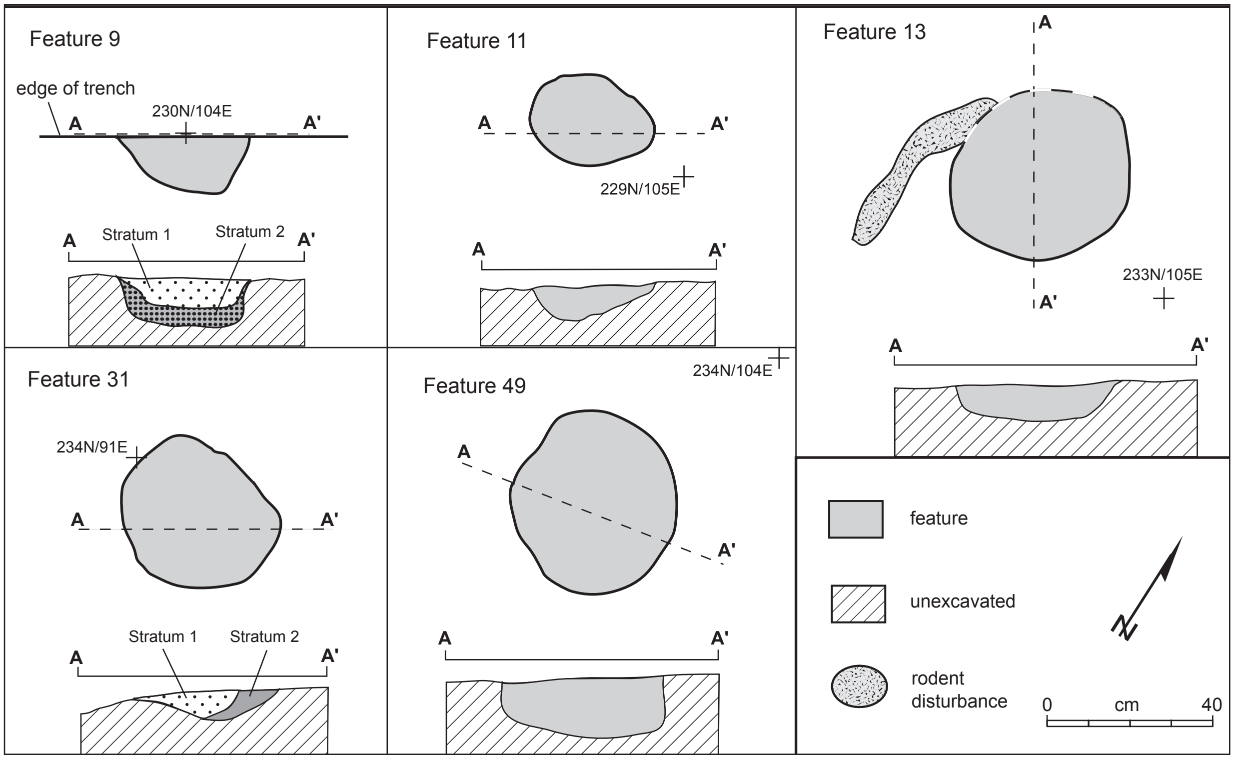

Figure 76. Townsend East Area A, small pits.

2 and south of Structure 5, Feature 5 originates at about the same level as both structures and could be associated with either. It was ovoid with a slab propped up against the east wall and a one-hand mano resting on the slab. Although the slab shows no wear, the pit profile and slab position are remarkably similar to that of a metate in a mealing bin. At the base of the pit were small pieces of burned sandstone and a charred corn kernel.

Few features contained artifacts. For ceramics (Table 55), Feature 2, which includes a good deal of rodent burrow material, has the largest sample (n=28). Most feature ceramics are El Paso Brown, with considerably fewer Jornada Brown and no Chupadero Black-on-white. Many Area A features (n=23) contained lithic artifacts (Table 56). Feature 2 again held the most, including a biface and a middle-stage biface. Most features (n=14) held 10 or fewer, with a range of 1 to 122. As for fauna, few features had appreciable numbers of bone (Table 57), and several had none at all. Much of the feature bone came from flotation samples (Table 58) and was no more than small burned fragments. The most consistently found economic (burned) plant materials were the weedy annuals, particularly goosefoot, pigweed, and purslane. Corn was found in only three of the features, one just south of Structure 3, which also had corn, and two in the vicinity of Structures 2 and 5. Fuelwood was predominately saltbush/greasewood and mesquite. Pits designated as thermal were no more likely to contain fuelwood than those not designated as thermal.

Area B Data Recovery Results

Fewer surface artifacts were located in this area. The greatest concentrations lay between 100N and 130N (Fig. 81). Fire-cracked rock was densest in an area centered around 150N and along the east edge between 170 and 195N. Ceramic artifacts were sparse, with a slight cluster between 110N and 125N.

Hand-Excavated Units

Hand-excavated units were placed in 13 areas (Table 59). These were either exploratory east-west profile trenches investigating surface features, stripping around the structure, or defining features after the mechanical scrape (Fig. 82). Structure 1 was located during the excavation of one of the east-west profile trenches. Several features were found when stripping soil from around the structure.

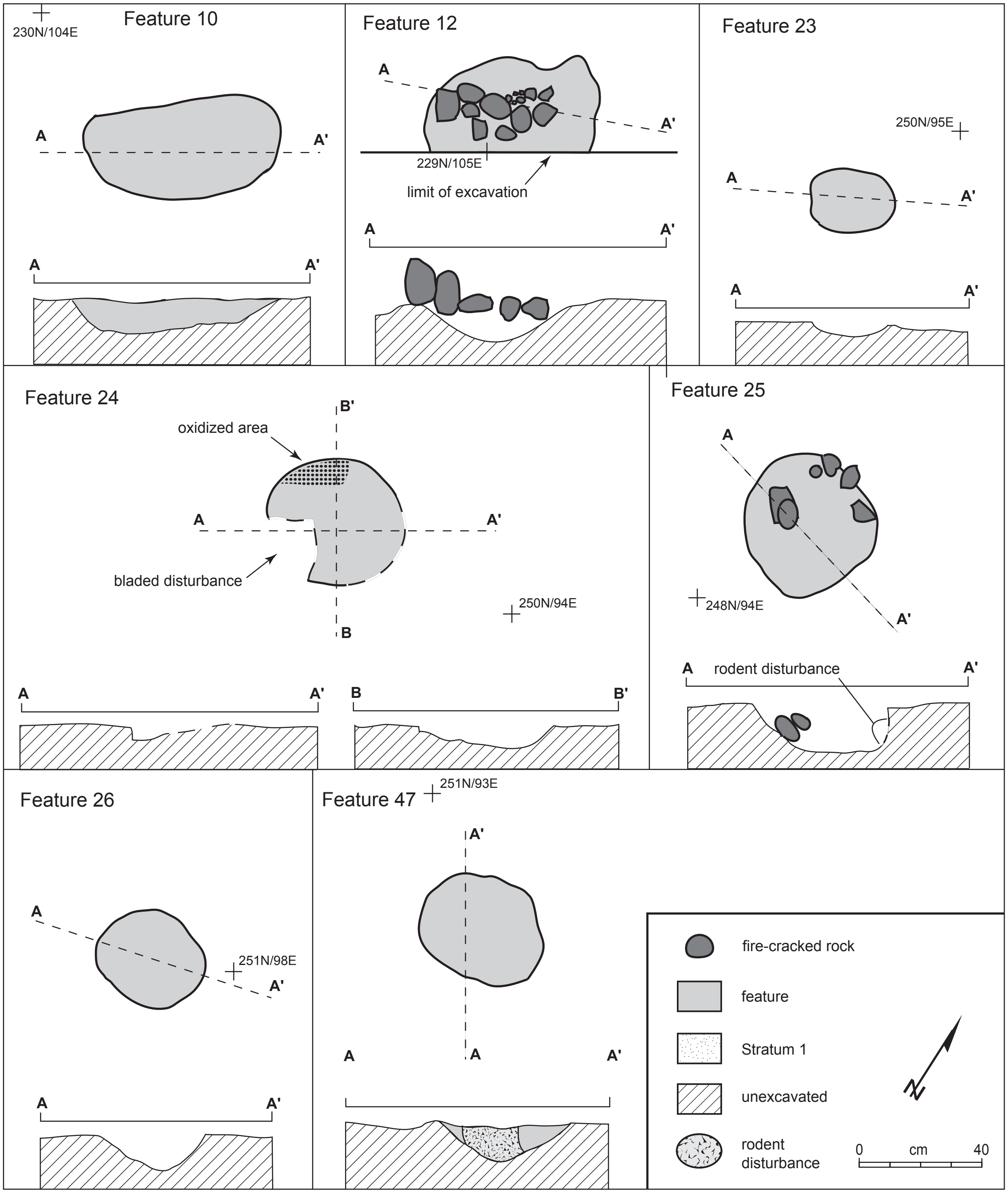

Figure 77. Townsend East Area A, small thermal pits.

Table 54. Townsend East Area A, large and small pit comparisons.

Feature	Max. Diameter (cm)	Max. Depth (cm)	Fill	Fire-Cracked Rock	Comments, and Fuelwood Recovered
Large thermals					
1	80	15	eolian	0	fire-cracked rock scatter; saltbush, greasewood
4	52	<10	grayish	++	fire-cracked rock scatter
6	100	<10	grayish	++	fire-cracked rock scatter
22	60	15	black	++	
27	76	15	charcoal and burned soil	?	fire-cracked rock above where feature was defined
45	117	14	brown with little charcoal	++	
Large pits					
2	74	10	grayish	0	undetermined nonconifer
3	62	22	grayish	+	saltbush, greasewood, mesquite, undetermined nonconifer
5	89	15	grayish	+	burned sandstone at base
7	84	18	brown with little charcoal	+	
28	100	9	brown and ashy	+	
29	72	7	brown with charcoal	+	
30	91	31	brown with little charcoal	-	
Small thermals					
10	30	6	dark gray	-	juniper, saltbush, greasewood, mesquite
12	30	8	dark gray	++	saltbush, greasewood, mesquite
23	26	3.5	dark gray	?	truncated by scrape
24	45	5	dark gray	-	truncated by scrape
25	47	17	dark gray	++	
26	34	10	light gray	-	truncated by scrape
47	36	10	gray	+	burned edge
Small pits					
9	33	14	dark gray	0	saltbush, greasewood
11	33	10	dark brown with charcoal	-	saltbush, greasewood, mesquite, undetermined conifer
13	44	5	brown with charcoal flecks	-	
31	43	3	dark gray	-	
49	47	14	grayish	+	saltbush, greasewood, mesquite, undetermined conifer

- none or none reported; + some; ++ a considerable amount

Table 55. Ceramic types recovered from Townsend East Area A features.

Feature	El Paso Brown	Thin El Paso Brown	Jornada Brown	South Pecos Brown	Total
1	- -	- -	2 100.0%	- -	2 100.0%
2	21 75.0%	1 3.6%	6 21.4%	- -	28 100.0%
5	1 100.0%	- -	- -	- -	1 100.0%
7	3 50.0%	1 16.7%	2 33.3%	- -	6 100.0%
13	1 100.0%	- -	- -	- -	1 100.0%
28	1 50.0%	- -	1 50.0%	- -	2 100.0%
29	2 66.7%	1 33.3%	- -	- -	3 100.0%
45	- -	- -	1 100.0%	- -	1 100.0%
47	1 100.0%	- -	- -	- -	1 100.0%
49	1 25.0%	- -	- -	3 75.0%	4 100.0%

Auger Tests

Auger tests were placed along the 100E grid line and at intervals on the 150N and 100N grid lines (Table 60). These were excavated to about 1 m deep and reveal that the sterile pink soil is deeper to the south, with more eolian deposition.

Surface Scrape

Much of Area B east of the right-of-way fence was scraped to a depth of 20 to 30 cm below the modern surface. Exceptions are the area along the fence, where the AT&T cable was found, and to the south, where the fiber optics cable crosses the project area. West of the right-of-way fence, scraping was particularly unproductive and stopped at about 115N.

Features uncovered by the scrape were far more subtle in Area B. Lacking the dark charcoal-stained upper fill found in Area A, feature fill was often similar to the sterile pink soil and visible only after complete drying or when rain saturated the soil.

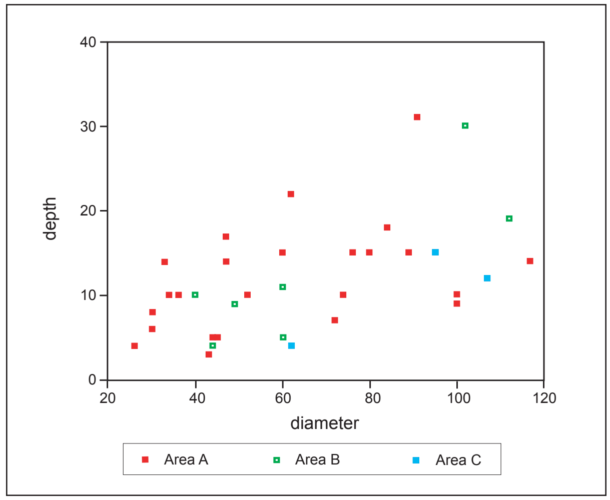

Figure 78. Townsend East scatter plot of small and large pits by area.

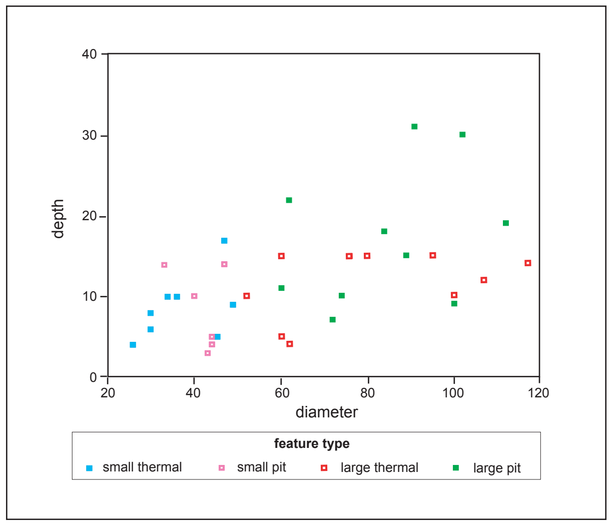

Figure 79. Townsend East scatter plot of small and large pits by feature type.

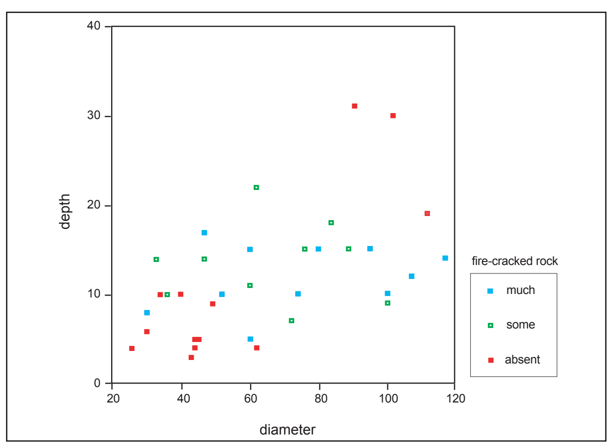

Figure 80. Townsend East scatter plot of small and large pits by amount of fire-cracked rock.

Table 56. Lithic artifact types recovered from Townsend East, Area A features.

Feature Number	Angular Debris	Core Flake	Biface Flake	Notching Flake	Bipolar Flake	Pot Lid	Tested Cobble	Multi-directional Core	Uniface	Biface	Mid-Stage Biface	Late-Stage Biface	Total
1	-	2	-	-	-	-	-	-	-	-	-	-	2
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
2	14	97	6	-	-	-	1	2	-	1	1	-	122
	11.5%	79.5%	4.9%	-	-	-	0.8%	1.6%	-	0.8%	0.8%	-	100.0%
3	3	12	2	-	-	-	1	-	-	-	-	-	18
	16.7%	66.7%	11.1%	-	-	-	5.6%	-	-	-	-	-	100.0%
5	3	12	2	1	-	-	-	-	-	-	-	-	18
	16.7%	66.7%	11.1%	5.6%	-	-	-	-	-	-	-	-	100.0%
7	5	17	2	-	-	-	-	-	-	-	-	-	24
	20.8%	70.8%	8.3%	-	-	-	-	-	-	-	-	-	100.0%
8	1	3	1	-	-	-	-	-	-	-	-	-	5
	20.0%	60.0%	20.0%	-	-	-	-	-	-	-	-	-	100.0%
9	-	3	-	-	-	-	-	-	-	-	-	-	3
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
10	4	17	-	-	-	-	-	-	-	-	-	-	21
	19.0%	81.0%	-	-	-	-	-	-	-	-	-	-	100.0%
13	-	3	-	-	-	-	-	-	-	-	-	-	3
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
23	2	-	-	-	-	-	-	-	-	-	-	-	2
	100.0%	-	-	-	-	-	-	-	-	-	-	-	100.0%
24	1	1	-	-	-	-	-	-	-	-	-	-	2
	50.0%	50.0%	-	-	-	-	-	-	-	-	-	-	100.0%
25	1	3	-	-	-	-	-	-	-	-	-	-	4
	25.0%	75.0%	-	-	-	-	-	-	-	-	-	-	100.0%
26	-	2	-	-	-	-	-	-	-	-	-	-	2
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
27	-	11	-	-	-	-	-	-	-	-	-	-	11.
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
28	-	10	-	-	-	-	-	-	-	-	-	-	10
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
29	1	2	-	-	1	-	-	-	-	-	-	-	4
	25.0%	50.0%	-	-	25.0%	-	-	-	-	-	-	-	100.0%
30	1	28	1	-	-	-	-	-	-	-	-	-	30
	3.3%	93.3%	3.3%	-	-	-	-	-	-	-	-	-	100.0%
31	-	1	-	-	-	-	-	-	-	-	-	-	1
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
42	-	-	-	-	-	-	-	-	1	-	-	-	1
	-	-	-	-	-	-	-	-	100.0%	-	-	-	100.0%
45	11	50	-	-	-	1	-	1	-	-	-	-	63
	17.5%	79.4%	-	-	-	1.6%	-	1.6%	-	-	-	-	100.0%
47	-	1	-	-	-	-	-	-	-	-	-	-	1
	-	100.0%	-	-	-	-	-	-	-	-	-	-	100.0%
48	1	2	-	-	-	-	-	-	-	-	-	-	3
	33.3%	66.7%	-	-	-	-	-	-	-	-	-	-	100.0%
49	8	28	1	-	-	-	-	-	-	-	-	-	37
	21.6%	75.7%	2.7%	-	-	-	-	-	-	-	-	-	100.0%

Table 57. Fauna recovered from Townsend East, Area A features.

Taxon	F. 1	F. 2	F. 5	F. 7	F. 8	F. 9	F. 10	F. 11	F. 12	F. 13
Small mammal	1 50.0%	9 81.8%	1 50.0%	8 100.0%	2 66.7%	16 69.6%	7 70.0%	2 100.0%	2 100.0%	- -
Small-medium mammal	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Medium-large mammal	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Large mammal	- -	- -	- -	- -	- -	- -	1 10.0%	- -	- -	- -
Prairie dog	- -	- -	- -	- -	- -	1 4.3%	1 10.0%	- -	- -	- -
Medium-large rodent	1 50.0%	- -	- -	- -	- -	6 26.1%	1 10.0%	- -	- -	1 100.0%
Cottontail	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Jackrabbit	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Deer	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Cow or bison	- -	2 18.2%	- -	- -	- -	- -	- -	- -	- -	- -
Egg shell	- -	- -	- -	- -	1 33.3%	- -	- -	- -	- -	- -
Mussel	- -	- -	1 50.0%	- -	- -	- -	- -	- -	- -	- -
Totals	2 100.0%	11 100.0%	2 100.0%	8 100.0%	3 100.0%	23 100.0%	10 100.0%	2 100.0%	2 100.0%	1 100.0%

Taxon	F. 22	F. 24	F. 27	F. 28	F. 29	F. 30	F. 31	F. 45	F. 47	F. 49
Small mammal	1 100.0%	2 66.7%	4 80.0%	8 100.0%	3 50.0%	6 46.2%	1 100.0%	- -	- -	2 66.7%
Small-medium mammal	- -	- -	- -	- -	- -	4 30.8%	- -	- -	- -	- -
Medium-large mammal	- -	- -	- -	- -	2 33.3%	2 15.4%	- -	1 50.0%	- -	- -
Large mammal	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Prairie dog	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Medium-large rodent	- -	- -	1 20.0%	- -	- -	- -	- -	- -	- -	- -
Cottontail	- -	- -	- -	- -	1 16.7%	- -	- -	- -	- -	- -
Jackrabbit	- -	- -	- -	- -	- -	- -	- -	1 50.0%	- -	- -
Deer	- -	1 33.3%	- -	- -	- -	- -	- -	- -	- -	- -
Cow or bison	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Egg shell	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Mussel	- -	- -	- -	- -	- -	1 7.7%	- -	- -	2 100.0%	1 33.3%
Totals	1 100.0%	3 100.0%	5 100.0%	8 100.0%	6 100.0%	13 100.0%	1 100.0%	2 100.0%	2 100.0%	3 100.0%

Table 58. Summary of environmental alteration, burning, and completeness for fauna from Townsend East, Area A features.

Feature	# From Flotation	Environmentally Altered	Unburned	Burned	>75% Complete	<25% Complete
1	2 100.0%	1 50.0%	1 50.0%	1 50.0%	- -	2 100.0%
2	8 72.7%	5 45.5%	5 45.5%	6 54.5%	- -	8 72.7%
5	- -	1 50.0%	1 50.0%	1 50.0%	- -	2 100.0%
7	3 37.5%	5 62.5%	2 25.0%	6 75.0%	- -	8 100.0%
8	2 66.7%	2 66.7%	3 100.0%	- -	- -	3 100.0%
9	22 95.7%	8 34.8%	3 13.0%	20 87.0%	1 4.3%	22 95.7%
10	6 60.0%	8 80.0%	2 20.0%	8 80.0%	- -	10 100.0%
11	2 100.0%	2 100.0%	- -	2 100.0%	- -	2 100.0%
12	2 100.0%	2 100.0%	- -	2 100.0%	- -	2 100.0%
13	1 100.0%	- -	- -	1 100.0%	- -	1 100.0%
22	1 100.0%	- -	1 100.0%	- -	- -	1 100.0%
24	3 100.0%	1 33.3%	1 33.3%	2 66.7%	- -	3 100.0%
27	5 100.0%	1 20.0%	- -	5 100.0%	- -	4 80.0%
28	8 100.0%	7 87.5%	1 12.5%	7 87.5%	- -	8 100.0%
29	1 16.7%	2 33.3%	- -	6 100.0%	- -	6 100.0%
30	- -	11 84.6%	7 53.8%	6 46.2%	- -	13 100.0%
31	1 100.0%	1 100.0%	1 100.0%	- -	- -	1 100.0%
45	- -	2 100.0%	- -	2 100.0%	- -	2 100.0%
47	- -	- -	2 100.0%	- -	- -	2 100.0%
49	1 33.3%	1 33.3%	2 66.7%	1 33.3%	- -	3 100.0%

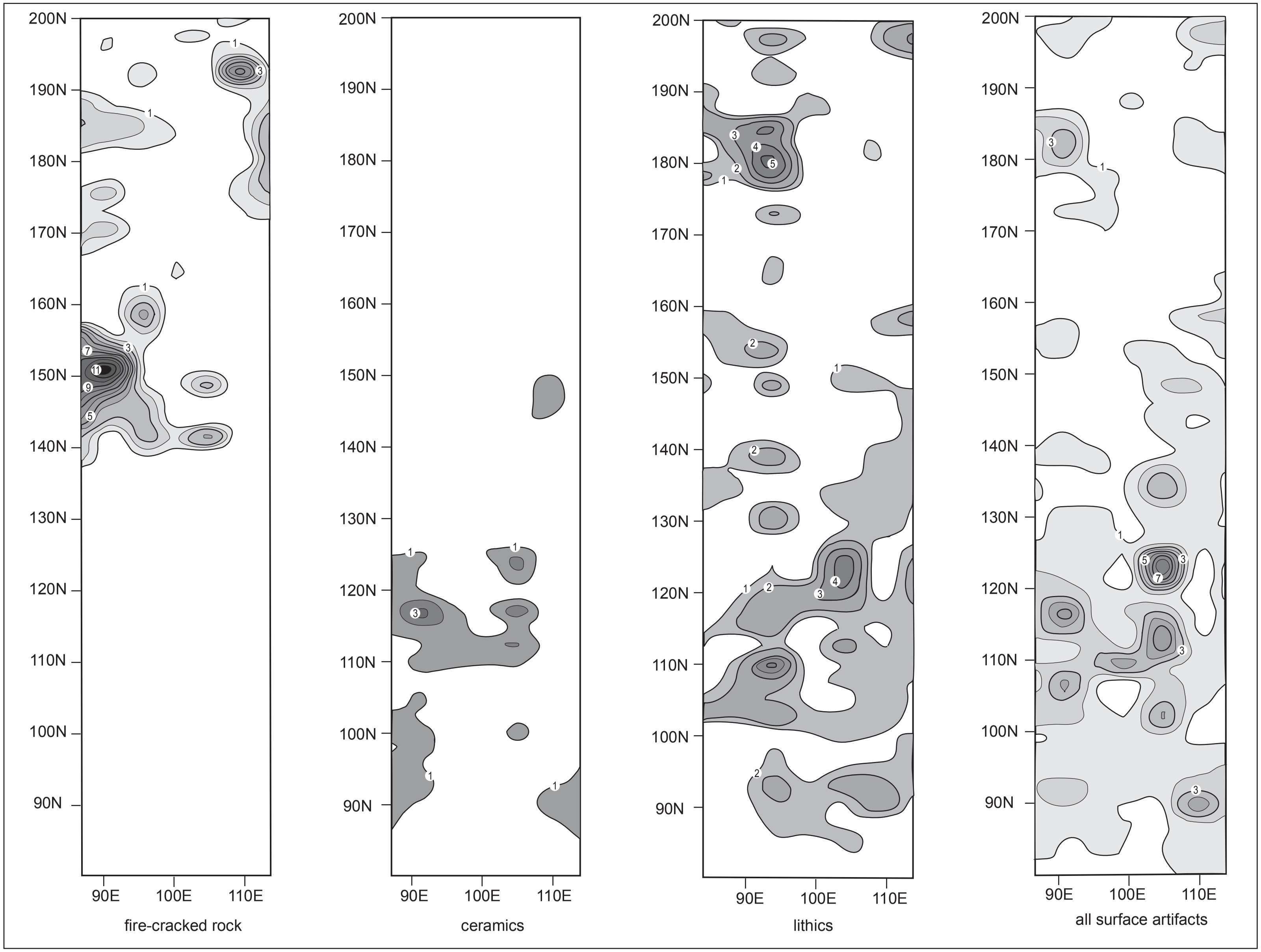

Figure 81. Townsend East Area B surface artifact distribution.

Table 59. Hand excavated units in Area B of Townsend East (north to south).

Location	No. of Levels	Top and Bottom Elevations (mbd)	Comments
193N 109-110E	2	8.22-8.00	investigate fire-cracked rock scatter
185N 96-97E	3	8.22-8.00	exploratory
150N 114E	3	8.80-8.52	exploratory
145N 103-105E	3-4	8.98-8.67	exploratory; no surface artifacts
127N 104-107E, 126N 104-108E	2	9.29-9.08	stripping around Structure 1
125N 102-107E	2	9.33-9.13	east-west profile trench; found Structure 1
125N 108E & 124N 104-107E	1-2	9.27-9.09	stripping around Structure 1
114N 104E	1	9.34-9.27	defining Feature 37; after scrape
111N 107E	2	9.45-9.25	south half; defining Feature 15
110N 96-97 & 100-107E	2-3	W 9.65-9.35, E 9.46-9.27	east-west profile trench; auger test to 8.40 mbd
109N 104E	1	9.26-9.21	investigate stain; after scrape
108-109N 109-110E	1-2	9.31-9.17	defining Feature 46; after scrape
90N 101-102E	3	10.03-9.73	investigate ceramic cluster

Table 60. Townsend East, Area B auger test summary.

Location	Surface Elevation (mbd)	Depth Excavated (m)	Disturbed Upper Fill	Eolian/ Cultural Fill (m)	Start Residual Soil (m)
190N 100E	8.14	1.00		0-0.15	0.15
180N 100E	8.29	1.01		0-0.40	0.40
168N 100E	-	1.00		0-0.30	0.30
160N 100E	8.62	1.00		0-0.30	0.30
150N 100E	8.88	1.00		0-0.24	0.24
150N 110E	8.81	0.92		0-0.22	0.22
150N 95E	8.73	0.92	highway-related disturbance		
140N 100E	9.20	0.95		0-0.25	0.25
130N 100E	9.27	0.95		0-0.25	0.25
120N 100E	9.57	0.99		0-0.29	0.29
100N 100E	10.00	1.00		0-0.40	0.40
100N 110E	9.50	1.20	cable trench fill		
100N 90E	9.60	1.00		0-0.32	0.32
90N 100E	10.13	1.00		0-0.30	0.30
80N 100E	10.08	1.00		0-0.30	0.30

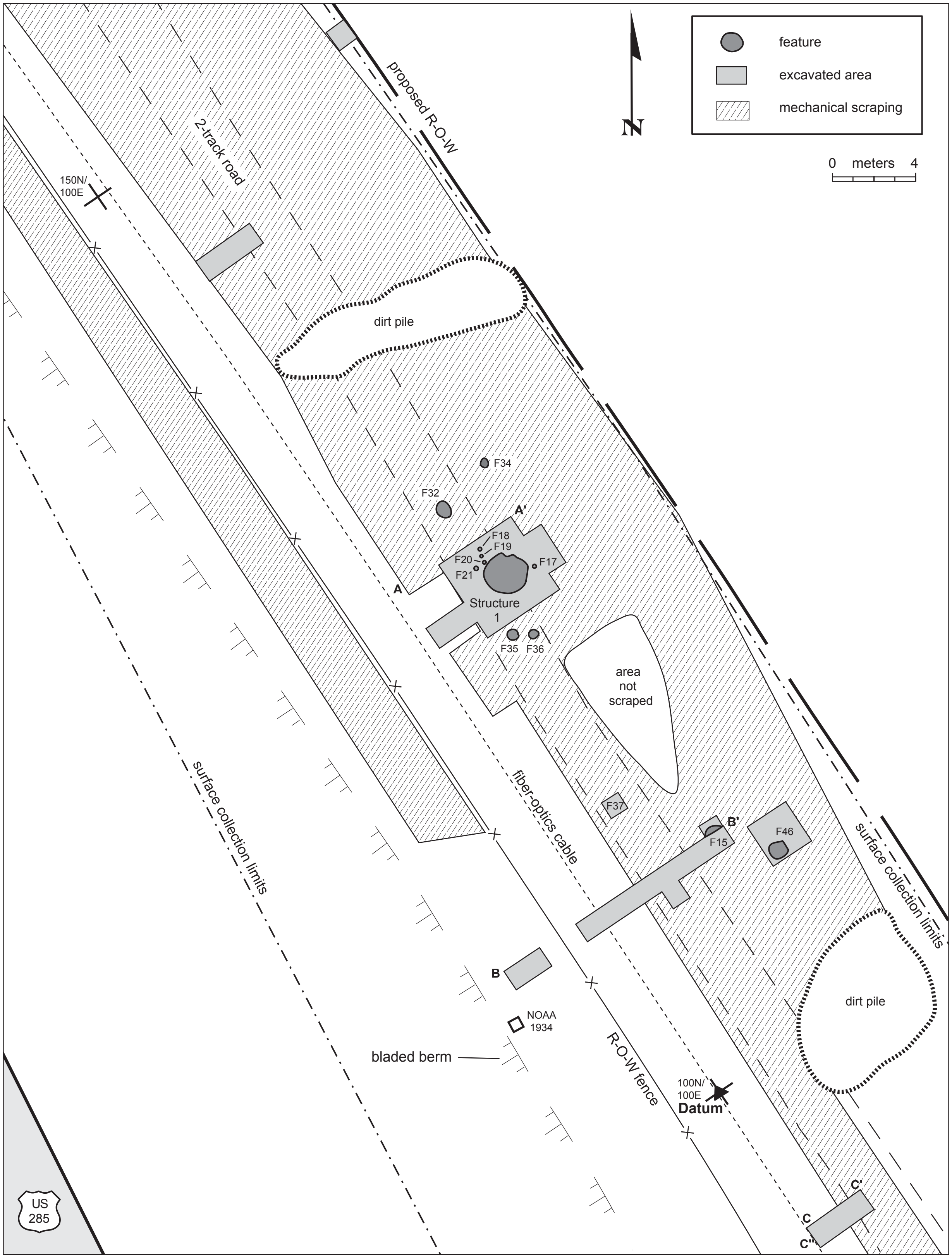

Figure 82. Plan of Townsend East Area B.

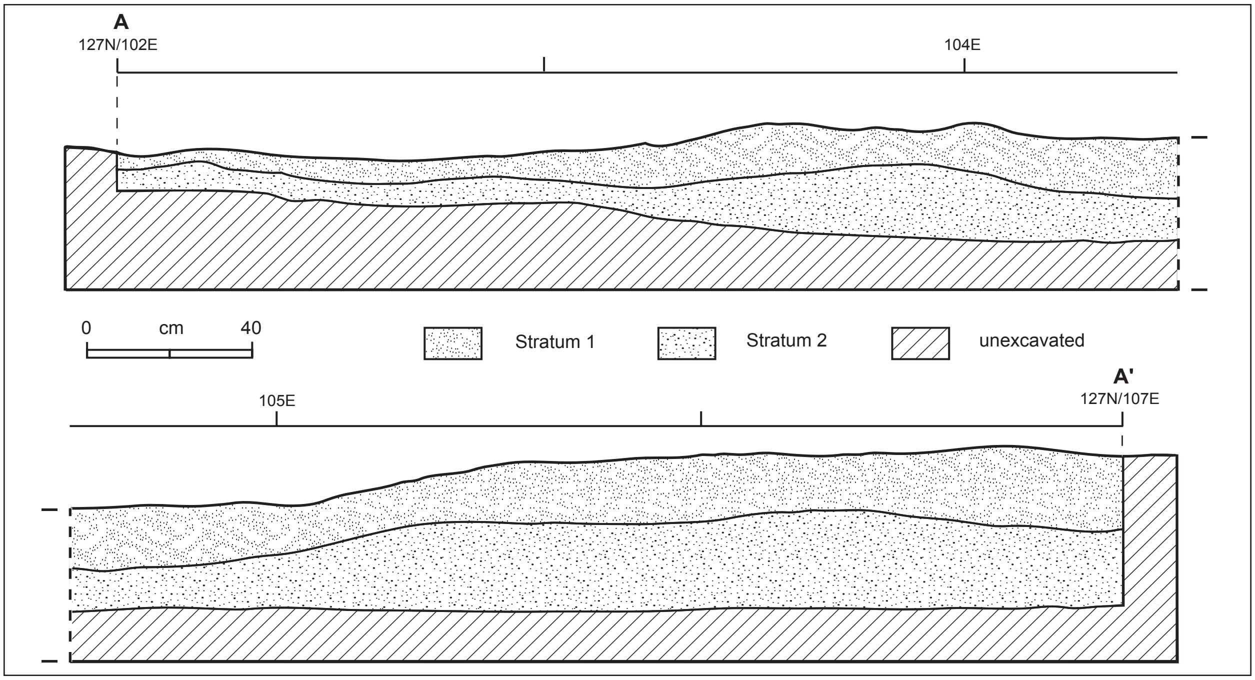

Figure 83. Townsend East Area B east-west profile at 127N.

Stratigraphy

Fill in this area is basically fine eolian silt to silty sand with very sparse charcoal usually overlying a slightly consolidated mixed strata of fine sandy loam with no charcoal, and finally, a consolidated layer of the pink sterile soil with moderate amounts of caliche inclusions. At 150N 114E the two upper layers are fairly regular, and each is about 10 cm thick. At 145N the same strata are found, but there are more irregularities in the upper surface of the sterile pink soil.

At the northern end of the area stripped around Structure 1 (127N), only the upper and lower layers are found (Fig. 83). The upper eolian layer has abundant rodent and insect intrusions and is more consolidated in the eroded area of the two-track road, where it thins from 20 cm to about 4 cm. Around and above Structure 1 there is slightly more charcoal in the upper eolian fill, with cultural fill replacing the middle layer. The sterile pink soil is moderately consolidated with profuse carbonate flecking. A few artifacts have worked their way into the upper few centimeters of this layer.

In the east-west profile trench at 110N (Fig. 84), stratigraphy appears more complex, mainly due to the rodent disturbance. Otherwise, it is similar to areas north: a thin eolian layer overlying the silty loam. Slightly different fill west of the right-of-way fence was probably redeposited during road construction. The pocket of ash at the east end of the trench (Feature 15) was determined to be a rodent burrow filled with ashy soil.

At 90N, fill remains the same clean eolian silt overlying a thicker layer of silty loam (Fig. 85). The silty loam layer has a blockier texture than to the north, is quite hard, and has abundant carbonate nodules and much insect disturbance.

Structure 1

Structure 1 was exceedingly difficult to define. The east-west profile trench at 125N went over the top of the structure. Although fill changes were quite subtle, scattered chunks of charcoal continued below the level where the sterile pink soil should have been reached. Examination of soils in the walls of 125N 106E revealed a subtle but steeply sloping change in fill starting at about 16 cm below the modern ground surface. Because of difficulties defining the structure, fill was removed by grid in various-sized levels depending on the presence of surfaces and features. Ultimately, three surfaces or slump episodes were defined and seven features located.

Fill (Fig. 86) was up to 60 cm of compact sandy loam with small amounts of charcoal, giving it a slight grayish cast (Layers 1 and A1). Caliche, chunks of burned clay and charcoal, gravel, and fire-cracked rock were present along with sparse artifacts. At the center of the structure was an even harder and more compact

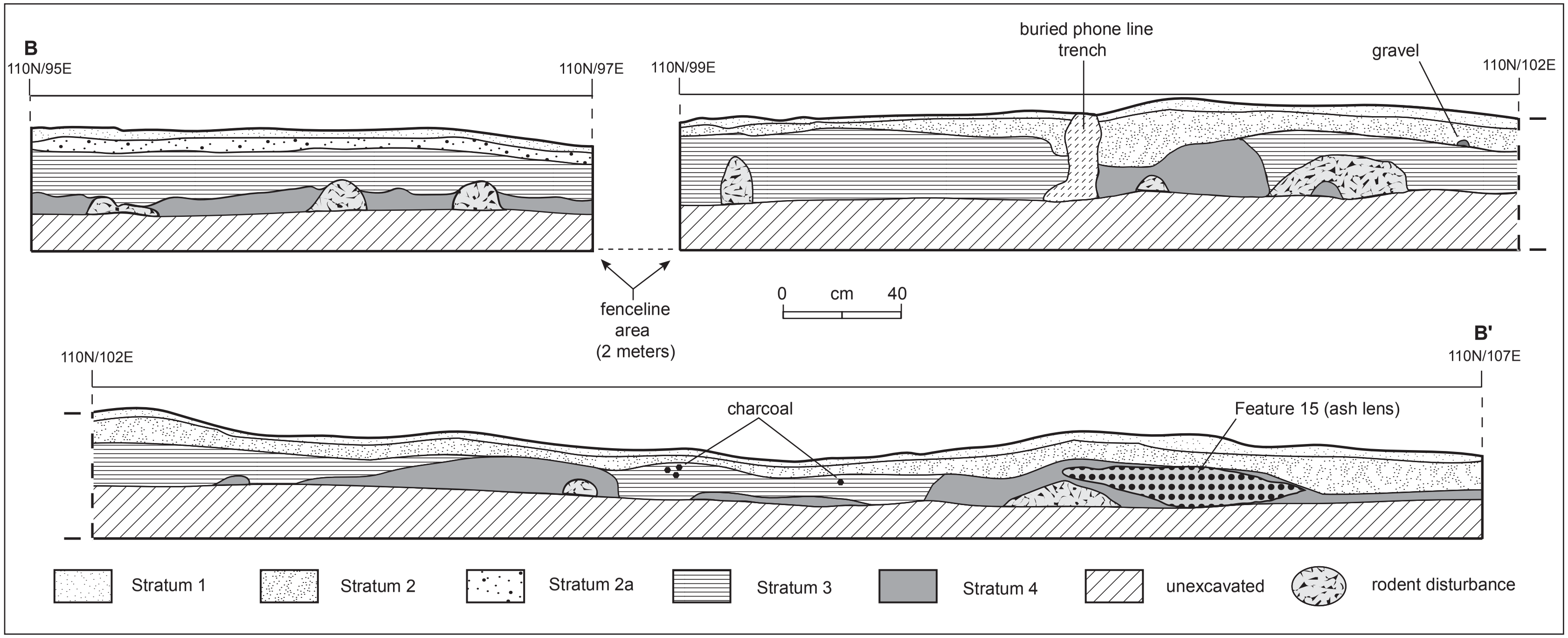

Figure 84. Townsend East Area B east-west profile at 110N.

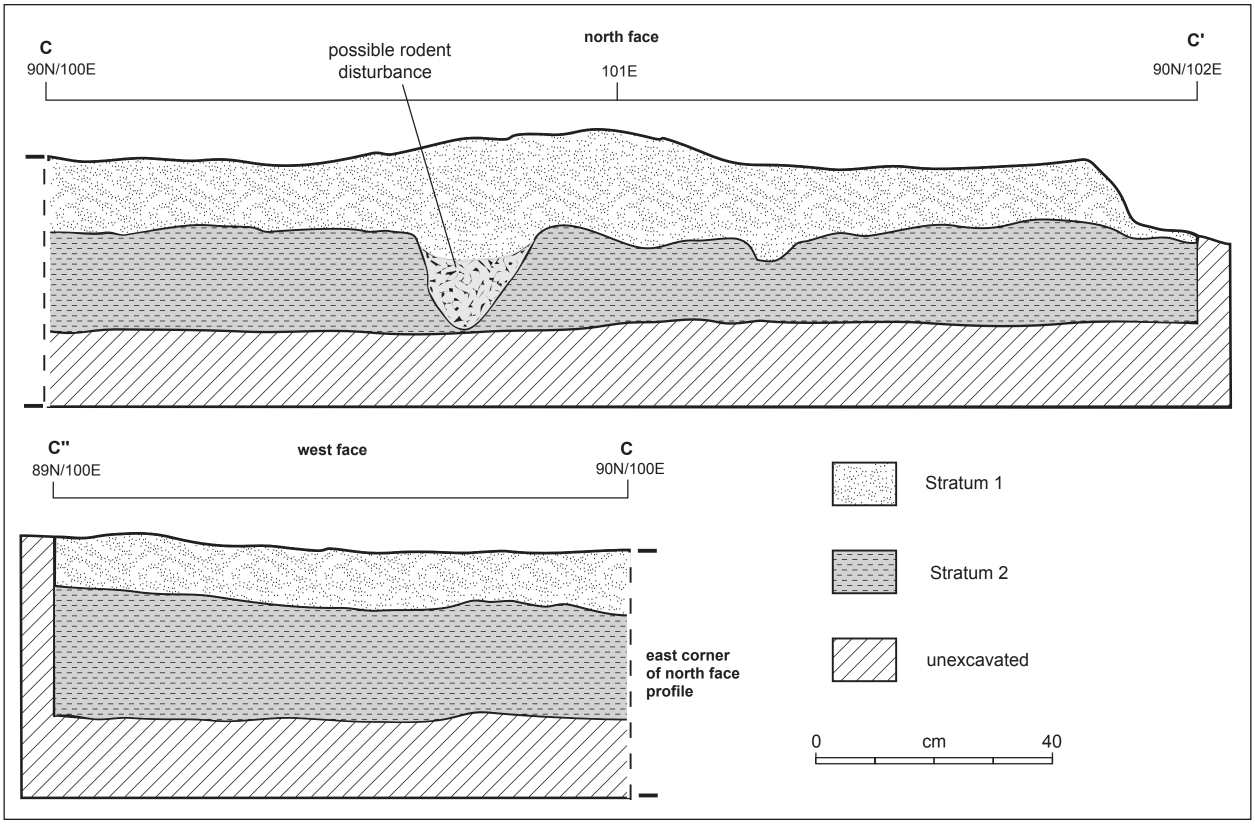

Figure 85. Townsend East Area B east-west/north-south profile at 90N.

layer of fine grained sandy clay loam with very sparse carbonate flecks, small amounts of charcoal, and virtually no chunks of the sterile pink soil (Layer B). This rested on a thin but distinctive alluvial wash lens of clean sand, then a fine silty loam with large amounts of powdered charcoal and areas of wall slump (Layer C) on a discontinuous surface labeled Surface 3a. Surface 1 was a small unconformity covering an area about 20 cm in diameter in 125N 107E about 60 cm bgs. It was at the base of an ant nest and was most likely a natural phenomenon. At best, it was a slightly used surface or even slumped soil washed to a fairly uniform depth, then trampled. About 17 cm below Surface 1 was an even to uneven cleavage plane or surface labeled Surface 2a. This one sloped steeply (about 45 degrees) toward the center of the structure and had rocks protruding through it. Surface 2a was discontinuous in the central part of the structure, and a Surface 2b was defined to the west in grids 126N 105 and 106E, even though the level (82 cm bgs) was more like that of Surface 3 (82 to 85 cm bgs), which underlies Surface 2a by 4 to 10 cm. It was judged to be a Surface 2 largely because there was a Surface 3 directly underlying it. Both surfaces rest on laminated lenses of alluvial soil. Surface 3 was the best of the possible surfaces because it was charcoal stained with scattered carbonate flecking.

Structure 1 is roughly circular with sloping walls (Figs. 87 and 88). No finishing was evident in walls or floors; however, a light gray film and occasional rootlets helped to define the walls in one grid. In most of the structure, the walls had slumped and were hard to follow. None of the surfaces were prepared and were generally no more than cleavage plains representing slight changes in fill. None were continuous across the structure. Levels 3 and 4 also produced pieces of burned clay that could be the remains of a daub superstructure.

A variety of features were defined (Table 61). All are small holes that could have held posts. Similar features were found outside the structure to the north and east.

The artifact assemblage from this structure is later and differs in the amount and type of ceramics and the amount of corn. Ceramics were relatively abundant (n=191) with more Jornada Brown (54.5 percent) than any other type. Chupadero Black-on-white and Chupadero paste sherds are well represented (9.9 percent), as is El Paso Brown (31.4 percent). Proportions of El Paso Brown generally increase with depth; however,

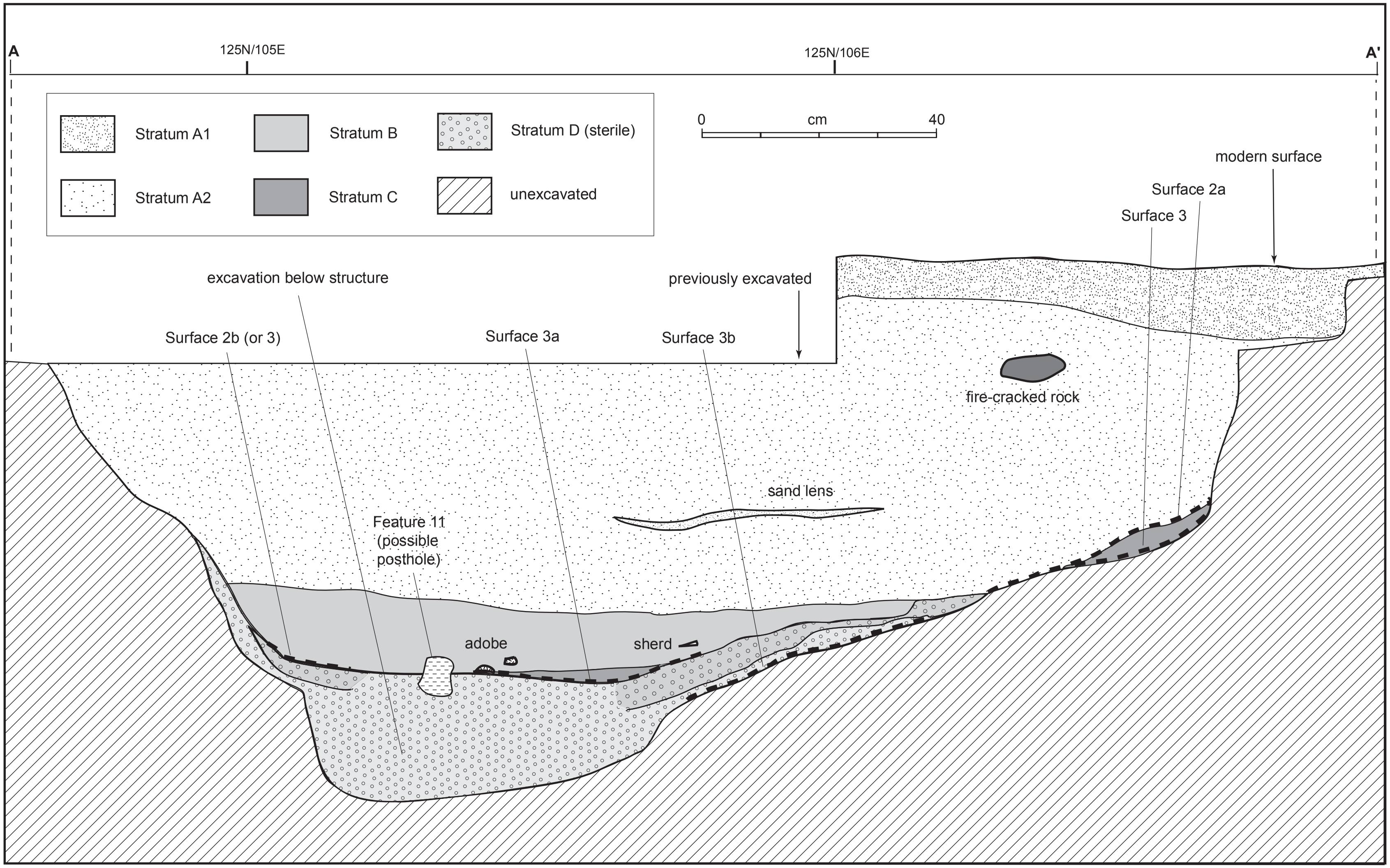

Figure 86. Townsend East Area B Structure 1 stratigraphic profile.

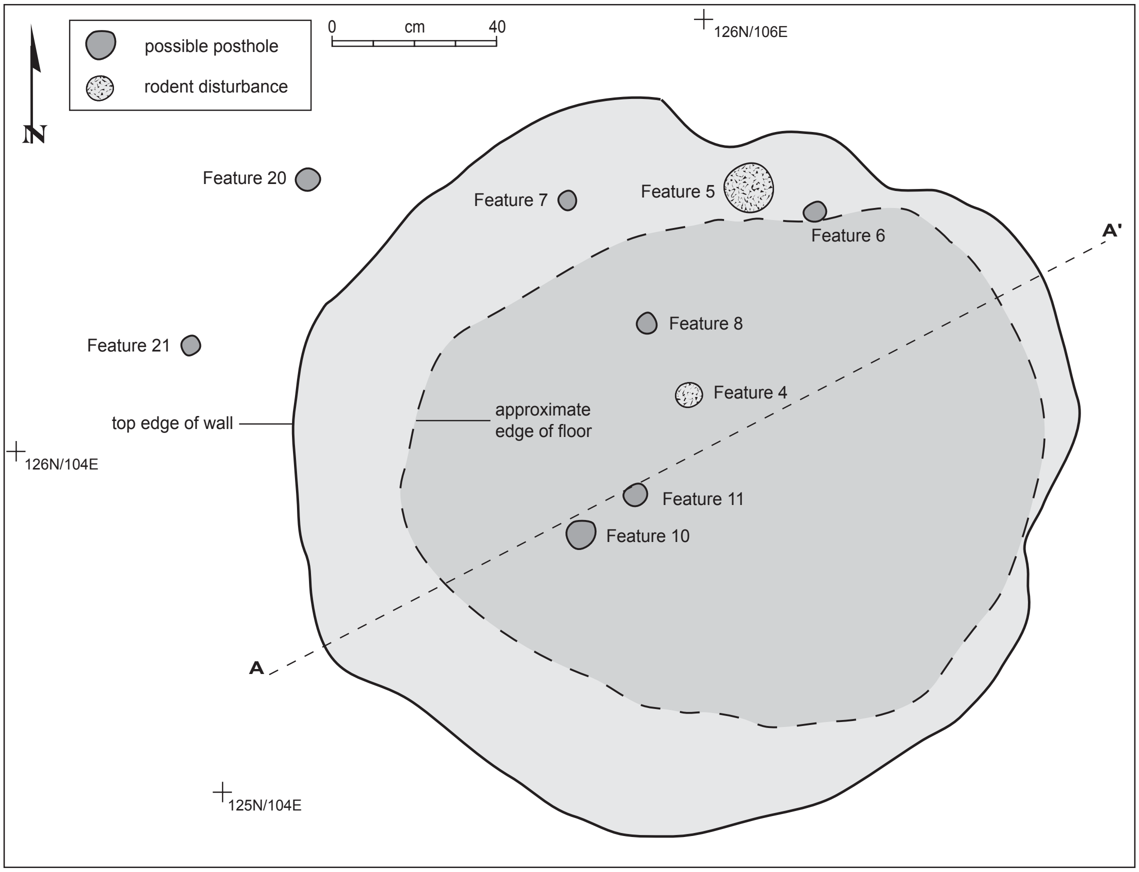

Figure 87. Townsend East Area B Structure 1 plan.

Figure 88. Structure 1 at Townsend East after excavation (arrow is 30 cm).

Table 61. Townsend East, summary of Structure 1 features.

No.	Type	Grid and Elevation (mbd)	Dimensions (cm)	Fill	Comments
1	modern posthole	126N 106E 8.84	17 x 18 x 20	fine to medium-grained silty sand; no charcoal	probably originated even higher
2	rodent disturbance	126N 105-106E			
4	rodent disturbance	125N 105-106E			
5	rodent disturbance	126N 106E			
6	posthole	126N 107E 8.54	6 x 5 x 4	unknown; fill removed before it was identified as a feature	in the wall but vertical; probably associated with Surface 2b
7	posthole	126N 106E 8.63	6 x 5 x 9	fine sandy loam with no charcoal	slanted 15° from vertical toward the center of the structure; Surface 2b?
8	posthole	126N 106E 8.52	5 x 4 x 5	fine sandy loam with no charcoal	Surface 2b
9	posthole	126N 106E 8.47	5 x 5 x 11	fine sandy loam with charcoal flecks	Surface 3
10	posthole	125N 107E 8.38	6 x 6.5 x 9	silty loam with charcoal flecks	below Surface 3
11	posthole	125N 106E 8.39	4 x 5 x 5	sandy loam with no charcoal	below Surface 3

the lowest level of fill contains only Jornada Brown. Chupadero sherds are mainly in the upper two levels of fill, with a single sherd in Level 5.

Structure 1 contained the largest number and diversity of lithic artifacts (Table 62). Five projectile points, including two small side-notched points, five bifaces, an end scraper, and a cobble core were found. In addition it has the second largest proportion of biface flakes for the structures (9.8 percent). Of the points, two were broken during production, one has a probable haft snap, and another is a midsection with the tip removed by an impact fracture. A single piece of ground stone was attributed to Structure 1. It is an indeterminate piece recovered in Level 6. Activities represented in the fill and surrounding area include large and small biface manufacture, cutting or chopping of a hard material such as wood, bone, or antler, refurbishing projectile shafts, processing carcasses, and working hide, wood, bone, or antler (Moore, this volume).

Fauna was relatively sparse at 110 pieces, 27 (23.5 percent) of those from flotation samples (Table 63). It is a fairly diverse assemblage for the sample size, with at least five species of small mammals, two carnivores, and specimens of artiodactyl, fish, and mussel. Remarkably little is burned, but most are small fragments.

Of the 16 flotation samples, seven contained corn cupules, glumes, or kernels, and all but two had goosefoot. Pigweed, purslane, mesquite, and other unknown or undetermined plants were also found. Two corncobs were collected as macrobotanical samples, as were numerous mesquite seeds and pods. The only other place where mesquite pods were recovered is a small thermal pit just south of Structure 1. Fuelwood was mainly saltbush/greasewood and mesquite with small amounts of juniper, alder, creosotebush, and undetermined nonconifer (McBride and Toll, this volume).

An AMS date (Beta 133472) on mesquite dated A.D. 990 ± 40 (conventional) and A.D. 1005-1175 (calibrated).

Features

With the exception of a sparse fire-cracked rock scatter, the features in Area B were associated with Structure 1

Table 62. Summary of lithic artifacts from Townsend East, Structure 1.

Material	Angular Debris		Core Flake		Biface Flake		Multidirectional Core		Bidirectional Cobble Tool		Early-Stage Uniface		Middle-Stage Biface		Late-Stage Biface		Edge Bite		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Unknown	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Chert	26	60.5%	246	76.4%	41	100.0%	-	-	-	-	1	100.0%	3	100.0%	5	100.0%	2	100.0%	324	77.3%
Alibates chert	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
San Andreas chert	-	-	2	0.6%	-	-	1	100.0%	-	-	-	-	-	-	-	-	-	-	3	0.7%
Slicified wood	-	-	2	0.6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.5%
Obsidian	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Basalt	2	4.7%	12	3.7%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	3.3%
Siltite	6	14.0%	17	5.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	4.1%
Rhyolite	2	4.7%	6	1.9%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	0.7%
Limestone	3	7.0%	10	3.1%	-	-	-	-	1	100.0%	-	-	-	-	-	-	-	-	14	3.3%
Sandstone	-	-	2	0.6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.5%
Siltstone	1	2.3%	6	1.9%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	1.2%
Dolomite	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Metamorphic	-	-	1	0.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2%
Quartzite	3	7.0%	14	4.3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	2.9%
Row total	43	10.3%	322	76.8%	41	9.8%	1	0.2%	1	0.2%	1	0.2%	3	0.7%	5	1.2%	2	0.5%	419	100.0%

Table 63. Summary of Townsend East, Structure 1 fauna

Taxon	Total Count	# From Flotation % From Flotation	Max. MNI	Unburned	Burned	>75% Complete	<25% Complete	# Mature
Unknown small	1 0.9%	- -	-	1 100.0%	- -	1 100.0%	- -	1 100.0%
Small mammal	36 31.3%	12 33.3%	-	28 77.8%	8 22.2%	- -	35 97.2%	35 97.2%
Small-medium mammal	2 1.7%	- -	-	2 100.0%	- -	1 50.0%	- -	1 50.0%
Medium-large mammal	6 5.2%	- -	-	4 66.7%	2 33.3%	- -	6 100.0%	5 83.3%
Large mammal	7 6.1%	- -	-	4 57.1%	3 42.9%	- -	7 100.0%	7 100.0%
Small squirrel	1 0.9%	- -	1	1 100.0%	- -	- -	- -	1 100.0%
Prairie dog	9 7.8%	2 22.2%	2	8 88.9%	1 11.1%	- -	8 88.9%	8 88.9%
Ord's kangaroo rat	2 1.7%	- -	1	2 100.0%	- -	1 50.0%	- -	- -
Medium-large rodent	12 10.4%	8 66.7%	-	11 91.7%	1 8.3%	1 8.3%	10 83.3%	11 91.7%
Cottontail	14 12.2%	3 21.4%	3	12 85.7%	2 14.3%	1 7.1%	11 78.6%	9 64.3%
Jackrabbit	7 6.1%	- -	1	6 85.7%	1 14.3%	1 14.3%	6 85.7%	7 100.0%
Canid	1 0.9%	1 100.0%	1	1 100.0%	- -	- -	- -	1 100.0%
Badger	1 0.9%	1 100.0%	1	1 100.0%	- -	1 100.0%	- -	- -
Artiodactyl	1 0.9%	- -	-	1 100.0%	- -	- -	1 100.0%	1 100.0%
Medium artiodactyl	3 2.6%	- -	1	2 66.7%	1 33.3%	- -	3 100.0%	2 66.7%
Fish	1 0.9%	- -	1	1 100.0%	- -	- -	- -	1 100.0%
Mussel	11 9.6%	- -	-	11 100.0%	- -	- -	11 100.0%	- -
Total	115 100.0%	27 23.5%	12	96 83.5%	19 16.5%	7 6.1%	98 85.2%	90 86.5%

or exposed by mechanical scraping. Those around Structure 1 are small postholes found at levels a few centimeters above where the structure was clearly defined and with similar fill. Two of the four are at the edge of the structure, and the other two extend toward grid north. Given this pattern, it is unlikely they represent roof supports or wall supplements unless there was a covered opening to the northwest.

The remaining features (Table 64) are small and large pits (Figs. 89 and 90) that are fairly shallow. The exception is Feature 46, a large ovoid pit 30 cm deep that contained burned clay. When included with the Area A feature scatter plots, the Area B pits fall within the scatter largely defined by the larger number of Area A features.

Three Area B features contained a total of 14 ceramics (Table 65). El Paso Brown was found in all three, and Chupadero Black-on-white and Jornada Brown in two. Six features in this area contained lithic artifacts (Table 66). These were generally few in number, a maximum of 22, and only one had anything but debitage. Feature 35 produced a small projectile point. Fauna was recovered from four Area B features (Table 67). These are mostly small burned fragments that are heavily pitted from soil conditions (Table 68). Burned plant remains were also sparse, with only goosefoot

Table 64. Townsend East, Area B feature summary.

No.	Location	Feature Type, Shape	Dimensions (cm)	Top and Bottom Elevation (mbd)	Fill	Comments
14						originally assigned to Structure 1
15	111N 106-107E	large pit, circular?	112 x ? x 19	9.37-9.18	sandy loam with charcoal flecks	probably a rodent burrow; badly disturbed; burned goosefoot
16	51.15N 102.22E	fire-cracked rock scatter, irregular	60 x 32 x 5	10.88-10.83	eolian with no charcoal	center of 3 fire-cracked rock; burned dropseed and nightshade
17	124N 107E	rodent burrow				
18	127N 105E	posthole, circular	7 x 7 x 3	9.03-9.00	sandy loam	Structure 1 area
19	127N 105E	posthole, circular	7 x 9 x 6	9.03-8.97	sandy loam	Structure 1 area
20	127N 105E	posthole, circular	7 x 7 x 6	9.05-8.99	sandy loam	Structure 1 area
21	127N 105E	posthole, circular	8 x 8 x 7	9.05-9.98	sandy loam	Structure 1 area
32	130N 105E	large pit, circular	60 x 59 x 11	9.15-9.01	sandy loam, charcoal, sparse fire-cracked rock	after scrape
34	130N 108E	small pit, circular	44 x 40 x 4	9.08-9.04	silty loam with charcoal flecks	after scrape
35	123N 104-105E	small fire pit, circular	49 x 47 x 9	9.18-9.09	silty loam with burned soil and charcoal	after scrape; burned seepweed, lemonadeberry, mesquite
36	122-123N 104-105E	small pit, circular	34 x 40 x 8-10	9.20-9.12	charcoal stained silty sand	after scrape; burned goosefoot, purslane
37	114N 104E	rodent burrow				
46	108N 109-110 E	large pit, ovoid	102 x 68 x 30	9.18-8.88	silty loam with pieces of burned clay	after scrape; rodent disturbed

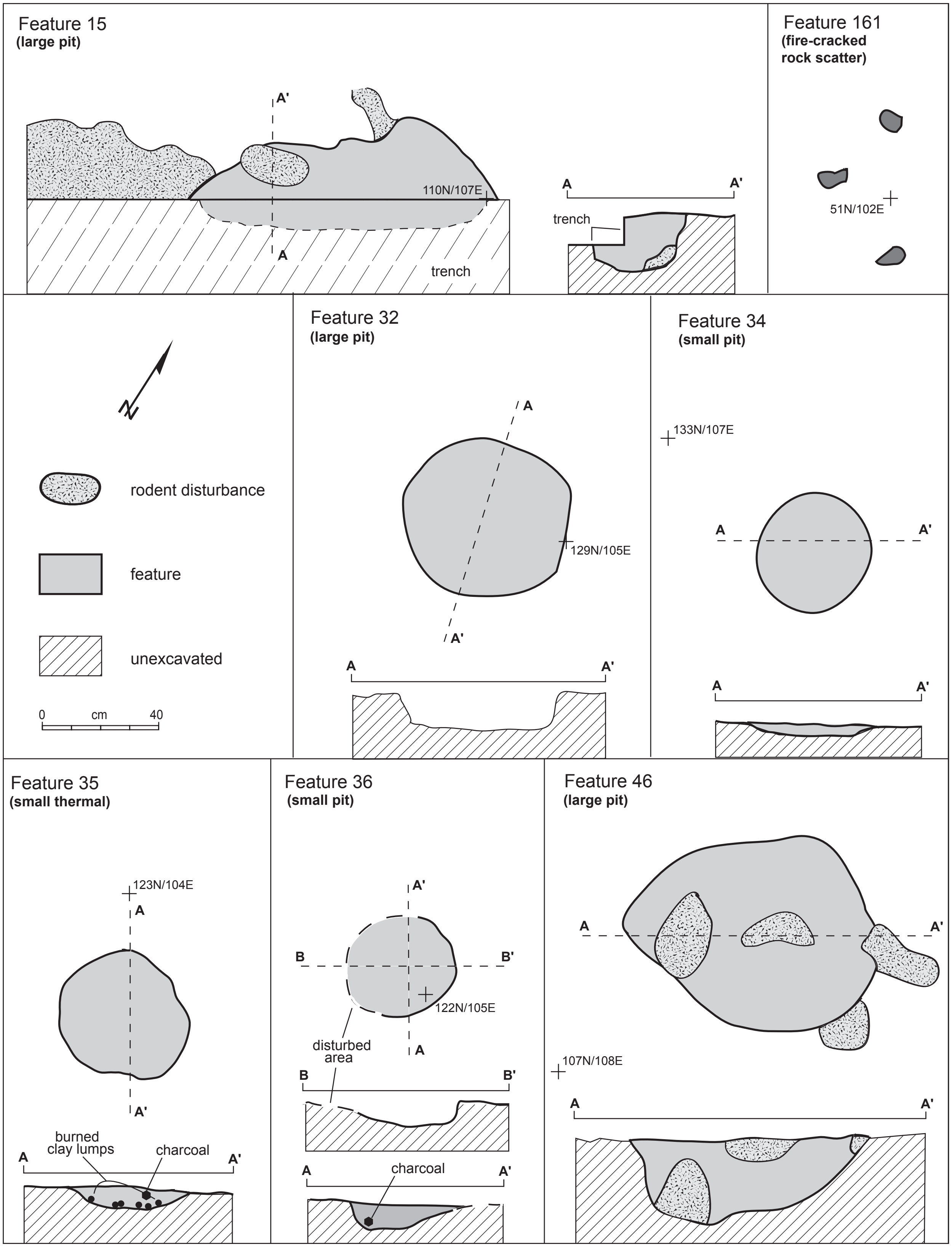

Figure 89. Townsend East Area B features (except postholes).

Table 65. Ceramic types recovered from Townsend East, Area B features.

Ceramic Type	Feature 15	Feature 35	Feature 46
El Paso Brown	1 100.0%	4 57.1%	3 50.0%
Unpainted with Chupadero paste	- -	1 14.3%	2 33.3%
Jornada Brown	- -	2 28.6%	1 16.7%
Totals	1 100.0%	7 100.0%	6 100.0%

Table 66. Lithic artifact types recovered from Townsend East, Area B features.

Feature	Angular Debris	Core Flake	Biface Flake	Late-Stage Biface	Total
14	- -	1 100.0%	- -	- -	1 100.0%
15	- -	4 80.0%	1 20.0%	- -	5 100.0%
32	- -	16 100.0%	- -	- -	16 100.0%
34	2 9.1%	20 90.9%	- -	- -	22 100.0%
35	- -	11 73.3%	3 20.0%	1 6.7%	15 100.0%
46	2 11.1%	16 88.9%	- -	- -	18 100.0%

Table 67. Fauna recovered from Townsend East, Area B features.

Taxon	F. 15	F. 34	F. 35	F. 46
Small mammal	1 50.0%	1 100.0%	15 83.8%	1 16.7%
Small-medium mammal	- -	- -	1 5.6%	- -
Medium-large mammal	- -	- -	1 5.6%	- -
Cottontail	- -	- -	- -	1 16.7%
Jackrabbit	- -	- -	1 5.6%	3 50.0%
Mussel	1 50.0%	- -	- -	1 16.7%
Total	2 100.0%	1 100.0%	18 100.0%	6 100.0%

Figure 90. Townsend East Area B, Feature 32 after excavation (arrow is 30 cm).

Table 68. Summary of environmental alteration, burning, and completeness for fauna from Townsend East, Area B features.

Feature	# From Flotation	Environmentally Altered	Unburned	Burned	>75% Complete	<25% Complete
15	1 50.0%	- -	2 100.0%	- -	- -	2 100.0%
34	1 100.0%	- -	- -	1 100.0%	- -	1 100.0%
35	9 50.0%	10 55.6%	1 5.6%	17 94.4%	- -	18 100.0%
46	- -	4 66.7%	4 66.7%	2 33.3%	- -	4 66.7%

found in more than one sample. Other burned taxa include purslane, seepweed, dropseed, nightshade, lemonadeberry, mesquite, and unidentifiable plant. One of the more interesting finds is the 15 mesquite pod fragments found in Feature 35, a small thermal pit.

Area C Data Recovery Results

Area C lies at the far southern end of the site on a low east-west-trending ridge. Additional cultural material, including fire-cracked rock and lithic artifacts, are found to the east on this same ridge but interrupted by a small saddle that has accumulated a good deal of soil and could be obscuring additional material. The project area is heavily disturbed by a telephone pole, two cable lines, the two-track road, and an excavation or eroded road to the far south (Fig. 91). A grid was imposed on the project area, then it was collected by 1 m unit. Artifacts were fairly sparse, and fire-cracked rock was scattered with no distinct concentrations. Fill was removed from 22 hand-excavated grids, each two to three levels deep. No features were encountered in them, and few had more than a scattering of artifacts.

Hand-Excavated Units

Hand-excavated units were placed to investigate two fire-cracked rock and artifact concentrations and provide stratigraphic information on this portion of the site (Table 69). No features were identified through hand excavations.

Surface Scrape

Much of Area C was mechanically scraped, avoiding the buried cables. Eolian fill was relatively shallow, so scrapes rarely exceeded 30 cm and generally ranged between 20 and 30 cm deep. Scraping located all of the features found in this area.

Stratigraphy

Fill in the northernmost profile trench at 496N (Fig. 92) is similar to that farther north. An upper layer of reddish-yellow eolian silt ranged from 3 to 10 cm thick. This overlies a slightly thicker layer of light brown sandy loam containing sparse cultural material and small amounts of pea-sized gravel. Sterile is an extremely consolidated layer of pinkish sandy loam with profuse carbonate flecking.

A few meters south, along the east edge at 489-490N 504E, fill is the same. Fairly uniform layers of fine silt eolian duff overlie a consolidated silty loam, then the sterile carbonate-laden fill. Similar fill was found at the east end of the east-west trench at 476N. At the west end there was no obvious duff layer, and compact eolian silt comprises the only fill above sterile. The center was not investigated because the two-track road had compressed and consolidated the fill.

Features

Four features were defined in Area C (Table 70). Feature 38, a small stain, was considerably north of the other features. Features 39 and 40 are large pits filled with fire-cracked rock (Fig. 93). Feature 39 produced an AMS date (Beta 133471) of 650 ± 40 B.C. (conventional) and 820-770 B.C. (calibrated) on conifer-wood charcoal. Feature 40 had the only piece of ground stone from the south area (an indeterminate fragment) and the only lithic artifact from a feature (a core flake). The only fauna from an Area C feature was found in the flotation sample from Feature 38: two pieces of small-mammal

Table 69. Hand-excavated units in Area C of Townsend East (north to south).

Location	No. of Levels	Top and Bottom Elevation (mbd)	Comments
497-498N 503E & 498N 503E	2	13.61-13.44	adjacent to artifact and fire-cracked rock scatter
496 N 495-504E	2-3	W 13.66-13.34; E 13.70-13.46	east-west profile trench
489-490N 505E	1-2	13.68-13.48	adjacent to lithic and fire-cracked rock scatter
476N 504-506E	3	13.80-13.51	east west profile trench
476N 496-498E & 475N 496E	3	W 13.92-13.54; E 13.92-13.63	fire-cracked rock scatter; east-west profile trench

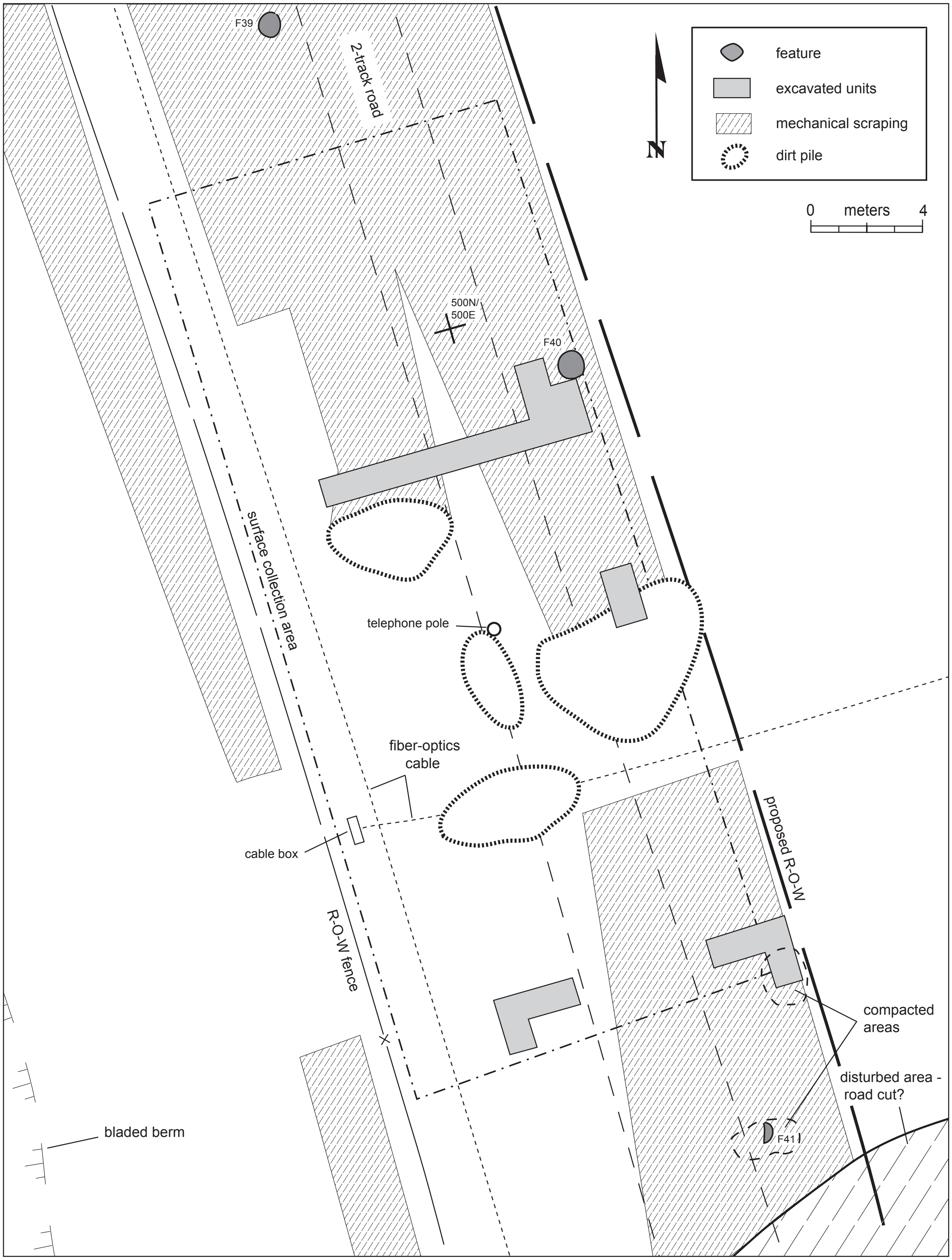

Figure 91. Plan of Townsend East Area C.

bone, and one piece of medium-to-large-rodent bone. All are burned, either heavily (n=1) or calcined (n=2), probably contributing to their preservation.

Feature 41 was a large pit filled with charcoal-stained silt but no rock. Much of this feature was removed during the scrape, leaving only a 62 by 22 cm pit up to 5 cm deep. After the feature was excavated, heavy rain caused a stain surrounding the pit to become visible (Fig. 93). The stain, which was actually a compaction surface that retained moisture differently than the surrounding soil, measured at least 2.5 m east-west and 1.5 m north-south. It probably represents an activity surface associated with the use of this pit. A similar compaction area was noted just south of 476N at the east margin of the right-of-way. None of the Area C feature flotation samples contained cultural plant material.

Table 70. Townsend East, Area C feature summary.

No.	Location	Feature Type and Shape	Dimensions (cm)	Top and Bottom Elevation (mbd)	Fill	Comments
38	532N 497E	stain	15 x 15 x 1	12.63-12.64	charcoal-stained silty loam	after scrape
39	511N 497E	large fire pit circular	95 x 80 x 15+	13.05-12.90	eolian with abundant fire-cracked rock	after scrape
40	497N 504E	large fire pit circular	107+ x 97 x 12	13.53-13.41	dark gray charcoal-laden silt with abundant fire-cracked rock	after scrape
41	469N 504E	large fire pit circular	62 x 22+ x 5	13.53-13.49	charcoal stained silt	after scrape; burned edge and bottom; west half destroyed by scrape; surrounding stain/use surface

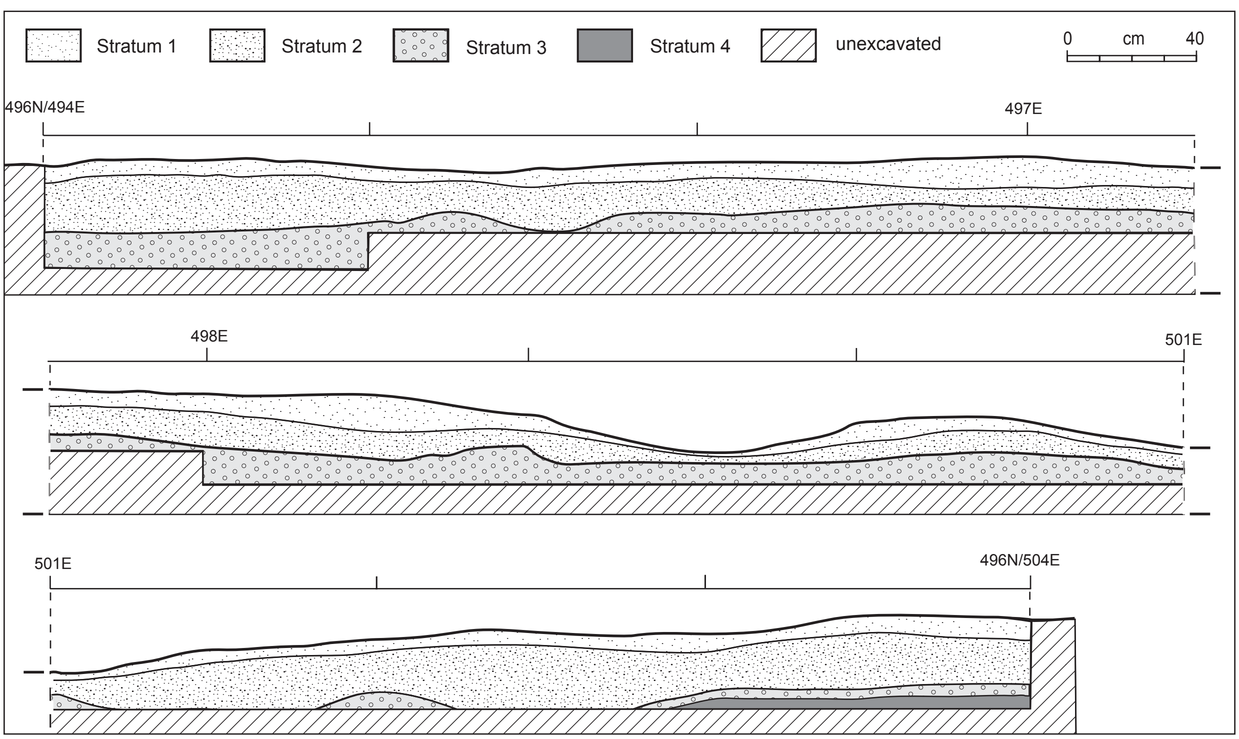

Figure 92. Stratigraphic profile of Townsend East Area C at 496N.

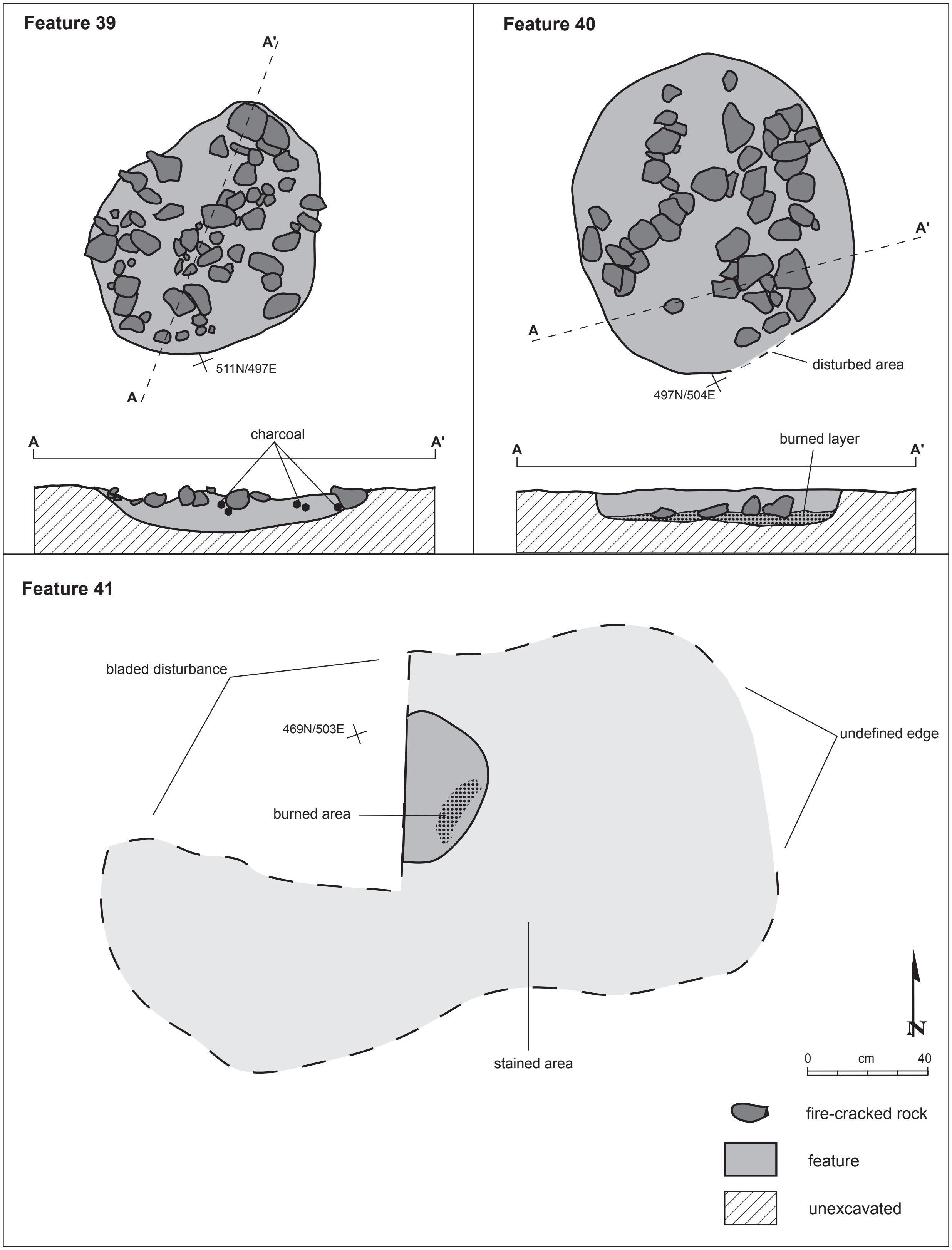

Figure 93. Townsend East Area C features.

Material Culture

A single El Paso Plain body sherd was found on the surface of Area C. No ceramics were found subsurface, supporting the early AMS date, which places this portion of the site in the Late Archaic. Chipped stone (Table 71) was relatively sparse, but the assemblage contains material types not found elsewhere on the site. Materials were mainly high quality, glassy (0.9 percent), glassy and flawed (0.9 percent), fine-grained (81.8 percent), fine-grained and flawed (8.2 percent), and medium-grained (8.2 percent). The lithic assemblage contains good evidence of early stage core reduction, reduction of cores reduced in situ and transported elsewhere, and use of exotic materials; and limited evidence of formal tool recycling and informal tool use, refurbishing projectile shafts, and inferred use of large bifaces as cores (Moore, this volume). Only four pieces of bone were found: two small mammal, one medium to large rodent, and one artiodactyl, in addition to one piece of freshwater mussel shell. Three of the bones are burned, and three were recovered from flotation samples. All are small fragments, representing less than a quarter of the element.

Summary of Material Culture

Much of the artifact data is presented in the applicable provenience sections, and the analysis reports address major issues concerning spatial and chronological distributions. This section briefly summarizes these findings and provides intrasite comparisons.

Ceramics

When broken down by structure fill and extramural areas (Table 72), clear differences are found in the predominant wares found in the extramural areas and some structures. Area A and Structures 3 and 5 have more of the expediently made earlier wares, while Area B and Structure 1 have larger amounts of the Jornada Brown wares and black-on-white pottery. The presence of small amounts of red ware, corrugated, and black-on-whites confirm some use of Area A during the late Ceramic period. Some structures had such small sample sizes that ceramics provide little aid in determining when these structures were used.

Lithic Artifacts

When lithic artifact types are presented in the same manner (Table 73), the areas show no substantial differences in Areas A and B. Overall, the variety of artifact types and the number of nonflake tools are highly correlated with the sample size (Pearson's Correlation sample size and artifact type=0.937; sample size and number of nonflake tools=0.953) when Areas A, B, and C and structures are the units of analysis.

Virtually the same array of tasks was performed in Areas and B and around the structures with any sample size (Moore, this volume). General chipped stone reduction is represented in both extramural areas and around Structure 2, while large-biface manufacture took place in all but the small structure samples (Structures 6 and 7) and at Area C. Evidence of small-biface manufacture is slightly more limited, and none is indicated for Area B extramural and Structure 5. Evidence of general hunting or refurbishing projectile shafts is found in all areas, while carcass processing is indicated for areas in and around Structures 1, 2, 3, and 5. Area A also has evidence of chopping hard materials, general cutting, and perforating relatively hard materials, while Area B has evidence of perforating relatively hard material and working hard material. Area C has only tool making and refurbishing activities.

Ground Stone

Relatively few pieces of ground stone were recovered, and almost all are generalized grinding tools. No complete metates were recovered from Townsend East, but fragments were found in Structures 2 and 7 and grinding slabs in the vicinity of Structure 7. Manos and mano fragments are more numerous. They were found in all three extramural areas and in Structures 1 and 2. None of the complete manos came from structures, but they do occur in the vicinity of Structures 2 and 3, suggesting that at least some food processing took place outdoors in areas surrounding the structures.

Minerals and Ornaments

All of the minerals and all but one ornament and pieces of worked shell came from Area A. While some of this is due to more excavation in that area, the amount of trashy charcoal-stained soil also suggests a more intense and lengthy occupation of Area A. Ground and unfinished shell objects indicating manufacture of ornaments are found in the area around Structure 2 and the fill of Structures 3 and 7. Lost beads were recovered from the fill of Structure 4, the fill above Structure 3, and the extramural area southeast of Structure 2.

Table 71. Summary of lithic artifacts from Townsend East, Area C.

Material	Angular Debris		Core Flake		Biface Flake		Tested Cobble		Core		Late-Stage Uniface		Biface		Early-Stage Biface		Table Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Unknown	1	4.5%	1	0.5%	-	-	-	-	-	-	-	-	-	-	-	-	2	0.9%
Chert	14	63.6%	142	78.0%	4	100.0%	2	66.7%	3	60.0%	-	-	2	100.0%	1	100.0%	168	76.3%
Alibates chert	-	-	2	1.1%	-	-	-	-	-	-	-	-	-	-	-	-	2	0.9%
Tecovas chert	-	-	1	0.5%	-	-	-	-	-	-	-	-	-	-	-	-	1	0.5%
San Andreas chert	1	4.5%	6	3.3%	-	-	-	-	1	20.0%	-	-	-	-	-	-	8	3.6%
Obsidian	-	-	1	0.5%	-	-	-	-	-	-	-	-	-	-	-	-	1	0.5%
Polvadera Peak obsidian	-	-	3	1.6%	-	-	-	-	-	-	-	-	-	-	-	-	3	1.4%
Siltite	1	4.5%	3	1.6%	-	-	-	-	-	-	-	-	-	-	-	-	4	1.8%
Rhyolite	1	4.5%	3	1.6%	-	-	-	-	-	-	-	-	-	-	-	-	4	1.8%
Sedimentary	-	-	1	0.5%	-	-	-	-	-	-	-	-	-	-	-	-	1	0.5%
Limestone	1	4.5%	2	1.1%	-	-	-	-	-	-	-	-	-	-	-	-	3	1.4%
Siltstone	-	-	3	1.6%	-	-	-	-	-	-	1	100.0%	-	-	-	-	4	1.8%
Quartzite	3	13.6%	11	6.0%	-	-	1	33.3%	-	-	-	-	-	-	-	-	15	6.8%
Quartzitic sandstone	-	-	3	1.6%	-	-	-	-	1	20.0%	-	-	-	-	-	-	4	1.8%
Row total	22	10.0%	182	82.7%	4	1.8%	3	1.4%	5	2.3%	1	.5%	2	.9%	1	.5%	220	100.0%

Table 72. Summary of ceramic groups by extramural area or structure for Townsend East.

Ceramic Group	Area A						Area B			Area C
	Extramural (200N)	Structure 2	Structure 3	Structure 5	Structure 6	Structure 7	Extramural	Structure 1	Structure 4	
El Paso Brown wares	798 70.2%	17 50.0%	26 66.7%	27 90.0%	1 100.0%	1 25.0%	198 21.7%	60 31.7%	3 50.0%	1 100.0%
Jornada Brown wares	302 26.6%	17 50.0%	11 28.2%	3 10.0%	- -	3 75.0%	484 53.0%	104 55.0%	2 33.3%	- -
Plains Brown wares	2 0.2%	- -	- -	- -	- -	- -	2 0.2%	- -	- -	- -
Three Rivers Redwares	22 1.9%	- -	2 5.1%	- -	- -	- -	41 4.5%	6 3.2%	- -	- -
Chupadero Black-on-white	11 1.0%	- -	- -	- -	- -	- -	185 20.3%	19 10.1%	1 16.7%	- -
Corona Corrugated	1 0.1%	- -	- -	- -	- -	- -	1 0.1%	- -	- -	- -
Mimbres White Ware	- -	- -	- -	- -	- -	- -	2 0.2%	- -	- -	- -
Column total	1136 100.0%	34 100.0%	39 100.0%	30 100.0%	1 100.0%	4 100.0%	913 100.0%	189 100.0%	6 100.0%	1 100.0%

Table 73. Summary of lithic artifact types by extramural area or structure for Townsend East.

Lithic Type	Area A						Area B			Area C
	Extra-mural (214N)	Structure 2	Structure 3	Structure 5	Structure 6	Structure 7	Extra-mural	Structure 1	Structure 4	
Angular debris	93 13.6%	68 10.9%	44 11.8%	19 6.9%	1 4.8%	11 5.8%	18 6.1%	43 10.3%	16 10.7%	19 9.1%
Core flake	527 77.3%	512 82.3%	307 82.1%	238 86.5%	18 85.7%	153 80.5%	244 82.4%	322 76.8%	122 81.3%	178 85.6%
Biface flake	40 5.9%	23 3.7%	8 2.1%	12 4.4%	2 9.5%	26 13.7%	30 10.1%	41 9.8%	10 6.7%	4 1.9%
Notching flake	2 0.3%	1 0.2%	2 0.5%	- -	- -	- -	- -	- -	- -	- -
Bipolar flake	1 0.1%	1 0.2%	3 0.8%	- -	- -	- -	- -	- -	- -	- -
Pot lid	1 0.1%	1 0.2%	- -	1 0.4%	- -	- -	- -	- -	- -	- -
Tested cobble	2 0.3%	- -	1 0.3%	- -	- -	- -	- -	- -	- -	- -
Unidirectional core	- -	- -	1 0.3%	- -	- -	- -	- -	- -	- -	- -
Bidirectional core	- -	2 0.3%	- -	- -	- -	- -	- -	- -	- -	- -
Multidirectional core	5 0.7%	9 1.4%	4 1.1%	2 0.7%	- -	- -	- -	1 0.2%	- -	4 1.9%
Bidirectional cobble tool	- -	1 0.2%	- -	- -	- -	- -	- -	1 0.2%	- -	- -
Uniface	1 0.1%	- -	- -	- -	- -	- -	- -	- -	- -	- -
Early-stage uniface	1 0.1%	- -	- -	- -	- -	- -	- -	1 0.2%	- -	- -
Late-stage uniface	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 0.5%
Biface	3 0.4%	- -	3 0.8%	2 0.7%	- -	- -	- -	- -	1 0.7%	1 0.5%
Early-stage biface	3 0.4%	- -	- -	- -	- -	- -	- -	- -	- -	1 0.5%
Middle-stage biface	3 0.4%	2 0.3%	- -	- -	- -	- -	- -	3 0.7%	- -	- -
Late-stage biface	2 0.3%	1 0.2%	1 0.3%	1 0.4%	- -	- -	3 1.0%	5 1.2%	- -	- -
Edge bite	1 0.1%	- -	- -	- -	- -	- -	- -	2 0.5%	1 0.7%	- -
Reworked early-stage biface	- -	- -	- -	- -	- -	- -	1 0.3%	- -	- -	- -
Unworked cobble	- -	1 0.2%	- -	- -	- -	- -	- -	- -	- -	- -
Column total	682 100.0%	622 100.0%	374 100.0%	275 100.0%	21 100.0%	190 100.0%	296 100.0%	419 100.0%	150 100.0%	208 100.0%

Fauna

The most obvious difference in the faunal assemblages from Areas A and B (Table 74) is the higher proportions of large forms (unidentified large and artiodactyls) and freshwater mussel in Area B. Preservation is largely responsible for the abundance of mussel in the Area B extramural assemblage (64.5 percent). Thin layers of cultural soil and a lack of substantial features and activity areas limits much of the Area B extramural assemblage to the surface collection and a thin layer of cultural fill. Of the extramural mussel (n=69 pieces), nine pieces (13.4 percent) were found on the surface, 44 (65.7 percent) in the first 10 cm of fill, and the rest in Levels 2 and 3. When the mussel is not included in the counts, the proportions are much closer to the Area A extramural assemblage but with slightly more large forms (11.3 and 15.7 percent).

Structure 4 has the most unusual assemblage, with a much larger proportion of large forms and more artiodactyl species than any other structure or area. It also has no mussel. As one of the latest structures, this could reflect a very different pattern of animal use. The elk, bison, and most (68.9 percent) of the large-mammal bones are from the lower fill: that is, the same levels from which the radiocarbon sample came. It differs significantly from that of Structure 1, which has more rodent and rabbit remains.

In general, the diversity of taxa correlates with sample size, producing a Pearson's Correlation of 0.844 when the sample size is compared to the number of taxa found in the Table 74 units. A scatter plot of the data shows Area A and Structure 5 have both large sample sizes and high diversity, and Structures 1 and 4 have moderate sample sizes but high diversity.

Botanical Remains

Table 75 summarizes the information on cultural plant remains recovered from flotation samples as macrobotanic samples and fuel woods collected for radiocarbon samples (a fair number contained no burned or unburned plant remains). Certainly the most ubiquitous taxa are the weedy annual species, including goosefoot, pigweed, and purslane. None of the perennials occur with any consistency. Corn remains are more common in Area B (8 of 27 samples, or 29.6 percent) than Area A (5 of 47 samples, or 10.6 percent).

Virtually all of the plants utilized at Townsend were those available during the summer. While some of these could have been transported, as the walnut almost certainly was, and used in other seasons, it seems more likely that groups with a mobile lifestyle, such as those probably represented at this site, relied more on available plants than stored resources. The small amount of corn and lack of grinding tools are poor evidence of corn growing at this locale, although it is possible that some was planted in small side drainages and left untended.

Summary and Interpretation

Townsend East consists of three spatially distinct occupations. Area A, which is closest to Salt Creek, has most of the features and structures. While there is evidence of later use in the form of superpositioning of features and scant later ceramics, and of earlier projectile point types, the bulk of the material represents the early Ceramic occupation. Radiocarbon dates suggest sporadic use between A.D. 570 and 940 or earlier. A general lack of storage features along with numerous thermal features suggest limited and repeated occupations, probably during the summer months. None of the five structures in Area A have evidence of substantial or prolonged use. Only two had hearths, and both were fairly informal.

Area A ceramics are predominantly brown wares with temper types common to the southern Mogollon region. Large tempered vessels, such as those that dominate this assemblage, are typical of those used by relatively mobile groups, whose ceramic vessels reflect their ease of manufacture and portability (Wilson, this volume). The only specialized form, a cloud blower, is from an extramural grid just southeast of Structure 5. Otherwise, where a form could be identified, most of the sherds are jars, with only two (0.2 percent) bowl sherds found.

Lithic artifacts indicate that a wide range of activities took place in and around the structures. All stages of reduction, manufacture of hunting tools, refurbishing of hunting tools, and working a variety of hard substances are indicated. Other biface fragments are those most likely brought to the site in carcasses, a good indication of hunting larger animals and returning at least parts to this site for processing. The few pieces of ground stone were used for generalized grinding activities.

While the biface assemblage indicates at least a moderate amount of hunting larger forms, the faunal assemblage from Area A is largely smaller forms that are generally procured without the aid of formal tools. This emphasis on small forms suggests most were taken in the immediate area, probably while collecting and processing the weedy annual and perennial plants growing in and along the creek. The near absence of bones from bison certainly suggests they were not at this location to procure bison.

The only definite association of corn with an early structure is found in Structure 3, which had by far the

Table 74. Summary of fauna by extramural area or structure for Townsend East.

Fauna	Area A						Area B			Area C
	Extra-mural (200N)	Structure 2	Structure 3	Structure 5	Structure 6	Structure 7	Extra-mural	Structure 1	Structure 4	
Small unknowns	278 54.6%	69 62.7%	18 45.0%	348 58.5%	1 50.0%	40 72.7%	21 19.6%	37 32.2%	48 34.0%	2 40.0%
Medium unknowns	20 3.9%	2 1.8%	2 5.0%	10 1.7%	- -	- -	1 0.9%	2 1.7%	1 0.7%	- -
Large unknowns	45 8.8%	5 4.5%	8 20.0%	26 4.4%	- -	9 16.4%	5 4.6%	13 11.3%	52 36.9%	- -
Rodents	27 5.3%	18 16.4%	1 2.5%	40 6.7%	- -	1 1.8%	- -	24 20.9%	11 7.8%	1 20.0%
Cottontail rabbit	19 3.7%	4 3.6%	2 5.0%	104 17.5%	- -	- -	4 3.7%	14 12.2%	14 9.9%	- -
Jackrabbit	10 2.0%	5 4.5%	1 2.5%	31 5.2%	- -	- -	4 3.7%	7 6.1%	6 4.3%	- -
Carnivore	- -	- -	- -	- -	- -	- -	- -	2 1.7%	- -	- -
Artiodactyl	13 2.5%	- -	- -	5 0.8%	- -	- -	1 0.9%	4 3.5%	- -	1 20.0%
Elk	- -	- -	- -	- -	- -	- -	- -	- -	1 0.7%	- -
Deer	1 0.2%	- -	- -	- -	- -	- -	- -	- -	1 0.7%	- -
Bison	- -	- -	- -	- -	- -	- -	- -	- -	2 1.4%	- -
Cow or bison	2 0.4%	- -	- -	- -	- -	- -	- -	- -	- -	- -
Bird	- -	- -	- -	3 0.5%	- -	- -	- -	- -	- -	- -
Egg shell	9 1.8%	- -	- -	1 0.2%	- -	- -	2 1.9%	- -	- -	- -
Turtle	1 0.2%	- -	- -	11 1.8%	- -	1 1.8%	- -	- -	- -	- -
Snake and lizard	- -	- -	- -	2 0.3%	- -	1 1.8%	- -	- -	5 3.5%	- -
Fish	- -	- -	- -	8 1.3%	- -	- -	- -	1 0.9%	- -	- -
Mussel	84 16.5%	7 6.4%	8 20.0%	6 1.0%	1 50.0%	3 5.5%	69 64.5%	11 9.6%	- -	1 20.0%
Total	509 100.0%	110 100.0%	40 100.0%	595 100.0%	2 100.0%	55 100.0%	107 100.0%	115 100.0%	141 100.0%	5 100.0%

Table 75. Summary of cultural plants (number and percent of flotation samples with plant remains), number of samples with burned macrobotanical samples, and fuel wood (percent of fuel weight) by extramural area or structure.

Taxon	Area A						Area B			Area C
	Extra-mural Features	Structure 2	Structure 3	Structure 5	Structure 6	Structure 7	Extra-mural Features	Structure 1	Structure 4	
					Cultural Plants					
No. of samples	24	8	7	3	2	3	8	16	3	1
Annuals										
Cheno-am	1 (4.2%)		2 (28.6%)	1 (33.3%)	1 (50.0%)			1 (6.2%)		
Flameflower			1 (14.3%)							
Goosefoot	11 (45.8%)	1 (12.5%)	5 (71.4%)	1 (33.3%)		3 (100.0%)	3 (37.5%)	13 (81.2%)	2 (66.7%)	
Purslane	4 (16.7%)		4 (57.1%)				1 (12.5%)	3 (18.7%)		
Seepweed	4 (16.7%)		1 (14.3%)				1 (12.5%)	1 (6.2%)		
Sunflower	1 (4.2%)									
Grasses				2 (66.7%)			1 (12.5%)			
Nightshade family							1 (12.5%)			
Winged pigweed	1 (4.2%)		1 (14.3%)					3 (18.7%)		
Perennials										
Juniper			1 (14.3%)							
Mesquite	1 (4.2%)			1 (33.3%)			1 (12.5%)	1 (6.2%)		
Lemonadeberry							1 (12.5%)			
Prickly pear	1 (4.2%)	1 (12.5%)								
Hedgehog cactus			1 (14.3%)							
Bulrush	1 (4.2%)									
Cultivars										
Corn	3 (12.5%)		2 (28.6%)					7 (43.7%)	1 (33.3%)	
					Macrobotanical					
Juniper			1	1						
Mesquite							1	6		
Walnut			1							
Corn								2		
					Radiocarbon Samples of Fuelwood					
Number of samples	4	6	8	8	2	2	0	8	5	1
Juniper	<1%	3%	<1%	5%				1%	2%	
Piñon			<1%							33%
cf. alder			<1%	2%	<1%	<1%		1%	<1%	
Undetermined conifer										66%
Saltbush/grease-wood	70%	41%	36%	65%	79%	73%		58%	58%	
cf. sagebrush		<1%								
cf. cholla			2%						2%	
Mormon tea			<1%	<1%					<1%	
cf. creosotebush			<1%	1%				<1%		
cf. rabbitbrush	<1%		2%	<1%					1%	
Mesquite	10%	52%	35%	17%	14%	27%		32%	15%	
cf. oak			<1%							
cf. rose family			<1%						<1%	

most diverse plant and fuelwood assemblage. Other corn from Area A is from undated extramural features that may or may not date to the early Ceramic occupation. A heavy reliance on weedy annuals and the use of any and every source of fuelwood available, including driftwood moving down Salt Creek, are clear.

Area B, set back from the creek, had two structures and few features. Radiocarbon dates and ceramic types, indicate that the late Ceramic occupation falls between A.D. 1000 and 1100, and probably longer, given the human burial placed in the upper fill of one of the structures. While these two structures are the deepest found at Townsend East, neither had hearths or other evidence of prolonged occupation, although multiple floors in both could suggest repeated occupation of these structures, as does the placement of a human burial in the upper fill of Structure 4.

Ceramics from Area B include Chupadero and Mimbres white wares, Mimbres or Corona Corrugated, and Three Rivers Red Ware, all of which are consistent with a later date for this portion of the site. While many of the brown wares continue to have temper types from the Southern Jornada Mogollon region, tempers thought to originate in the Sierra Blanca Mountains are three times more abundant than in Area A. There is also a change in the predominant type of brown ware, which was El Paso Brown Ware in Area A but is Jornada Brown Ware in Area B. More variety in ceramic types (in a sample that is a third smaller), the use of finer temper types, and indications that more effort was put into manufacturing the brown wares suggest a more durable form of technology (Wilson, this volume) and a different kind of mobility.

Lithic artifacts indicate a similar array of activities for the later occupation of this site. The fill of Structure 4 has a distinctive faunal assemblage, one with large amounts of artiodactyl and large-mammal bone and lacking freshwater mussels. Structure 1 has more evidence of corn (cupule, kernel, and glume parts) than the rest of the site combined. It also has abundant evidence of the use of weedy annuals, goosefoot, pigweed, purslane, and mesquite. Fewer fuelwoods are found than in Area A, but the samples are much more limited. Saltbush/greasewood and mesquite remain the dominant fuelwoods.

Area C, the Late Archaic component, is a considerable distance from the creek, probably by design. Large fire pits and an occupation surface indicate probable use as a short-term camp. None of the thermal features produced economic plant material, only finely powdered charcoal. A more substantial occupation, possibly related to Area C, lies to the east. A much more limited array of activities is represented in the lithic assemblage, which is geared mainly toward core reduction.

Evaluation and Data Potential

While our excavations have exhausted the research potential within the project area, considerable portions of the site remain and could contain additional structures and features. These are outside of the utility and road maintenance area and should have less disturbance. Given the evidence of a long and varied use of this particular area and the presence of early Ceramic period structures, we conclude that this site has the potential to add to our knowledge of the prehistory of the area.

CHAPTER 13

CERAMICS

BY C. DEAN WILSON

During investigations at Salt Creek, 2,356 sherds were recovered, including two from LA 117250 and 2,354 from Townsend East (LA 34150) (Table 76). Analysis of this pottery involved recording a range of data categories that are used to determine the possible time of occupation for the various components and examine ceramic trends such as patterns of vessel production, exchange, and use. In order to compare trends noted during the present study to those previously documented, I employed strategies and categories similar to those used in other studies of pottery from the general area (Hill 1996a; Jelinek 1967; Kelley 1984; Mera 1943; Runyon and Hedrick 1987; Wilson 1999a, 1999b; Wiseman 1991b).

The recording of ceramic attributes and type categories forms the basis for examining various patterns and trends. Ceramic attributes recorded during this study include temper type, pigment, surface manipulation, slip, vessel form, and refired color.

Descriptive Attributes

Temper Categories

Temper types were identified by examining freshly broken sherd surfaces through a binocular microscope. More detailed characterizations of temper from sherds assigned to various temper categories are provided for ceramics submitted for petrographic analysis (Hill, this volume).

The great majority of the sherds examined during the present study are tempered with forms of crushed igneous rock (Table 77) utilized by potters in the Jornada Mogollon region. The most common temper categories noted during the present study are similar to those found at sites in other areas of Jornada Mogollon country, including the Middle Pecos Valley, Southern Rio Grande Valley, and Sierra Blanca Highlands (Hill 1996a; 1996b; Jelinek 1967; Kelley 1984; Mera 1943; Runyon and Hedrick 1987; Wiseman 1991b).

The most common tempering group identified during the present study is a leucocratic igneous rock consisting of both light feldspar and quartz fragments that may represent the use of crushed granites or monzonites. This group is dominated by milky white to gray grains, probably representing feldspar, along with some quartz. Dark fragments of hornblende may be present in extremely low amounts. Fragment size is relatively small compared to other tempering material found in Jornada region pottery. Such fragments are commonly visible on the sherd surface. This temper is most common in pottery from the El Paso region, where crushed granite from the Franklin Mountains was used.

Another temper group common in Jornada Brown Ware pottery, distinguished by numerous very small and profuse clear to dark fragments, is referred to as fine crystalline igneous rock. Larger grains are sometimes present and are usually roundish and crystalline or sugary in structure. This group may represent the use of Capitan aplites (Wiseman 1991b).

Another temper group represented in plain brown ware sherds is characterized by the dominance of dark feldspar fragments, presumably from syenites originating somewhere in the Sierra Blanca Mountains. Feldspar fragments tend to be similar in appearance, angular, and sparsely scattered. These fragments are large compared to other temper fragments and are often readily visible without the aid of a binocular microscope. These feldspar fragments tend to be opaque and gray to off-white. Smaller grains of other mineral are rare if present.

Varieties of igneous rock occurring in plain brown ware pottery are often difficult to distinguish. Differences in characteristics of these temper categories are often gradational and depend on slight variations in size, color, and composition. Despite overlap between these categories, the distributions noted may still be statistically important, and various trends associated with distributions of these temper categories may prove to be useful.

Temper occurring in most of the Chupadero Black-on-white sherds was fairly similar, consisting of combinations of dark sherd and rock particles. Both sherd and rock particles tend to be small and dark and can be difficult to distinguish, particularly in vitrified pastes. The sherd fragments are recognized by their dull appearances and range in color from dark gray to brown. Rock

Table 76. Distribution of ceramic types from the Salt Creek project sites.

Ceramic Type	Townsend East		LA 117250	
	n	%	n	%
El Paso Brown wares	**1133**	**48.1**		
El Paso Brown body	1075	45.7		
El Paso Brown rim	9	0.4		
Jornada-like El Paso Brown	15	0.6		
Thin El Paso unpainted brown	33	1.4		
El Paso smudged surface	1	*		
Jornada Brown wares	**927**	**39.3**		
Jornada Brown rim	15	0.6		
Jornada Brown body	860	36.5		
Jornada incised	1	*		
Indeterminate Jornada corrugated	1	*		
Jornada smudged	1	*		
South Pecos Brown	49	2.1		
Plains Brown wares	**3**	**0.1**		
McKenzie Brown	2	0.1		
Plains brushed	1	*		
Three Rivers Red wares	**71**	**3.0**		
Plain slipped red	63	2.7		
Three Rivers Red-on- terracotta	8	0.3		
Chupadero Black-on-white	**216**	**9.2**	**2**	**100.0**
Unpainted with Chupadero Black-on-white paste	127	5.4	2	100.0
Chupadero Black-on-white (indeterminate design)	60	2.5		
Chupadero Black-on-white (solid design)	13	0.6		
Chupadero Black-on-white (hatchured design)	14	0.6		
Chupadero Black-on-white (hatchured and solid design)	2	0.1		
Corona Corrugated	**2**	**0.1**		
Indeterminate Mimbres White Ware	**2**	**0.1**		
Total	2354	100.0	2	100.0

Table 77. Distribution of temper by ceramic group for Townsend East ceramics.

Temper	El Paso Brown		Jornada Brown		Plains Brown		Three Rivers Red		Chupadero Black-on-white		Corona Black-on-white		Mogollon Black-on-white		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Sand	-	-	-	-	3	100	-	-	-	-	-	-	-	-	3	0.1
Fine tuff and sand	-	-	-	-	-	-	-	-	-	-	-	-	2	100	2	0.1
Leucoratic igneous	1096	96.7	488	52.6	-	-	26	36.6	10	4.6	-	-	-	-	1620	68.8
Fine crytalline ignous	32	2.8	390	42.1	-	-	45	63.4	6	2.8	2	100	-	-	475	18.1
Dark igneous and sherd	-	-	-	-	-	-	-	-	183	84.7	-	-	-	-	183	7.7
Dark feldspar	5	0.4	49	5.3	-	-	-	-	-	-	-	-	-	-	54	2.3
Sherd and calcium carbonate	-	-	-	-	-	-	-	-	16	7.4	-	-	-	-	16	0.7
Calcium carbonate	-	-	-	-	-	-	-	-	1	0.5	-	-	-	-	1	0.1
Row total	1133	48.1	927	39.4	3	0.1	71	3.0	216	9.2	2	0.1	2	0.1	2354	100.0

particles are very fine and often contain white to light gray leucocratic rock particles, but they also contain dark gray to black biotite felsite particles. Fragments associated with this temper are often very fine and difficult to distinguish.

Calcium carbonate refers to temper dominated by fine ivory-colored calcium carbonate fragments. This temper is primarily associated with Chupadero Black-on-white. Similar temper is sometimes associated with sherd fragments and assigned to a sherd and calcium carbonate category.

Sand refers to the presence of rounded or subrounded, white to translucent, well-sorted medium to coarse quartz grains. Small angular fragments sometimes occur with these grains and indicate the use of sands weathered from sandstone outcrops.

Another temper category employed during the present study is crushed tuff and igneous and sand particles, consisting of fine shiny white to gray quartz and tuff particles and reflecting the use of weathered volcanic-clastic rocks. These inclusions are similar to those noted in self-tempered clays used in the production of Mogollon Brown Ware and Mimbres White Ware types in various areas of the Mogollon Highlands in southwest and south central New Mexico (Wilson 1999b).

Vessel Form

Sherd-based vessel form categories reflect the shape and portion of the vessel from which a sherd was derived. Sherds were placed into categories based on rim shape or the presence and location of polish and painted decorations. Distributions of vessel form categories are given in Table 78.

While it is often easy to identify the basic form (bowl versus jar) of body sherds from many southwestern regions by the presence and location of polish, such distinctions are not as easy for Jornada Brown Ware types. Jornada Brown Ware bowl and jar sherds can be polished or smoothed on either side. Thus, most of the plain brown ware body sherds were assigned to a series of descriptive categories representing combinations of surface treatments with unknown functional significance.

Sherds with surfaces for which the treatment could not be determined were placed into an indeterminate category. Rim sherds from vessels of unknown forms were placed into an indeterminate rim category. Body sherds not exhibiting polished treatments on either surface were classified as unpolished body. Body sherds with roughly equal amounts of polishing on both sides were assigned to a polished body category. Other body sherds were assigned to a category based on the presence of a distinct polish on one surface and include exterior polished body and interior polished body.

In most cases, the bowl body category was only assigned to decorated sherds with a relatively heavy polish, slip, or painted decoration on the interior surface. Bowl rim refers to sherds exhibiting inward rim curvature characteristic of bowls. Jar body was mainly limited to decorated sherds exhibiting higher-polished, slipped, or painted decoration on the exterior surface. Cooking/storage jar neck sherds were identified by the presence of distinct curves associated with the neck area. Cooking/storage jar rim sherds exhibit the distinct curves of a necked jar and relatively wide rim diameters. Olla rim refers to necked jar sherds with a relatively narrow rim diameter. Cloudblower refers to sherds from a conical pipe.

Surface Manipulation

Attributes relating to surface manipulations reflect the presence and type of surface texture, polish, and slip treatment. Surfaces that are too heavily worn to determine the original treatment were classified as surface missing. Surface manipulation categories were recorded for both interior (Table 79) and exterior (Table 80) vessel surfaces. Plain unpolished refers to surfaces where coil junctures have been completely smoothed, but surfaces were not polished. Some sherds were assigned to categories based on textured treatments noted on a particular surface.

Plain striated denotes a series of long shallow parallel grooves resulting from brushing with a fibrous tool on an unpolished surface. Indented corrugated refers to the presence of fine exterior coils with regular indentations on the exterior surface. Surfaces with wide unobliterated coils or fillets were classified as wide coils.

Polished surfaces are those which have been intentionally polished after smoothing. Polishing implies intentional smoothing with a polishing stone to produce a compact and lustrous surface. Surfaces exhibiting polished treatments were assigned to a plain polished category.

A few sherds also exhibit distinct slipped surfaces that have been polished over. Slips are intentional applications of distinct clay, pigment, or organic deposits over an entire vessel surface. Such applications are used to achieve black, white, or red surface colors not obtainable using the paste clays or firing methods normally employed. Surfaces over which high iron slip clay was applied to create a red ware were assigned to a polished red slipped category. Those with a low iron slip, as represented in some white wares, were classified as having

Table 78. Distribution of vessel by ceramic group for Townsend East.

Vessel Form	El Paso Brown		Jornada Brown		Plains Brown		Jornada Red		Chupadero Black-on-white		Corona Corrugated		Mogollon Black-on-white		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Indeterminate	5	0.4	-	-	-	-	-	-	1	0.5	-	-	-	-	6	2.5
Bowl rim	1	0.1	2	0.1	-	-	4	5.6	3	1.4	-	-	1	50	11	0.5
Bowl body	-	-	-	-	-	-	9	12.7	36	16.7	-	-	1	50	46	2.0
Olla rim	-	-	-	-	-	-	-	-	2	0.9	-	-	-	-	2	0.1
Jar neck	32	2.8	15	1.6	-	-	2	2.8	20	9.3	-	-	-	-	69	2.9
Cooking/storage jar rim	8	0.7	10	1.1	-	-	-	-	3	13.9	-	-	-	-	21	0.8
Jar body	2	0.2	1	0.1	-	-	-	-	129	13.5	1	50	-	-	133	5.6
Cloudblower	-	-	1	0.1	-	-	-	-	-	-	-	-	-	-	1	0.05
Polished body	61	5.4	773	83.4	1	33.3	47	66.2	9	4.2	-	-	-	-	891	37.9
Unpolished body	974	86.0	66	7.1	2	66.7	1	1.4	5	2.3	1	50	-	-	1049	44.6
Exterior polished body	45	4.0	50	5.5	-	-	5	7.0	6	2.8	-	-	-	-	106	4.5
Interior polished body	5	0.4	8	0.3	-	-	3	4.3	-	-	-	-	-	-	16	6.8
Indeterminate rim	-	-	1	0.1	-	-	-	-	1	0.5	-	-	-	-	2	0.1
Row total	1133	48.1	927	39.4	3	0.1	71	3.0	216	9.2	2	0.1	2	0.1	2354	100.0

Table 79. Distribution of interior manipulation for Townsend East ceramics.

Manipulation	El Paso Brown Wares		Jornada Brown Wares		Plains Brown Wares		Jornada Red Wares		Chupadero Black-on-white		Corona Corrugated		Mogollon Black-on-white		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Plain unpolished	1066	94.1	113	12.2	2	66.7	7	9.9	103	47.7	1	50	-	-	1292	54.9
Plain polished	62	5.5	811	87.5	1	33.3	27	38.0	46	21.3	-	-	-	-	947	40.2
Polished white slip	-	-	1	0.1	-	-	-	-	14	6.5	-	-	2	100	17	0.7
Polished red slip	-	-	1	0.1	-	-	36	50.7	2	0.9	-	-	-	-	39	16.6
Polished smudged	1	0.1	1	0.1	-	-	1	1.4	-	-	-	-	-	-	3	0.1
Plain striated	3	0.3	-	-	-	-	-	-	50	23.1	-	-	-	-	53	2.3
Surface missing	1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	1	*
Wide coils	-	-	-	-	-	-	-	-	1	0.5	-	-	-	-	1	*
Indented corrugated	-	-	-	-	-	-	-	-	-	-	1	50	-	-	1	*
Row total	1133	48.1	927	39.4	3	0.1	71	3	216	9.2	2	0.1	2	0.1	2354	100

Table 80. Distribution of exterior manipulation for Townsend East ceramics.

Manipulation	El Paso Brown Wares		Jornada Brown Wares		Plains Brown Wares		Jornada Red Wares		Chupadero Black-on-white		Corona Corrugated		Mogollon Black-on-white		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Plain unpolished	1024	90.4	80	8.6	1	33.3	3	4.2	39	18.1	-	-	-	-	1147	48.7
Plain polished	107	9.4	847	91.4	1	33.3	26	36.6	131	60.7	-	-	-	-	1112	47.2
Polished white slip	-	-	-	-	-	-	-	-	40	18.5	-	-	2	100	42	0.2
Polished red slip	-	-	-	-	-	-	42	59.2	-	-	-	-	-	-	42	0.2
Plain striated	-	-	-	-	1	33.3	-	-	5	2.3	-	-	-	-	6	0.3
Surface missing	2	0.2	-	-	-	-	-	-	1	0.5	2	100	-	-	5	0.2
Row total	1133	48.1	927	39.4	3	0.1	71	3	216	9.2	2	0.1	2	0.1	2354	100

polished white-slipped surfaces. Surfaces to which a black layer of soot that appears to have been applied during the later stages of firing were assigned to a polished black smudged category.

Wall Thickness

As the overall wall thickness of brown wares has been demonstrated to have changed through time in other regions of the Jornada Mogollon (Whalen 1994a), thickness of sherds was recorded. Wall thickness was recorded to the millimeter for all sherds. This measurement was taken on an area of the sherd that appeared to be most typical of the overall thickness.

Refired Color

Clips from selected sherds were fired under controlled oxidation conditions at a temperature of 950 degrees C to standardize ceramic pastes. This allows comparisons of pastes based on the influence of mineral impurities (particularly iron) on paste color, and may be used to identify pottery that could have derived from the same source clays (Shepard 1965). The color of each refired sample was recorded using a Munsell soil chart.

Ceramic Types

Ceramic types, as the term is used here, are best considered as convenient groupings that are useful in relaying information about combinations of traits with temporal, spatial, and functional significance. Types recognized during the present study were further lumped into one of seven basic ceramic groups indicative of regional tradition and ware group combinations. Ceramic groups recognized during the present study include El Paso Brown wares, Jornada Brown wares, Plains Brown Wares, Jornada Red Wares, Chupadero Black-on-white, Corona Corrugated, and Mimbres White wares. The types within each ceramic group are described, then trends are discussed by ceramic type or group.

Brown Wares

Brown ware types are the most common pottery group recovered from Salt Creek sites: 2,063 (87.5 percent) of the sherds from Townsend East. Similar plain brown ware vessels, which appear to have been produced in the Pecos drainage of the Jornada region, may have been produced as early as A.D. 200 and remained the dominant utility ware until the abandonment of this region in the fourteenth century.

Brown ware sherds associated with regional variants of the Jornada Mogollon are divided into types based on combinations of attributes thought to be spatially significant. The recognition of the various brown ware types is based on differences in surface color, polish, and temper noted for plain brown wares from different areas of the Jornada Mogollon region (Jelinek 1967; Jennings 1940; Lehmer 1948). However, recent studies have found considerable overlap in the characteristics of brown ware pottery common in different parts of the Jornada Mogollon region (Whalen 1994a). Visual and petrographic examinations demonstrate strong similarities in pastes and manipulations of brown ware pottery found in riverine and mountainous areas of the Jornada Mogollon. As a result, some archaeologists have simply lumped plain brown ware sherds that others would assign to regional specific types such as El Paso Brown, Jornada Brown, or South Pecos Brown into a single plain brown ware type category and attempted to document the variation in pottery from different areas through the distribution of various paste and technological attributes (Hill 1996a, 1996b; Whalen 1994a).

Other archaeologists have divided similar brown ware pottery into groups that may have been produced in different areas of the Jornada Mogollon (Wiseman 1996a). Such studies also recognize that a variety of factors may contribute to the differentiation of these brown wares. During the present study, brown ware sherds were divided into modified versions of brown ware types described by Jelinek (1967) and recently modified by Wiseman (1996a).

Problems in the use of different brown ware varieties stem from the various mixes of attributes used to define different plain brown ware types. For example, some sherds may contain a temper class commonly used to define one variety along with a surface manipulation frequently used to define another (Wiseman 1996a). Still, the use of such categories allows for the monitoring of variation in pottery assemblages, which may be of spatial or temporal significance. The documentation of such variability, using combinations of attribute categories alone, can be cumbersome and difficult.

El Paso Brown Wares

The most common ceramic group identified at Townsend East is the El Paso Brown wares. For the most part, these sherds were easily distinguished from Jornada Brown wares by the profusion of large temper fragments, including rounded quartz fragments. In most cases, these represent crushed granite temper. El Paso

Brown Ware sherds also tend to be soft and have less evidence of polish or luster and more scraping marks on the interior surface. Pastes tend to be dark or brown with a dark core.

During the present study, 1,133 sherds (48.1 percent) were assigned to types within the El Paso Brown Ware group. Most are plain brown wares exhibiting combinations of attributes clearly distinct from other brown ware sherds. While the characteristic most commonly used to recognized El Paso Brown sherds was the lack of well-polished surfaces, most of the sherds also have relatively large temper, thick walls, dark cores, and dark gray to chocolate brown surfaces. Following conventions I have used for other southwestern pottery traditions, 1,075 plain body sherds exhibiting these characteristics were classified as El Paso Body, while nine rim sherds were assigned to an El Paso Brown Rim category. The assignment of the great majority of the sherds to El Paso Brown Ware types was fairly clear cut and based on a combination of attributes.

A few sherds, however, exhibit combinations of traits intermediate between those normally assigned to El Paso Brown Ware and Jornada Brown Ware types. Such overlap resulted in the placement of 15 sherds into a Jornada-like El Paso Brown category. In addition, 33 extremely thin sherds (less than 4 mm) were placed into to a Thin El Paso Brown category. Such sherds are often considered separately since extremely thin sherds are assumed to have derived from El Paso Polychrome vessels, an assumption that commonly results in the assignment of very thin sherds without painted decorations to El Paso Polychrome. However, the recent analysis of pottery from LA 29363, near Carlsbad, found very thin brown ware pottery at a site clearly dating before the production of El Paso Polychrome (Wilson 2000). It is likely that the these and the very thin sherds from Townsend East were derived from earlier vessels. Thus, sherds placed into Thin El Paso Brown, as used here, may reflect either a thin-walled variant of earlier El Paso or Jornada Brown vessels and pottery derived from unpainted portions of El Paso Polychrome vessels. A single sherd with an El Paso Brown paste appears to have been intentionally sooted and was classified as El Paso Smudged Surface.

Jornada Brown Wares

Wiseman (1991b) refers to Jornada Brown, as used here, as the Sierra Blanca variety of Jornada Brown Ware. This type is described as generally having well-polished surfaces that obscure temper grains. Temper fragments are often very small, consisting of a profusion of small equally sized grains. Vessel walls are usually relatively thick (6 to 8 mm). Jornada Brown is very similar to Alma Plain, the most common type in most areas of the Mogollon Highlands in southwestern New Mexico (Mera 1943; Wiseman 1991b). The lack of sherds assigned to Alma Plain during the present study may reflect difficulties in distinguishing Jornada Brown Ware from Alma Plain rather than the absence of brown wares derived from the Mogollon Highlands.

During the present study, 927 (39.3 percent) of the sherds were assigned to one of eight types included in the Jornada Brown Ware group. Most of the Jornada Brown Ware sherds display high polish on at least one surface, small temper, and a brown, light brown, or tan surface color. The great majority of Jornada Brown Ware sherds have plain undecorated surfaces, Jornada Brown Rim (n=15), and Jornada Brown Body (n=860).

Other sherds exhibiting typical Jornada Brown Ware paste were assigned to distinct types based on textured or slipped treatments. A single sherd has fingernail-shaped incised lines and was classified as Jornada Incised. Another sherd with exterior corrugated treatments was classified as Jornada Corrugated, although it is possible it could represent a variation of Mimbres Corrugated or Corona Corrugated. A single sherd with an El Paso Brown paste appears to have been intentionally sooted and is classified as El Paso Smudged Surface.

Also included in the Jornada Brown group is South Pecos Brown (n=49). This type is distinguished from other types in the Jornada Brown Ware group by a distinct temper and different range of surface treatments. This type is generally well smoothed, but polish ranges from heavy to absent. Temper is sparse large gray feldspar fragments that appear to indicate syenite from the Sierra Blanca region, and which frequently show through the surface. This temper results in blocky to tabular paste cross sections. Protruding temper cracks are surrounded by very small radial cracks resulting from the contracting of surface clays. Because this type is usually identified on the basis of temper alone, a wide range of surface manipulations and treatments is represented, including some with paste and treatments more similar to El Paso Brown and Jornada Brown.

Plains Brown Wares

Three sherds were placed into types possibly associated with a Plains Brown Ware group based on a dark paste and sand temper. Two unpolished plain sherds were classified as McKenzie Brown and a single highly striated sherd as Jornada Brushed. These characteristics are similar to those noted in pottery occurring at sites on the plains of Texas and were presumably produced by

Caddoan groups (Suhm and Jelks 1962). It is also possible that these characteristics simply reflect a variation of the Jornada Mogollon technology, since brushed and striated treatments also occur occasionally on Jornada Mogollon pottery, and they are common on Chupadero Black-on-white. These sherds, while exhibiting characteristics possibly indicating plains influence, also exhibit characteristics that fall within the range of Jornada Brown Ware types and could have just as easily been placed into this group.

Three Rivers Red Ware

The 71 (3.0 percent) sherds with applications of bright red clay over pastes similar to the Jornada Brown Wares were assigned to Three Rivers wares (Wimberly and Rogers 1977). The initial use of red slip is thought to have been inspired by San Francisco Red, a type appearing with the onset of pottery production in the Mogollon Highlands (Haury 1936). Temper and pastes of Three Rivers Red Ware types were similar to those noted on Plains Brown wares, although surfaces tend to be more polished, and bowls are the dominant vessel form.

Sherds with bright red thin to moderately thick slips covering at least one surface were assigned to Plain Slipped Red (n=61). Except for the distinct slip clay, all are extremely similar to those classified as Jornada Brown. Unslipped areas are often visible in examples with thin slips, resulting in distinct red streaks and contrasts. Forms are mainly bowls with slipped interiors. While the slipped and unslipped surfaces were commonly polished, the slipped surface is usually more polished. Distinct intrusive red ware types such as Playas Red were not found.

Red painted decorations over an orange to light brown unslipped surface were noted in eight sherds. This paint is an iron pigment that is red to maroon in color and is similar in appearance to the slip clay noted in previously described red wares. Characteristics of these sherds are identical to pottery previously classified as Three Rivers Red-on-terracotta (Kelley 1984; Mera 1943; Mera and Stallings 1931). The paste is similar to that noted in Jornada Brown sherds, although it tends to be harder. Temper is described as less variable than in Jornada Brown and is represented by evenly spaced white quartz fragments (Kelley 1984). Surfaces tend to be very smooth and polished.

Previous studies have attempted to differentiate similar red painted pottery into two styles based on thickness of decorated lines (McCluney 1962; Mera and Stallings 1931; Wiseman 1991b). Examples with wide line diameters (greater than 5 to 8 mm) have sometimes been placed into Broadline or San Andres Red-on-terracotta, which is sometimes characterized as an earlier variety. All of the red painted sherds identified during the present study exhibit thin lines and other design styles described for Three Rivers Red-on-terracotta (Kelley 1984). Primary designs consist of a series of two to five narrow lines that are 2 to 4 mm in width applied directly below the rim. These lines usually occur in rectilinear patterns, although curvilinear and scroll-shaped patterns are sometimes represented. Secondary designs are sometimes incorporated into these lines and include small solid triangles. This type is generally represented by bowl forms.

Chupadero Black-on-white

White ware sherds exhibiting traits indicating their derivation from Chupadero Black-on-white vessels are represented by 216 (9.2 percent) sherds. Chupadero Black-on-white is found at sites covering a wide area of the Jornada Mogollon (Kelley 1984; Mera 1931; Hayes et al. 1981; Vivian 1964; Wiseman 1986). Chupadero Black-on-white was first manufactured between A.D. 1050 and 1100 and continued to be produced until about 1550. It is often the dominant, and sometimes only, white ware type at sites throughout the Jornada Mogollon country and adjacent regions (Mera 1931).

Chupadero Black-on-white usually has a dense light gray to white paste reflecting the use of a low-iron clay that fires to buff colors and a low-oxidizing or neutral atmosphere. When subjected to controlled oxidizing conditions, it consistently fires to similar buff colors in an oxidizing atmosphere. These colors contrast with the red colors noted for sherds from all other ceramic groups identified during the present study. Temper is often dark and includes fine sherd and rock fragments. The undecorated surfaces of Chupadero Black-on-white are often unpolished with striated or scored treatments resulting from scraping. Jelinek (1967) divided Chupadero Black-on-white sherds into several types thought to be temporally sensitive, primarily based on the presence of slips, surface color, and temper type. These distinctions do not appear to be warranted.

Chupadero Black-on-white sherds from the Salt Creek sites display a wide range of characteristics. Striated treatments are common on vessel surfaces. Most surfaces are light gray in color with moderate polish. While most sherds are not slipped, a significant proportion display a white slip over a gray paste. Most Chupadero sherds are tempered with dark igneous rock and sherd, although a wide variety of tempers are represented, which may indicate Chupadero vessels came from a number of sources.

Painted designs on Chupadero Black-on-white vessels often consist of combinations of hatchure and solid motifs. Designs were executed in a series of panels with the basic design repeated every one or two sections. At least four and as many as eight panels may be represented.

In the present study, Chupadero Black-on-white sherds were assigned to a series of categories based on the presence of painted decoration or style. Sherds with Chupadero paste but without painted decoration were classified as Unpainted Chupadero Black-on-white (n=127). Painted sherds were placed into a specific category by the type of design: Indeterminate Design (n=60), Solid Design (n=13), Hatchure Design (n=14), and Solid and Hatchured Design (n=2).

Corona Corrugated

Two sherds were assigned to Corona Corrugated. This type is the primary utility ware found at some prehistoric sites in southeastern and central New Mexico. A problem encountered when examining pottery from poorly dated sites is differentiating Corona Corrugated from Mimbres Corrugated in contexts of unknown age. The degree and type of similarities shared by Mimbres Corrugated and Corona Corrugated are still poorly understood. Such distinctions are important since Mimbres Corrugated appears to date from the early eleventh century to the end of the twelfth century, while Corona Corrugated appears to date from the beginning of the thirteenth to the middle of the fifteenth century. The assignment of these two sherds to Corona Corrugated is fairly arbitrary, as is the case for the single sherd classified as Jornada Corrugated, although surface characteristics are well within the range for this type. They exhibit fine plain corrugated treatments and were tempered with fine igneous rock similar to that common in Jornada Brown Ware.

Mimbres White Ware

Two sherds identified during this study exhibit characteristics of Mimbres White Ware. These sherds have fine volcanic temper like that found in the self-tempered sources in the Mogollon Highlands. Mimbres White Ware types are a brown-paste, white-slipped, painted pottery produced in areas of the Mogollon Highlands from the ninth to at least the middle twelfth centuries. Painted decorations are executed in iron-based mineral pigments and applied over a white slipped surface that is usually polished over. Surfaces are usually moderately to lightly polished, but they are not as lustrous as contemporaneous white ware types from other regions.

Ceramic Patterns

Ceramic data from the Salt Creek Project provide an opportunity to characterize ceramic assemblages associated with at least two occupational spans in this area of the Pecos Valley, and to examine several distinct trends. The following section discusses these patterns. Ceramic distributions are first used to determine the potential time of occupation for the sites and contexts. Next, ceramic distributions from dated contexts are compared to examine issues concerning vessel production, exchange, and use.

Ceramic Dating

Ceramic data from sites and components investigated during the Salt Creek Project provide clues to the span of occupation. The two Chupadero Black-on-white sherds recovered from LA 117250 indicate that at least one vessel was dropped at this site sometime after A.D. 1050 to 1100, when this type was first made. The only other pottery at this site was a couple of brown ware sherds beyond the right-of-way fence. These sherds were not collected or analyzed.

The distribution of the 2,354 sherds recovered from Townsend East indicates at least two distinct ceramic temporal components. The great majority (87.4 percent) of the pottery consists of brown wares, which include El Paso Brown wares (48.1 percent), Jornada Brown wares (39.3 percent), and Plains Brown wares (0.1 percent). Very low frequencies of these brown ware sherds exhibit other treatments, including polished smudged and corrugated surface surfaces. Later occupations are indicated by Corona Corrugated, Chupadero Black-on-white, and Three Rivers Red-on-terracotta sherds. The presence of these types indicates that at least some areas of this site were occupied after A.D. 1050 to 1100.

The presence of at least two distinct Ceramic period components is indicated by differences in distributions for Area A (north of 200N) and Area B (south of 200N) at the site (Table 81). Also, a gap between the two areas of this site where pottery and other artifacts were very rare further suggests the presence of two Ceramic components.

Area A ceramic types seem to indicate an occupation early in the Jornada Mogollon sequence. For example, assemblages from Area A contain a higher frequency (97.0 percent) of brown utility types and fewer (1.0 percent) white wares than Area B. Area A is also characterized by a higher frequency of El Paso Brown wares (69.8 percent) than Area B (23.3 percent). Jornada Red wares are limited to sherds with red slips (1.9 percent). Corona Corrugated is represented by a single sherd. All

Table 81. Ceramic types recovered from areas at Townsend East.

Ceramic Type	Area A		Area B		Total	
	n	%	n	%	n	%
El Paso Brown wares	**873**	**69.8**	**258**	**23.4**	**1131**	**48.1**
El Paso Brown body	821	65.7	252	22.9	1073	45.6
El Paso Brown rim	7	0.6	2	0.2	9	0.4
Jornada-like El Paso Brown	12	1.0	3	0.3	15	0.6
Thin El Paso unpainted brown	32	2.6	1	0.1	22	0.9
El Paso smudged surface	1	0.1	-	-	1	0
Jornada Brown wares	**338**	**27.0**	**589**	**53.4**	**927**	**39.4**
Jornada Brown rim	5	0.4	10	0.9	15	0.6
Jornada Brown body	291	23.3	569	51.6	860	36.6
Jornada incised	1	0.1	-	-	1	*
Indeterminate Jornada corrugated	-	-	1	0.1	1	*
Jornada smudged	-	-	1	0.1	1	*
South Pecos Brown	41	3.3	8	0.7	49	2.1
Plains Brown wares	**2**	**0.2**	**1**	**0.1**	**3**	**0.1**
McKenzie Brown	1	0.1	1	0.1	2	0.1
Plains brushed	1	0.1	-	-	1	*
Three Rivers Red wares	**24**	**1.9**	**47**	**4.3**	**71**	**3**
Plain slipped red	24	1.9	39	3.5	63	2.7
Three Rivers Red-on- terracotta	-	-	8	0.7	8	0.3
Chupadero Black-on-white	**12**	**1**	**204**	**18.5**	**216**	**9.2**
Unpainted with Chupadero Black-on-white paste	8	6	119	10.8	127	5.4
Chupadero Black-on-white (indeterminate design)	2	0.2	58	5.3	60	2.5
Chupadero Black-on-white (solid design)	1	0.1	12	1.1	13	0.6
Chupadero Black-on-white (hatchured design)	1	0.1	13	1.2	14	0.6
Chupadero Black-on-white (hatchured and solid design)	-	-	2	0.2	2	0.1
Corona Corrugated	**1**	**0.1**	**1**	**0.1**	**2**	**0.1**
Indeterminate Mimbres White Ware	**-**	**-**	**2**	**0.2**	**2**	**0.1**
Row total	1250	53.1	1102	46.8	2352	10.0

Two sherds are unprovenienced (Area C).

white ware sherds were Chupadero Black-on-white.

In contrast, the overall frequency (76.9 percent) of plain brown ware is lower in Area B, and the frequency of Chupadero Black-on-white (18.5 percent) is much higher. Frequencies of El Paso Brown Ware (23.4 percent) are much lower than for Area A, while those for the Jornada Brown wares are much higher (53.3 percent). Also significant is the presence of eight sherds of Three Rivers Red-on-terracotta in Area B.

These differences in type frequencies indicate that most contexts in Area A date prior to the introduction of decorated types and represent an early brown ware component. The very small number of Chupadero Black-on-white sherds and the single Corona sherd may represent material associated with the later occupation at Area B, because very little (less than 3 percent) of the pottery is other than plain ware. Thus, El Paso Brown is the dominant type during the early occupation.

Similar trends were noted by Wiseman (1991a) for sites northeast of Alamogordo, when comparing pottery from the Bent site with the nearby and slightly later Abajo de la Cruz site. Differences in the frequencies of brown ware pottery types from the two sites were dramatic, because the majority of the sherds were considered classic examples of the two types. These differences are particularly interesting given that El Paso Brown and Jornada are thought to have similar temporal ranges. Wiseman also noted very little difference in architecture and ceramic patterns between the two sites, and the amount of time separating the two sites does not appear to have been very great.

Ceramic data from a recently excavated site near Carlsbad (Zamora 2000), dated by carbon 14 samples to the eighth and ninth centuries, however, appear to partially contradict the assumption that El Paso Brown is dominant at earlier sites. An early date is supported by the observation that all of the pottery is plain brown ware. South Pecos Brown is as common as El Paso Brown, while other forms of Jornada Brown are rare. The South Pecos from this site, however, was distinguished from El Paso Brown purely on the basis of a gray feldspar temper. Other attributes such as paste color, lack of polish, and surface colors are similar to traits noted in El Paso Brown. Wiseman (1991a:55) also found gray feldspar temper in sherds that would have otherwise been classified as El Paso Brown at the Bent site. Thus, while the temper utilized may have varied geographically, a basic ceramic technology characterized by the use of large temper, the lack of polishing, and a firing atmosphere similar to that of El Paso Brown was employed for long periods in the Southern Jornada Mogollon region, including the Sierra Blanca region, where pottery was tempered with large dark feldspar fragments.

Thus, the shift from assemblages dominated by El Paso Brown to Jornada Brown may largely reflect a technological shift in brown ware pottery production over extremely wide areas of the Jornada Mogollon region. These differences were also noted during the monitoring of temper, manipulation, and form attributes for all brown ware sherds from Townsend East. Brown ware sherds from Area A are dominated by large leucocratic temper, while those from Area B are dominated by the smaller crystalline temper (Table 82). Likewise, brown wares from Area A tend to be unpolished on both sides, while those from Area B are more likely to have been polished (Table 83). Sites in the El Paso area follow similar trends (Whalen 1994a), although most of the pottery associated with widely separated time periods is fairly similar and usually classified as El Paso Brown.

Table 82. Jornada Brown Ware temper by area for Townsend East.

Temper	Area A		Area B		Total	
	n	%	n	%	n	%
Lecocratic igneous	1031	85.1	550	65.1	1581	76.9
Fine Jornada temper	135	11.4	286	33.8	421	20.5
Dark feldspar	45	3.7	9	1.1	54	2.6
Row total	1211	58.9	845	41.1	2056	100

Table 83. Brown ware vessel form for the areas at Townsend East.

Vessel Form	Area A		Area B		Total	
	n	%	n	%	n	%
Indeterminate	4	0.3	1	0.1	5	0.2
Bowl rim	1	0.1	-	-	1	*
Bowl body	1	0.1	1	0.1	2	0.1
Jar neck	40	3.3	7	0.8	47	2.3
Jar rim	10	0.8	8	0.9	18	0.9
Jar body	2	0.2	1	0.1	3	0.2
Cloudblower	1	0.1	-	-	1	*
Polished body	273	22.5	558	66.0	831	40.4
Unpolished body	811	67.0	228	27.0	1039	50.5
Polished exterior body	59	4.9	36	4.3	95	4.6
Polished interior body	9	0.7	4	0.5	13	0.6
Indeterminate rim	-	-	1	0.1	1	*
Row total	1211	58.9	845	41.4	2056	100

Thus, attribute data reflecting technical differences in the brown wares are used to assign sherds to different types. These differences may stem from important changes in exchange patterns, manufacturing technology, and use associated with plain brown ware vessels. The average thickness of sherds assigned to various types, however, appears to be similar for both areas (Table 84). The possible significance and details of these differences are discussed in more detail in later sections of this chapter.

Also of interest is the higher frequency of Thin El Paso Brown in Area A. This suggests that the very thin brown ware sherds may be derived from El Paso Brown Ware vessels produced centuries before El Paso Polychrome. This observation is further supported by the recovery of similar thin brown ware sherds from the

Table 84. Mean thickness by ceramic type from areas at Townsend East.

Ceramic Type	Area A			Area B		
	Mean	n	SD	Mean	n	SD
El Paso Brown rim	6.1	7	1.91	5.5	2	0.21
El Paso Brown body	5.7	821	1.06	5.9	252	1.0
Jornada-like El Paso Brown	4.0	12	0.69	4.1	3	7.81
Thin El Paso unpainted brown	3.6	32	0.53	3.9	1	-
El Paso smudged surface	4.3	1	-	-	-	-
Jornada Brown rim	5.6	5	0.73	5.4	10	1.01
Jornada Brown body	5.6	291	0.87	5.7	569	0.93
Jornada incised	5.7	1	-	-	-	-
Indeterminate Jornada corrugated	-	-	-	6.1	1	-
Jornada smudged	-	-	-	-	-	-
South Pecos Brown	5.2	41	0.83	4.9	8	1.2
McKenzie Brown	4.3	1	-	3.8	1	-
Plains brushed	5.7	1	-	-	-	-
Plain slipped red	5.1	24	-	5.6	39	1.0
Three Rivers Red-on- terracotta	-	-	-	5.2	7	0.71
Unpainted with Chupadero Black-on-white paste	5.2	8	1.06	5.7	119	0.95
Chupadero Black-on-white (indeterminate design)	5.2	2	-	5.6	58	0.70
Chupadero Black-on-white (solid design)	6.5	1	-	5.7	12	0.66
Chupadero Black-on-white (hatchured design)	5.6	1	-	5.3	13	0.64
Chupadero Black-on-white (hatchured and solid design)	-	-	-	5.5	2	0.85
Corona Corrugated	1	8.6	-	6.0	1	-
Indeterminate Mimbres White Ware	-	-	-	2	4.8	-
Total	5.5	1250	1.01	5.7	1102	0.95

previously mentioned site near Carlsbad, which only contained brown ware. That these thin brown ware sherds were derived from earlier forms of El Paso Brown is further supported by the absence of painted El Paso Polychrome at Townsend East, and demonstrates that very thin brown ware sherds are not necessarily derived from El Paso Polychrome, which is characteristic of occupations dating after A.D. 1100. Thus, it is important not to confuse thin sherds from El Paso Brown and related variants, which may represent the earliest dominant ceramic type in this region, with El Paso Polychrome, which is the last dominant type of the Southern Jornada sequence.

Radiocarbon dates from the Townsend East structures provide further support for ceramic-based inferences concerning distinct temporal occupations, as well as clues concerning the actual time of these occupations. Radiocarbon samples from Area A early structures ranged from A.D. 570 to 940. All the dates are well in the range of the Mesilla phase of the Southern Jornada Mogollon and are fairly similar to dates from the Carlsbad area site (Zamora 2000).

Radiocarbon dates from the single Area B structure (Structure 1) and the southernmost Area A structure (Structure 4) fall between about A.D 1000 and 1100. This agrees well with the ceramic date of about A.D. 1050 to 1300, based on the presence of Chupadero but the absence of Lincoln Black-on-red and other fourteenth-century types.

Ceramic Trends

If previously discussed conjectures regarding the dating of ceramic assemblages from different areas of Townsend East are correct, the ceramic types and attributes documented for Area A and Area B may also provide information on the nature and cause of changes in the use of pottery vessels in this area. Both areas have small shallow structures and scattered features, and are assumed to represent occasional use of this location by mobile groups. Many, if not most, of the features could represent different episodes of occupation, so that the earlier and later components could represent similar adaptive strategies practiced over a long span of time. Both the appearance and increase of certain decorated types and the shift from assemblages dominated by pottery assigned to El Paso Brown Ware to those assigned to Jornada Brown Ware pottery types reflect changes in the ceramic technology that may be attributed to a number of causes.

Differences in the dominant brown ware groups are often attributed to distinct and separate regional brown ware technologies. Pottery assigned to the El Paso Brown Ware group is often assumed to be associated with the southern Jornada Mogollon ceramic tradition, attributed to groups residing in the southern Rio Grande Valley and Tularosa Basin in extreme west Texas and south-central New Mexico. The pottery associated with Area A is indistinguishable from Mesilla phase assemblages dating sometime between A.D. 200 to 1100. Pottery assigned to the Jornada Brown Ware group is often characterized as produced by groups in the mountainous northern Jornada Mogollon region. If this is the case, the apparent temporal shift in dominant brown ware could reflect a shift in the nature of influence or exchange between groups in the Middle Pecos and other areas of the Jornada Mogollon. Such a regional shift is also supported by the appearance or increase of decorated types such as Chupadero Black-on-white and Three Rivers Red-on-terracotta, which appear to have been commonly produced in the Sierra Blanca highlands.

Different areas of production for these two brown ware traditions are further supported by the very different frequencies of tempers associated with Areas A and B at Townsend East. Over 96.7 percent of the El Paso Brown pottery is tempered with large leucocratic igneous particles, while only 52.7 percent of Jornada Brown Ware sherds have this temper. A high frequency (41.8 percent) of the Jornada Brown Ware is tempered with fine crystalline igneous rock, while only 2.8 percent of the El Paso Brown Ware sherds have this temper.

It is possible that these patterns reflect different areas of origin for pottery vessels assigned to the two brown ware traditions. The large leucocratic sand is similar to material assumed to reflect granite sources from the Franklin Mountains that were commonly employed in the southern Jornada Mogollon region. The finer crystalline temper is similar to that thought to have been employed in the Sierra Blanca Highlands. Thus, the shift in brown ware types could reflect a shift in either exchange or influence from Mesilla phase groups in the El Paso area to groups in the Sierra Blanca Highlands. Yet another shift involving the return of influence or interaction with groups in the southern Mogollon regions is reflected by the dominance of El Paso Polychrome at sites in the El Paso region dating after A.D. 1300 (Kelley 1984).

While it is tempting to characterize the distributions noted for earlier forms of El Paso and Jornada Brown wares as reflecting changes in ethnicity and interaction, it is also possible that the early production of types such as El Paso Brown may have been more widely spread, cross-cutting the southern and northern Jornada Mogollon region as defined for later periods. In at least some areas, such changes may reflect regional shifts in ceramic technology that correlate with changes in the type of containers employed. It is interesting that characteristics of El Paso Brown such as large temper, firing in a reduced atmosphere, and unpolished surfaces are commonly found in utility wares, particularly cooking pots, produced in other areas of the Southwest. In contrast, traits used to define Jornada Brown, including small temper, firing in a low-oxidation atmosphere, and polished surfaces, are more common in brown or decorated wares produced elsewhere. While variation in vessel shape indicates that pottery associated with both of these basic brown ware groups had a wide variety of uses, including bowls, seed jars, cooking jars, and ollas, differences in the two wares have certain advantages and disadvantages.

The slight but significant changes in pottery technology in the Roswell area and elsewhere in the Jornada Mogollon country are comparable to changes noted in other areas of the Southwest. These changes may ultimately reflect selective pressures relating to mobility and manifest in the decoration, construction, and forms of ceramic vessels. Characteristics of pottery vessels ultimately reflect their production for use as containers that serve as facilities designed to even out spatial and temporal heterogeneity in subsistence resources (Mills 1989). Pre-Ceramic groups dealt with resource heterogeneity through mobility. Pottery, however, provides a technological alternative to full-scale mobility. One model for understanding potential changes in ceramic production and manufacture involves the distinction of maintainable and reliable systems (Mills 1989). Maintainable systems sacrifice durability for other factors, such as modularity and portability, while reliable systems are designed for increased durability. Containers from maintainable systems are characterized by their ease of manufacture and repair; they require little time for manufacture, lack backup systems, are portable, are utilized for a limited number of tasks, and are the result of simple and easily transferred construction and firing techniques. Containers in reliable productions systems tend to be abundant and sturdy, involve more specialized forms, resist failure during a specific task, and may require more specialized manufacturing and firing techniques, which can be relatively time consuming.

Mills (1989) notes widespread trends concerning the shift from reliable to maintainable production systems in the Anasazi from the Basketmaker III to Pueblo II periods. The lack of such a dramatic change during the same temporal span in most of the Jornada Mogollon region, where plain brown wares dominate most assemblages, may indicate less need for the development of reliable containers. Still, changes in brown ware toward more specialized forms and the increase in specialized decorated forms may reflect a shift toward a slightly more reliable production system, even in an area characterized by similar seasonal occupational episodes.

CHAPTER 14

PETROGRAPHIC ANALYSIS

BY DAVID V. HILL

Introduction

Eleven sherds of El Paso Brown, Jornada Brown, and Chupadero Black-on-white were submitted for analysis from the Townsend site. This analysis focuses on identifying the range of variation within and between the two types of brown ware ceramics recovered from this site.

Methodology

The artifacts were analyzed with a Nikon Optiphot-2 petrographic microscope. The sizes of natural inclusions and tempering agents were described in terms of the Wentworth Scale, a standard method for characterizing particle sizes in sedimentology. These sizes were derived from measuring a series of grains using a graduated reticle built into one of the microscope's optics. The percentages of inclusions in untempered ceramics were estimated using comparative charts (Matthew et al. 1991; Terry and Chifingar 1955). Studies have been conducted regarding the reproducibility of determinations using these charts (Mason 1995). Given the limited amount of inclusions that may be present or identifiable in ceramics, and the variable size of the sherds in the sample, the comparative method for assessing the amount and size of materials found in ceramics has been found to be useful for archaeological ceramic petrography as point counting (Mason 1995).

Analysis was conducted by first examining the ceramic collection and generating a brief description of each of the sherds. A second phase created classification groups based on the similarity of the paste and temper between sherds. This process also allowed for the examination of the variability within each paste grouping. Additional comments about the composition of individual sherds were made at this time.

Descriptions

FS 2540 (Area A, 245N 92E, Level 1), El Paso Brown

The paste of this sherd is a medium brown color and is slightly birefringent. The paste contains about 15 percent very fine to medium mineral grains and rock fragments derived from a granite. Since no larger isolated mineral grains were observed, it is likely that the granite was equigranular in texture. The continuous size distribution of the mineral grains and rock fragments and the degree of weathering observed in the potassium feldspars indicates that the grains were a natural constituent of the clay. The rock fragments consist of aggregate particles composed of potassium feldspar, occasionally in the form of microcline, plagioclase, and quartz. The potassium feldspar grains within the rock fragments and those that occur as isolated grains display slight alteration to sericite and clay minerals. A few of the potassium feldspar grains contain quartz poikilitically. One potassium feldspar grain contains patch-type micro-perthritic intergrowths of albite. Two rock fragments display a micrographic texture consisting of the intergrowth of quartz and potassium feldspar. Quartz grains within the sherd display undulose extinction. Sparse fine brown biotite, green hornblende, and black opaque inclusions that likely represent weathered biotite are also present in the ceramic paste.

FS 2541 (Area A, 245N 93E, Level 1), El Paso Brown

The paste of this sherd is medium yellowish brown in color and is slightly birefringent. The paste contains about 15 percent very fine to fine mineral grains and rock fragments derived from a granite. This sherd is quite similar in terms of the size and composition of the mineral grains and rock fragments and the minor degree of weathering of the alkali feldspars found in FS 2540. These similarities indicate a common origin for these two sherds. Three grains of caliche or very fine-grained limestone was also present in the paste of this sherd.

FS 2495 (Area A, Structure 5, Level 1), El Paso Brown

The paste of this sherd is a reddish brown color. The paste contains about 15 percent fine to coarse fragments of granite and isolated mineral grains. The granite appears to have been derived from the same source as the previous two samples. However, the mineral grains in the present sherd are slightly larger than those observed in the previous two samples. These differences in grain size between this sample and the two previously examined may reflect variations within the source of the ceramic clay. A single rock fragment displayed micrographic texture consisting of the intergrowth of quartz and potassium feldspar. Two medium angular fragments of caliche are present in the paste as well.

FS 2510 (Area A, Structure 2, Level 1), El Paso Brown

The paste of this sherd is a medium reddish brown color. The paste contains 15 percent fine to coarse fragments of granite and isolated mineral grains derived from the granite. The paste of this sherd is virtually identical to FS 2495 and may have been derived from the same vessel and certainly from the same productive source. Two fine grains of caliche or very fine-grained limestone were observed in the paste as well as the igneous rock fragments.

FS 2258 (Area B, 110N 102E, Level 2), Jornada Brown

The paste of this sherd is a medium reddish brown color. The paste contains about 20 percent very fine to fine mineral grains and intrusive igneous rock fragments. A few medium-sized rock fragments are also present. The fine-textured rock fragments and isolated mineral grains were derived from a granite consisting of equigranular subhedral laths of potassium feldspar, quartz, and a limited amount of plagioclase. There appears to be a slightly greater percentage of potassium feldspar relative to quartz in the rock fragments and in the paste as a whole. Some of the potassium feldspar laths are contained sub-ophilitically within quartz grains. Two medium-sized fragments of potassium feldspar are also present as isolated grains. The feldspars appear fresh, with only a few grains displaying slight kaolinization. A few fragments of brown biotite are also present in the paste.

FS 1695 (Area B, 118N 94E, Surface), Jornada Brown

The paste of this sherd is a medium reddish brown color. The paste contains about 20 percent very fine to medium fragments of syenite and isolated mineral grains derived from granite. The granite somewhat resembles that observed in FS 2258. However, a few coarse fragments in the present sample consist of quartz containing poikilitic alkali feldspars, indicating an origination at a slightly more quartz-rich portion of the source rock. Sparse brown biotite was also observed in the paste and in one of the rock fragments.

FS 1224 (Area A, 241N 91E, Surface), Jornada Brown

The paste of this sherd is a medium brown color. The mineral grains and rock fragments in the paste range from very fine to coarse in size. About 90 percent of the inclusions fall within the very fine to fine range and consist of alkali feldspar, quartz, plagioclase, and brown and green biotite. The isolated grains and rock fragments make up about 15 percent of the ceramic paste. Also present are fine sparse black opaque inclusions that probably represent biotite that has altered to hematite and clay minerals. The coarse fraction in the paste consists of a wide range of types of isolated minerals and rock fragments. The most common coarse-sized inclusions consist of angular fragments of potassium feldspar and plagioclase. Potassium feldspar is occasionally present as microcline. In two rock fragments, potassium feldspar and plagioclase are found together. The potassium feldspar grains display slight weathering to clay minerals giving the alkali feldspar grains a somewhat clouded appearance. Microperthritic intergrowth of the patch type is present in two of the potassium feldspar grains. Also present are two medium-sized grains of a fine-grained well-sorted sandstone. The sandstone is grain supported with some brown clay contained interstitially between the grains. Also present is a highly weathered coarse-sized volcanic rock fragment with a ground mass that consists of highly weathered plagioclase, epidote, and cubes of magnetite. Much of the body of the inclusion has a brown stain originating from the weathering of the magnetite. A medium-sized rock consisting of trachytic plagioclase and ferromanganese cubes is also present and likely originated from the same source as the other volcanic rock fragment. A single medium-sized rounded grain of quartzite with sutured grains was also observed in the paste.

FS 1818 (Area B, 102N 106E, Surface), Jornada Brown

The paste of this sherd is a medium reddish brown color. The paste contains about 20 percent very fine to medium fragments of syenite and isolated mineral grains derived from the syenite. The syenite resembles that observed in FS 2258 and FS 1695. This specimen lacks the coarser particles observed in FS 1695 and contains less quartz. Sparse brown biotite was also observed in the paste and in one of the rock fragments.

FS 1639 (Area B, 129N 112E, Surface), Jornada Brown

The paste of this sherd is a light yellowish brown color. The paste has a sandy appearance resulting from the 20 percent silt-sized to fine isolated mineral grains present in the paste. The mineral grains consist primarily of potassium feldspar, with less common plagioclase and brown biotite, and sparse quartz. Some of the biotite has altered to hematite and clay minerals resulting in sparse small black opaque inclusions. The potassium feldspars are slightly weathered to almost completely altered to sericite and clay minerals. Three medium fragments and one coarse fragment of potassium feldspar and one fragment of chalcedony are also present. A single medium-sized grain of basalt was also present. The basalt grain consisted of plagioclase feldspar and contained interstitial brown glass.

FS 2600 (Area A, Structure 7, Level 2), El Paso Brown

The paste of this sherd is a medium brown color and contains about 15 percent fine to coarse fragments of granite and isolated mineral grains. The granite appears to have been derived from the same source as FS 2540, FS 2541, and FS 2510. A few of the mineral grains in the present sherd are slightly larger than those observed in samples FS 2540 and FS 2541 and are more the size of the grains observed in FS 2510. These differences in grain size between this sherd and the other El Paso Brown sherds examined reflects variations with the source of the ceramic clay. A single rock fragment displayed micrographic texture consisting of the intergrowth of quartz and potassium feldspar. One medium-sized rounded fragment of caliche or fine-grained limestone was also present in the paste.

FS 2353 (Area B, 124N 106E, Level 2), Chupadero Black-on-white

The paste of this sherd is a light gray color. The paste contains about 40 percent silt-sized to fine fragments derived from a very fine-grained equigranular quartz monzonite. The few rock fragments consist of equal parts potassium feldspar and plagioclase with sparse quartz.

Discussion

The five El Paso Brown ceramics were produced with clays containing granite. It is likely that the granite was a natural inclusion within the clays used in forming the ceramics. The continuous size-grading of the mineral grains and granite particles and the degree of weathering of the feldspars are indicative of the use of clays containing these materials, rather than the use of crushed rock. The ceramic pastes of samples FS 2541, FS 2495, FS 2510, and FS 2600 also contained rounded grains of either a very fine-grained limestone or caliche most likely resulting from this material's presence in the source clay.

The Jornada Brown sherds are much more compositionally variable. Samples FS 2258, FS 1618, and FS 1818 contain a finer-grained granite than that observed in the El Paso Brown specimens. Like the El Paso Brown samples, the inclusions in these sherds were also likely to have been present in the source clay.

FS 1224 contains fragments from a coarse-grained granite. Based on the variation in the sizes of the mineral grains, the granite originally had a porphyritic texture. The yellowish paste color and presence of volcanic rock fragments in the paste distinguishes this sherd from the paste of the samples of El Paso Brown.

FS 1639 contains rock fragments rich in potassium feldspar, and mineral grains that are smaller and more highly weathered than the feldspars observed in the other samples of Jornada Brown. Like the other Jornada Brown sherds, it is likely that the inclusions observed in this specimen represent natural inclusions in the ceramic paste.

The single sherd of Chupadero Black-on-white contained equigranular quartz monzonite. The continuous particle size of the inclusions, degree of weathering of the feldspars, and the sheer abundance of inclusions indicates that they represent natural inclusions in the source clay.

It is likely that all of the brown ware sherds examined during this analysis were derived from clays originating within the Lincoln County porphyry belt (Kelley and Thompson 1964). Clays containing sediments from the Capitan Pluton are present on the piedmont surrounding this structure (Sidwell 1946). The Capitan and other plutons that are part of the Lincoln County porphyry belt are radiometrically dated as contemporary. The intrusive bodies, such as the Capitan Pluton compositional zones, resulted from a combination of crystal fractionation, convection, and crustal contamination (Allen and Foord 1991; Allen and McLemore 1991). The compositional variation within the single pluton and between contemporary plutons precludes the differentiation of plain ware ceramics through petrographic analysis alone.

The Chupadero Black-on-white sherd also contains fragments of intrusive igneous rock and may be from the same area. However, this ceramic was made with iron-deficient clays, indicating a different sedimentary source for the clay from the eroded intrusives that were used in forming the brown wares.

CHAPTER 15

CHIPPED STONE

BY JAMES L. MOORE

ANALYTIC METHODS

With the exception of the Townsend site (LA 34150), chipped stone artifacts from the sites examined by this project were analyzed using a standardized format developed by the Office of Archaeological Studies (OAS 1994a). One of the goals of this standardization is an increase in comparability between projects from across the state. Hopefully, this will eventually allow the study of specific problems with a much larger data base representing sites distributed through both time and space. The OAS chipped stone analysis includes a series of mandatory attributes that describe material, artifact type and condition, cortex, striking platforms, and dimensions. In addition, several optional attributes have been developed that can be used to examine specific questions. This analysis included mandatory and optional attributes.

The Townsend assemblage was treated somewhat differently because it contains 14,959 artifacts—97.8 percent of the chipped stone recovered during this project. Because of time and budgetary constraints, the entire Townsend assemblage could not be examined using the standardized analysis. Thus, debitage and cores were sampled, and materials from contexts judged to be the most meaningful were selected for full analysis. Debitage and cores from other contexts were rough sorted, providing an inventory that could be used at a very general comparative level. The rough sort entailed tallying by material type and artifact type. Similar information was then culled from the full analysis sample, tallied using the same variables, and combined with the rough sort data. This provided a full inventory of the debitage and cores recovered from the Townsend site, which among other things can be used to determine whether the sample is representative of the assemblage as a whole, or is biased. Since formal tools comprised only a small percentage of this assemblage, all specimens encountered during rough sort were pulled and subjected to full analysis.

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

Each chipped stone artifact that went through the intensive analysis was examined using a binocular microscope to aid in defining morphology and material type, examine platforms, and determine whether it was used as a tool. The level of magnification varied between 15x and 80x, with higher magnification used for wear pattern analysis and identification of platform modifications. Utilized and modified edge angles were measured with a goniometer; other dimensions were measured with a sliding caliper. Analytic results were entered into a computerized data base using the Statistical Package for the Social Sciences Data Entry program (version 4.0.1).

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

Attributes recorded for all artifacts include material type and quality, artifact morphology and function, amount of surface covered by cortex, portion, evidence of thermal alteration, edge damage, and dimensions. Platform information was recorded for flakes only. Unless otherwise noted, attributes pertain to the intensive analysis only.

Material type was coded by gross category unless specific sources or distinct varieties were recognized. Codes are arranged so that major material groups fall into specific sequences of numbers, progressing from general material groups to specific varieties. The same codes were used for both the rough sort and intensive analyses. The way in which certain cherts fluoresce under short-wave infrared light can be indicative of source. Thus, selected chert artifacts were classified according to their degree of fluorescence, a procedure that is discussed in a later chapter.

Material texture is a subjective measure of grain size within rather than across material types. Texture is scaled from fine to coarse for most materials, with fine textures exhibiting the smallest grains and coarse the largest. Obsidian is classified as glassy by default, and this category is applied to no other material. Material quality records the presence of flaws that can affect flakeability, including crystalline inclusions, fossils, visible cracks (incipient fracture planes), and voids. Inclusions that would not affect flakeability, such as specks of different colored material or dendrites, are not considered flaws. These attributes were recorded together.

The artifact morphology and function attributes are used to provide information about artifact form and use. The first is morphology, which categorizes artifacts by general form. The second is function, which categorizes artifacts by inferred use. These attributes were coded separately. Artifact morphology was recorded in both the rough sort and intensive analyses, while artifact function was only used in the latter.

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. For each artifact, the amount of cortical coverage was estimated and recorded in 10-percent increments.

The type of cortex present on an artifact can be a clue to its origin. Waterworn cortex indicates that a nodule was transported by water and that its source was probably a gravel or cobble bed. Nonwaterworn cortex suggests that a material was obtained where it outcrops naturally. Cortex type was identified, when possible, for any artifacts on which it was present. When identification was not possible, cortex type was coded as indeterminate.

All artifacts were coded as whole or fragmentary; when broken, the portion was recorded if it could be identified.

Flake platform records the shape and any alterations to the striking platform on whole flakes and proximal fragments.

The presence or absence of a lip at the ventral edge of a platform provides information on reduction technology and can often be used to help determine whether a flake was removed from a biface or core.

The platform width attribute provides information on reduction strategy and entails measurement of the maximum distance between the ventral and dorsal edges of platforms. Since flake mass is related to platform width, core flakes should have larger platform widths than biface flakes.

Cherts can be modified by heating at high temperatures. This process can cause a realignment of the crystalline structure and sometimes heals minor flaws like microcracks. Heat treatment can be difficult to detect unless mistakes are made. When present, the type and location of evidence for thermal alteration was recorded to determine whether an artifact was purposely altered.

Wear patterns or the use of a piece of debitage or core as an informal tool can result in edge damage, producing patterns of scars suggestive of the way in which it was used. Cultural edge damage denoting use as an informal tool was recorded and described when present on debitage. A separate series of codes was used to describe formal tool edges, allowing measurements for both categories of tools to be separated.

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

Maximum length, width, and thickness were measured for all artifacts. On angular debris and cores, length was the largest measurement, width was the longest dimension perpendicular to the length, and 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.

Flake Categories

Several types of flakes may be present in an assemblage, and one of the goals of this analysis was to distinguish between core flakes, biface flakes, resharpening flakes, notching flakes, bipolar flakes, hammerstone flakes, blades, channel flakes, and pot lids. With the exception of core and biface flakes, most categories are usually rare or absent in assemblages. Thus, distinguishing between core and biface flakes was a critical analytic need.

Flakes were divided into removals from cores and bifaces using a polythetic set of variables (Fig. 94). 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 removal from a biface, a flake needs to fulfill at least 70 percent of these conditions in any combination. Those that do not match that percentage of conditions are classified as core flakes by default. This percentage is considered to be high enough to isolate flakes produced during the later stages of biface production from those removed from cores, while at the same time it is low enough to permit flakes removed from a biface that do not fulfill the entire set of conditions to be properly identified. Some flakes removed from bifaces cannot be distinguished, but those that can be distinguished are considered definite evidence of biface reduction. Instead of rigid definitions, the polythetic set provides a flexible means of categorizing flakes and helps account for some of the variability seen during experiments.

Other flake types are identified by certain distinguishing characteristics. Notching flakes are produced when the hafting elements of bifaces are notched. They generally exhibit a recessed, U-shaped platform and a deep, semicircular scallop at the juncture of the striking platform and dorsal flake surface. Bipolar flakes are evidence of nodule smashing and usually exhibit signs of having been struck at one end and crushed against an anvil at the other. Blades are long, narrow removals from specially prepared cores, and are rare in the Southwest after the Paleoindian period. Likewise, channel flakes were removed during the process of fluting Paleoindian dart or spear points and do not occur in later sites.

The traditional definition of blades in the Southwest follows that developed by Bordes (1961), which classifies as a blade any flake that is twice as long as it is wide. However, as Collins (1999) points out, the context of that definition is often overlooked by archaeologists in the New World:

> He was defining the term for use in classifying Lower and Middle Paleolithic stone tools, where blades by any definition are relatively infrequent…In contrast, during the Upper Paleolithic, blades—often called "true blades"—are far more common and they meet more stringent definitions, even in Bordes own writings…where emphasis is placed on the techniques of production, not just the proportions of the piece. (Collins 1999:7)

This is an important point to note, because many flakes removed from large bifaces fit the proportional criteria that are often used to define blades, but result from an entirely different technology. Large biface flakes often appear to be prismatic in form and have a curvature similar to that of blades. However, blades are struck from specially prepared cores, have platform angles approaching 90 degrees, and exhibit evidence of platform preparation on the dorsal surface below its juncture with the platform (Collins 1999). Large biface flakes are struck from bifacially flaked tools or biface-cores, have platform angles around 45 degrees, and exhibit evidence of platform preparation across the platform as well as the edge where the platform and dorsal

Whole Flakes

1. Platform:
   a. has more than one facet.
   b. is modified (retouched and abraded).
2. Platform is lipped.
3. Platform angle is less than 45 degrees.
4. Dorsal scar orientation is:
   a. parallel.
   b. multidirectional.
   c. opposing.
5. Dorsal topography is regular.
6. Edge outline is even, or flake has a waisted appearance.
7. Flake is less than 5 mm thick.
8. Flake thickness is relatively even from proximal to distal end.
9. Bulb of percussion is weak (diffuse).
10. There is pronounced ventral curvature.

Broken Flakes or Flakes with Collapsed Platforms

1. Dorsal scar orientation is:
   a. parallel.
   b. multidirectional.
   c. opposing.
2. Dorsal topography is regular.
3. Edge outline is even.
4. Flake is less than 5 mm thick.
5. Flake thickness is relatively even from proximal to distal end.
6. Bulb of percussion is weak (diffuse).
7. There is pronounced ventral curvature.

Artifact is a biface flake when:

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

Figure 94. Polythetic set for distinguishing biface flakes from core flakes.

surface meet. Thus, even though there is a superficial resemblance between some of the by-products of blade-core and biface-core reduction, they represent two distinct techniques, each with its own set of distinguishable attributes.

Other flake categories are evidence of removals from formal or informal tools, or indicate inadvertent damage during thermal processing. Resharpening flakes were removed from formal tool edges that became dull from use and usually fit the polythetic set for biface flakes. They are often impossible to separate from other biface flakes but can sometimes be distinguished by an extraordinary amount of damage on the platform and on the portion of dorsal surface adjacent to the platform. Hammerstone flakes are debitage that were detached from a hammerstone by use. Finally, pot lids are debitage that were blown off the surface of a chipped stone artifact during thermal alteration.

Core and Tool Categories

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

Core analysis in the Southwest tends to be rather simplistic in that evidence of specialized reduction techniques are rare after the Paleoindian period. For instance, blade technology does not seem to occur after that period, so the specially prepared and reduced cores associated with this technique rarely occur. Blade technology seems to have been replaced by the manufacture of biface-cores by the Early Archaic period. biface-cores were multifunctional in that they could be used as tools or as sources for informal debitage tools, or be modified into other forms. While the manufacture of biface-cores was rather wasteful of material, the tools themselves were an efficient adjunct to a hunting and gathering lifestyle. However, because of their multifunctional character, they tend to be categorized as formal tools rather than cores.

Cores are classified by the direction of removals, and in rare circumstances by shape. Unidirectional cores have a single platform from which flakes were removed in one direction or along one continuous surface. Pyramidal cores represent a subdivision of the unidirectional category and resemble blade cores in form but lack evidence of preparation for the standardized removal of flakes. This type represents an attempt to maximize the number of flakes removed from a core without formal preparation. 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 or exhausted cores or nodules between a hammerstone and an anvil. This is usually done when materials are rare or highly prized, or nodules of high-quality materials are small and difficult to flake in other ways.

Tools are separated into two basic categories: formal and informal. Formal tools are debitage or cores that were intentionally altered to produce specific shapes or edge angles. Alterations take the form of unifacial or bifacial retouch, and artifacts are considered intentionally shaped when retouch scars obscure their original shape or significantly alter 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 is defined by the presence of marginal attrition caused by use. Evidence of informal use is divided into two general categories: wear and retouch. Retouch scars are 2 mm or more in length, while wear scars are less than 2 mm long. Where informal tools also provide direct evidence of the reduction process, formal tools tend to provide indirect evidence unless they were discarded before being finished.

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

Both cores and formal tools represent nuclei from which flakes were removed, but differ in the rationale behind 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 are classified with debitage as by-products of the reduction process. Formal tools tend to be considered separately because they are usually evidence of other unrelated tasks. Since all chipped stone artifacts result from similar reductive processes, this division is in many ways artificial. Thus, formal tools can be used both to aid in the examination of reduction processes at a site and to provide information on the range of tasks performed there.

The Formal Tool Assemblage

This analysis defines formal tools as 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 are considered intentionally shaped when retouch scars obscure their original shape or significantly alter the angle of at least one edge. Hammerstones, an exception to this, are classed as formal tools even though they were often used without formal alteration.

As discussed above, two attributes were used to categorize chipped stone artifacts. The first was morphology, which describes the general form of an artifact. Three basic formal tool morphologies were used: cobble tools, unifaces, and bifaces. Cobble tools were made on cobbles and include both those that were formally altered and those that were used without alteration. Unifaces and bifaces were usually made on debitage, with formal alteration of one or two surfaces, respectively.

Artifact morphology also categorizes formal tools according to the amount of modification perceptible. For cobble tools, this differentiation is rather simplistic and includes only three varieties: unmodified, unidirectional flaking, and bidirectional flaking. Flaking is confined to tool margins in the latter two cases, leaving much of the original cobble surface untouched. Four morphological types each were distinguished for unifaces and bifaces. Three morphological types are used to describe each tool category in a staged approach as defined by Callahan (1979), while the fourth represents a general category for tools that are too fragmentary to be assigned to a specific reduction stage.

Three manufacturing stages are defined for unifaces and bifaces: early, middle, and late. These categories describe general edge shape and extent and regularity of flaking on surfaces. Early- and middle-stage tools often represent those that were discarded or abandoned during manufacture before being completed. Late-stage tools are usually those that were finished and used. However, there are exceptions to these schemes, so they cannot be taken as a given. Some early- and middle-stage tools represent finished forms, while many late-stage tools were broken before they were finished. Thus, it is necessary to examine tools for evidence of use or production breaks as well as general form.

Early-stage unifaces exhibit primary flaking on one surface, irregular outlines, and widely and variably spaced flake scars. Middle-stage unifaces display secondary flaking, evidenced by semiregular outlines and closely or semiregularly spaced flake scars. Late-stage unifaces have regular outlines with closely or quite regularly spaced flake scars.

Early-stage bifaces exhibit evidence of primary thinning, including irregular outlines and widely and variably spaced flake scars that rarely extend past the midline of a surface. Middle-stage bifaces display evidence of secondary thinning consisting of semiregular outlines and closely or semiregularly spaced flake scars, some of which may extend to or past the midline of a surface. Late-stage bifaces have regular outlines and closely or quite regularly spaced flake scars that usually extend to or past the midline of a surface.

The second attribute used to describe formal tools was function—in this case, assumed use. Functions were assigned to artifacts that fit certain shape and flaking parameters that are generally thought to represent specific uses. A good example of this is the category of notched and pointed bifaces, which are usually classed as projectile points because that is how well-preserved prehistoric and ethnographic specimens were used. However, as Andrefsky (1998:189) states, "The function of chipped stone artifacts cannot easily and reliably be attributed to the morphology of the artifact, and …more and more evidence shows that lithic artifacts are multifunctional tools." Thus, just because a tool can be classed as a projectile point by form does not necessarily mean that it was used in that capacity, or that it was solely used for that purpose. Examination of edge wear and breakage patterns can provide some evidence of the use(s) to which a tool was put. Unfortunately, since this was a macroscopic analysis, we were unable to examine most tool edges for more specific evidence of use, so function usually remains assumed rather than proven.

At this level of analysis, most wear patterns attributable to use could not be separated from those that are evidence of edge modification to facilitate flaking during manufacture. However, a few attributes can provide better evidence upon which to base our assumptions of function for a few tools. Some tools exhibit extreme levels of wear that are readily visible and distinguishable from damage incurred during manufacture. More confident functional assignments could be made in these cases. Likewise, breakage patterns often allow us to suggest that tools fractured as they were used in certain ways or before they were finished. Even so, the multifunctional nature of many formal tools, especially those used by hunter-gatherers, is recognized but usually cannot be accounted for by this analysis. Functional categories are simply labels used to describe a general form

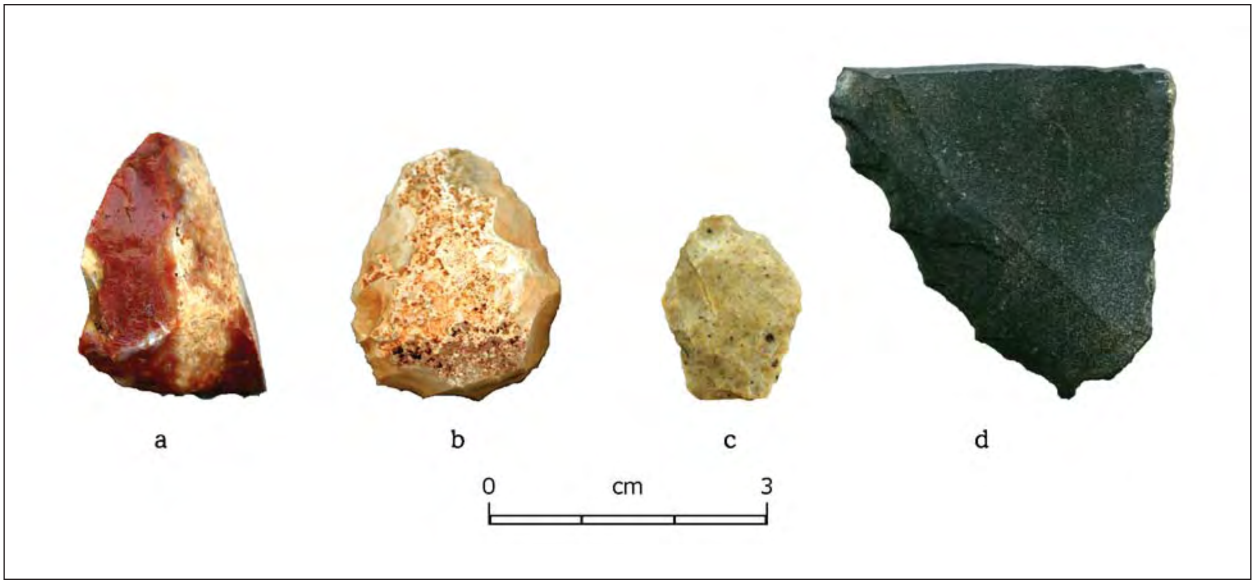

Figure 95. Unifacial tools: (a) Alibates chert end scraper from LA 117255; (b) gray chert end scraper from Townsend; (c) chert end scraper from LA 117248; (d) siltite denticulate from Townsend.

and classify a tool by its assumed use. When more specific evidence of use is present, it is discussed.

The following discussion divides the formal tool assemblage into the three general categories described above. Initial discussions are by tool type rather than site or provenience. Location is taken into account in the final part of each section. In addition to the formal tools discussed in this chapter, six others were identified during rough sort of the Townsend assemblage but could not be relocated for intensive analysis. Thus, they are not considered in this discussion.

Cobble Tools

Only five cobble tools were identified in this assemblage. Two are bidirectionally flaked pieces of limestone and siltstone with battered edges and/or surfaces. These tools may represent cores that were reused, or they could be nodules that were flaked to produce sharp, durable edges. The amount of battering suggests that they functioned as hammerstones or were used to chop materials on a hard anvil. Since similar wear patterns can occur with either use, these tools are better categorized as hammerstones/choppers. The three remaining tools in this category are unmodified limestone cobbles with battered surface loci. These tools were classified as hammerstones and were probably used for chipped stone reduction.

All five cobble tools were recovered from Townsend East. Two limestone hammerstones were found in extramural parts of Area A that cannot be linked to a specific occupational feature. The three remaining artifacts in this category were recovered from structures. The limestone hammerstone/chopper was associated with Structure 1, while the siltstone hammerstone/chopper and a limestone hammerstone were associated with Structure 2.

Unifaces

Nine unifacially flaked tools were identified in this assemblage. Three (33.3 percent) were simply categorized as unifaces because their fragmentary condition precluded more specific classification. They include a gray chert lateral fragment too small to be assigned to a manufacturing stage, a tan chert proximal fragment from an early-stage tool, and a medial fragment of a middle-stage tool made from a different variety of tan chert. While the latter two specimens may have been broken before they were finished, their fractures are nondiagnostic.

Potential functions were assigned to the six remaining unifaces, which include five end scrapers and a denticulate. Two scrapers were made from undifferentiated cherts and include a lateral fragment of an early-stage tool and a complete late-stage tool (Fig. 95c). A complete early-stage tool (Fig. 95b) and a distal fragment of a middle-stage tool were made from two different varieties of gray chert. The last scraper is a complete late-stage tool made from Alibates chert (Fig. 95a), which is the only exotic material in the uniface assemblage. The denticulate is an early-stage tool made from siltite (Fig. 95d).

The end scrapers were probably all hafted for use, though our level of analysis did not allow identification of wear patterns indicative of this type of attachment. The basic shapes of the three complete specimens illustrated in Fig. 95 suggest they were hafted and probably resharpened until no longer suitable for use. Although conventional wisdom generally considers these tools indicative of hide working, Andrefsky (1998:193-194) summarizes several microwear analyses which suggest that end scrapers were multifunctional tools used to process hides, wood, bone, and antler. Thus, we can only suggest that these tools were used in general scraping activities that may have involved one or all of these materials. The denticulate was unifacially flaked to create a series of projections similar to the teeth on a saw and was probably used to cut through pieces of wood, bone, or antler, though no use-wear specific to this function was noted.

Unifacial tools were recovered from three sites. The complete undifferentiated chert end scraper came from LA 117248, while the Alibates chert end scraper was found at LA 117255. The seven remaining unifaces came from Townsend. Six of these tools were recovered from extramural portions of Area A and could not be linked to a specific feature. They include the siltite denticulate, fragments of an undifferentiated chert scraper and a gray chert scraper, and all three uniface fragments. The last uniface from this site, the only one that can be linked to a pit structure, is part of a gray chert end scraper associated with Structure 1.

Undifferentiated Bifaces

Fifty tools were assigned to this category, representing all stages of biface manufacture. Table 85 divides these tools by reduction stage and categorizes them by material type and portion represented. Fourteen material types are found in this assemblage, mostly varieties of chert. Over a third are made from undifferentiated cherts (36.2 percent); four types of gray chert and two types of tan chert are also represented. Only two of these tools are made from materials with known sources: one each of Alibates and San Andres cherts. Four bifaces were made from materials other than cherts, including undifferentiated quartzite (n=2), light purple quartzite (n=1), and brownish red siltstone (n=1). The light purple quartzite was available locally as cobbles, but the other materials are from unknown sources.

Undifferentiated manufacturing stage. Six bifaces representing four different material types could not be assigned to a manufacturing stage. This was mostly because of their fragmentary nature: the portion represented could not even be identified in four cases, and a fifth specimen is a possible medial fragment of an Alibates chert biface that has been extensively reworked, obscuring any evidence that could be used to assign it to a more specific manufacturing stage. No definable fracture types were observed on these bifaces, so it was impossible to determine when or how they were broken. The sixth specimen was the only complete biface in this category.

Early-stage manufacture. Eight bifaces representing six material types were assigned to early-stage manufacture. A tan chert specimen is an unidentified fragment; otherwise the tools in this category are whole (n=4), tips (n=2), or medial fragments (n=1). Of the whole early-stage bifaces, two appear to have been discarded because they could not be thinned any further. A third specimen is fairly large and made of quartzitic sandstone. This tool may be a biface-core that was discarded because it was unsuitable for reworking into another form, or it could have been abandoned because it could not be thinned any further. The last tool in this category is actually a reworked uniface. In its unifacial form this artifact exhibits several rounded-edge margins. Subsequent bifacial flaking obscured its original form as well as much of the evidence for prior use. The bifacial form of this tool was never finished, and it appears to have been abandoned because it could not be adequately thinned.

The tips include tan and gray chert specimens (Table 85). The former exhibits a lateral snap, indicating that it broke during reduction. The latter exhibits a snap fracture, which is nondiagnostic and could have occurred during or after reduction. The final artifact in this category is a medial fragment of gray chert which has a badly hinged surface and displays a possible lateral snap. Thus, it is likely that this biface also broke during manufacture.

Middle-stage manufacture. Half of the undifferentiated bifaces were assigned to middle-stage manufacture. Eight different materials are represented (Table 85). Three undifferentiated chert and two tan chert specimens were unassignable fragments. The rest are whole (n=1), tips (n=8), midsections (n=4), bases (n=4), and lateral fragments (n=3).

Of the undifferentiated fragments, two could not be assigned to specific manufacturing stages because they were reworked. An undifferentiated chert specimen appears to have originally been abandoned because step fracturing left a large knot on one surface that could not be removed. The reworking was neither extensive nor successful, and the tool was again discarded. The second reworked specimen is tan chert and was reworked along a break and a lateral edge. This artifact seems to have originally been a thick biface-core. The two remaining undifferentiated chert specimens display multiple breaks. One seems to have been abandoned because stepping formed a knot on one surface. This tool was later intentionally smashed and displays bipolar scars at the main break. Two breaks were identified on the second specimen: a lateral snap which indicates that it fractured during reduction, and a scar that originates at a surface and probably indicates deliberate smashing. The final tool in this category is a tan chert fragment that exhibits a lateral snap and was therefore broken during manufacture.

As many as six biface tips broke during manufacture: lateral snaps occur on four (two tan chert, one gray chert, one brownish-red siltstone), a possible lateral snap on a fifth (undifferentiated chert), and a reverse

Table 85. Undifferentiated bifaces by material type, portion, and reduction stage.

Reduction Stage	Material Type	Indeterminate Fragment	Whole	Proximal	Medial	Distal	Lateral
Indeterminate	Undifferentiated chert	3	-	-	-	-	-
	Alibates chert	-	-	-	1	-	-
	Gray chert, no fluorescence	1	-	-	-	-	-
	Gray chert, medium fluorescence	-	1	-	-	-	-
Early stage	Chert	-	1	-	-	-	-
	Gray chert, warm fluorescence	-	-	-	-	1	-
	Tan chert, no fluorescence	1	1	-	-	1	-
	Gray chert, no fluorescence	-	1	-	1	-	-
	Quartzitic sandstone	-	1	-	-	-	-
Middle stage	Undifferentiated chert	3	1	1	-	3	2
	San Andreas chert	-	-	-	-	-	1
	Tan chert, no fluorescence	-	-	-	1	-	-
	Tan chert, no fluorescence	2	-	1	-	3	-
	Gray chert, no fluorescence	-	-	2	1	1	-
	Brownish red siltstone	-	-	-	-	1	-
	Undifferentiated quartzite	-	-	-	1	-	-
	Light purple quartzite	-	-	-	1	-	-
Late stage	Undifferentiated chert	2	-	-	-	1	1
	Gray chert, no fluorescence	-	1	-	-	-	-
	Orange chert with white chalcedonic masses	-	-	-	-	1	-
Edge bites	Undifferentiated chert	1	-	-	-	-	-
	Gray chert, warm fluorescence	1	-	-	-	-	-
	Tan chert, no fluorescence	1	-	-	-	-	-
	White chert with yellow and gray inclusions	1	-	-	-	-	-
	Tan chert, no fluorescence	1	-	-	-	-	-

fracture on a sixth (tan chert). Two laterally snapped fragments—tan chert and brownish-red siltstone—are parts of thick biface-cores, and the latter was partly reworked after it was broken. From the amount of stepping on one surface of the reverse fractured tip, that specimen probably broke during an attempt to thin it from one end. The remaining tools in this category (both undifferentiated chert) exhibit snap fractures and were broken during or after reduction.

Two of three medial fragments are quartzite, and the third is gray chert. All seem to have been discarded because of mistakes made during reduction. An undifferentiated quartzite specimen is thick, and stepping has formed a large knot on one surface. The breaks on this tool are nondiagnostic and could have occurred either during or after reduction. It seems to have been discarded because of thickness and production errors, and may have fractured while trying to remove the knot, though this is questionable. A light purple quartzite specimen also exhibits numerous step fractures on one surface that form a large knot. The presence of a lateral snap indicates that this tool broke during reduction. The final specimen is gray chert, and also exhibits a lateral snap.

Two of four biface bases may have been discarded because of problems encountered during reduction. A gray chert specimen exhibits a lateral snap and was apparently broken during thinning. Multiple step fractures formed a large knot on one surface of a tan chert specimen and may have been the reason for its discard. This artifact exhibits a nondiagnostic break which could have occurred during or after reduction. The last two bases are undifferentiated chert and gray chert, and display possible bipolar breaks that originate at one surface and suggest that these tools were intentionally smashed.

Two undifferentiated chert lateral fragments probably broke during reduction. One specimen exhibits a lateral snap, and the other broke because of an incipient fracture plane, in this case a flaw. A third lateral fragment is San Andres chert, which has an indeterminate break.

Late-stage manufacture. This category contains six artifacts in three material types, including undifferentiated cherts, gray chert, and orange chert with white chalcedonic masses. Two undifferentiated chert specimens are unidentifiable fragments. One with a nondiagnostic break may be a projectile point tang, while the second exhibits a manufacturing break (lateral snap) and may be part of a base. The latter is also crazed, but improper thermal treatment does not seem to have caused the fracture.

The only complete artifact in this category is a reworked gray chert hafted tool. Its original form is uncertain, but it could have been a dart point with shallow lateral notches or a biface that was broken during manufacture and reworked into a hafted form. A break at the proximal end of this tool exhibits shape and wear indicative of spokeshave use.

There are also two biface tips in this category, one of orange chert with white chalcedonic masses and a second of undifferentiated chert. The former fractured during manufacture and exhibits a lateral snap which broke through a flaw. The latter displays a bipolar-like scar that originates at one surface and suggests that this tool was intentionally smashed. An undifferentiated chert lateral fragment, the last tool in this category, exhibits a nondiagnostic snap fracture.

Edge bites. This category includes five fragments of biface edges, all representing mistakes made during production. Edge bites occur when a blow is struck incorrectly and breaks a chunk out of the edge of a tool rather than removing a thinning flake. All five are of different varieties of chert.

Provenience. Most of the undifferentiated bifaces were recovered from the Townsend site (49 or 98 percent). The only specimen not from Townsend was an early-stage biface from LA 117255. Bifaces from Townsend can be divided into two groups: those from areas in and around structures to which a date can be assigned, and those from general artifact scatters, which can rarely be assigned a date.

Area A yielded 60 percent of the undifferentiated bifaces recovered from the Townsend site (Table 86). Of the 30 bifaces found in this area, 17 came from extramural zones and could not be assigned an accurate date; these tools are described in Table 87. However, since most dates obtained from structures in this part of the site fall into the early Ceramic period, it is likely that

Table 86. Distribution of undifferentiated bifaces on Townsend.

Provenience	Townsend East			Townsend West
	Area A	Area B	Area C	Area D
Extramural areas	23	11	3	1
Structure 1	-	3	-	-
Structure 2	1	-	-	-
Structure 3	3	-	-	-
Structure 4	-	1	-	-
Structure 5	3	-	-	-

Structures include both interior and exterior fill.

most of these tools date to the same period. The 13 remaining bifaces were associated with Structures 2, 3, and 5, which date to the early Ceramic period. Bifaces were considered associated with structures when they occurred in structural fill or within 2 m of the structure perimeter in extramural grids.

Five bifaces were associated with Structure 2. A lateral fragment of a late-stage undifferentiated chert biface with a nondiagnostic break was found in structural fill. The remaining tools were found in extramural grids. Two bifaces were recovered from southwest of Structure 2 and include the base of an undifferentiated chert middle-stage biface that seemed to have been intentionally smashed, and a complete tan chert early-stage biface that was discarded because it could not be thinned. Two bifaces were found northeast of this structure and include a lateral section of a middle-stage San Andres chert biface, and the tip of a middle-stage undifferentiated chert tool. The breaks on these bifaces were nondiagnostic.

Four bifaces were associated with Structure 3. Structure fill yielded an indeterminate fragment of an undifferentiated chert biface. Three fragments were found in extramural grids north of the structure—an indeterminate fragment of a gray chert biface, a midsection of a middle-stage quartzite biface, and an indeter-

Table 87. Undifferentiated bifaces recovered from extramural zones in Areas A and B that were not associated with a structure.

Area A	Area B
tan chert early-stage tip; BIM	chert middle-stage lateral fragment; BIM
tan chert middle-stage fragment; possibly reworked biface core	gray chert late-stage hafted tool; laterally notched; REW; spokeshave (?)
Alibates chert medial (?) fragment; reworked	chert edge bite
tan chert middle stage fragment; BIM	gray chert middle-stage base; BIM
gray chert middle-stage base; ISM	chert middle-stage tip
gray chert early-stage biface core; ABT	chert middle-stage lateral fragment; BIM
Chert late-stage tip; ISM; crazed	gray chert middle-stage tip; BIM
reworked chert middle-stage fragment; ABT	tan chert edge bite
tan chert early-stage fragment	tan chert middle-stage tip; BIM
chert middle-stage fragment; ABT; ISM	tan chert middle-stage biface core tip; BIM (?)
light purple quartzite middle-stage midsection; BIM; ABT	brownish-red siltstone middle-stage tip; BIM; REW; biface-core (?)
tan chert middle-stage base; ISM	
tan chert middle-stage tip; BIM	
chert middle-stage tip; BIM (?); ABT	
chert late-stage fragment; BIM (?); crazed; base (?)	
orange chert with white chalcedonic masses; late-stage tip; BIM; pot lidded	
chert middle-stage fragment; ISM; BIM	

BIM = broken in manufacture
REW = reworked
ISM = intentionally smashed
ABT = abandoned because it couldn't be thinned

minate fragment of a late-stage undifferentiated chert biface. None of these tools have diagnostic break patterns, but the midsection may have been discarded because a large knot on one surface precluded further thinning. The undifferentiated chert fragment may be a projectile point tang, but is too small for accurate identification.

Four bifaces were associated with Structure 5. A tan chert middle-stage midsection and an indeterminate fragment of a gray chert biface were found in structure fill; neither has diagnostic breaks. A lateral fragment of a late-stage undifferentiated chert biface was found in an extramural grid southeast of the structure, and a medial fragment of an early-stage gray chert biface was found to the northeast. The latter was broken during manufacture, while the break on the former was nondiagnostic.

Fifteen bifaces were recovered from Area B, which contains structures dating to the late Ceramic period. Eleven of these tools were found in extramural areas lacking any association with a structure and are described in Table 87. Three bifaces were recovered from Structure 1 fill, including edge bites of gray chert and white chert with yellow and gray inclusions, and a complete undifferentiated chert middle-stage biface. The only biface tool recovered from Structure 4 was a tan chert edge bite.

Area C is a small provenience which was radiocarbon dated to the Late Archaic period. The three bifaces recovered from this area include a reworked chert tool and two undifferentiated chert indeterminate biface fragments. The former was originally a uniface with multiple rounded use loci that was partly rechipped into a bifacial form and then abandoned before it was finished.

Townsend West, or Area D, was another small provenience that was radiocarbon dated to the Late Archaic period. While a previous study in this part of the site yielded both Late Archaic and early Ceramic period dates (Maxwell 1986), a lack of pottery in the area examined by this study in addition to the radiocarbon date suggests Late Archaic use. Only one biface was recovered from Area D; it consists of an early-stage gray chert biface tip with a nondiagnostic fracture.

Bifacial Tools Other than Projectile Points

Only two bifacial tools that could be assigned a specific function were not classified as projectile points; both are chert. One specimen is a late-stage biface which appears to be a drill fragment. The second is an early-stage biface which was shaped to form a denticulate (saw). Both of these tools were recovered from Area A at Townsend East. The denticulate was found in an extramural feature (Feature 2) northeast of Structure 3. The probable drill fragment was found in an extramural area southwest of Structure 2.

Projectile Points

Projectile points were the most common type of bifacial tool identified in this assemblage. Of the 96 projectile points recovered, 94 (97.9 percent) were found at the Townsend site, and one each came from LA 117255 and LA 117257. Leslie (1978) provides a framework for typing and evaluating projectile points from southeastern New Mexico, and his typology is used in structuring this discussion. Specimens that do not fit Leslie's (1978) typology are discussed last.

Small unnotched points are categorized as Type 1 projectile points, 18 examples of which were recovered from Townsend. Leslie (1978:89) feels that most examples of this type represent arrow point preforms. While this may be true in some cases, in others it is not. Unnotched points were commonly used in some areas. In an analysis of projectile points from the Mogollon Highlands, Moore (1999a:67) categorized unnotched 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. Forty percent of medium-sized unnotched points (1.5 to 2.5 cm wide) and 50 percent of small unnotched points (less than 1.5 cm wide) exhibited impact fractures, indicating that they were damaged during use. These styles occurred after A.D. 1000 and were most common after A.D. 1150.

Small triangular unnotched bifaces with concave bases are classified as Cottonwood triangular points in the Great Basin, where they mostly occur after A.D. 1300 (Holmer 1986:108). Kearns (1996:132-133) indicates that this point style is common at protohistoric and early historic sites in New Mexico and was used by Navajos and Utes. Similar unnotched concave-base arrow points are also common at Mission period sites in Texas, reflecting use by diverse groups (Hester 1977).

These examples indicate that use of small unnotched points was widespread across much of the Southwest. Thus, it would be questionable to assume that specimens from southeastern New Mexico 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 will be more difficult.

Leslie (1978:89) divides small unnotched points into four varieties based upon the shape of the proximal

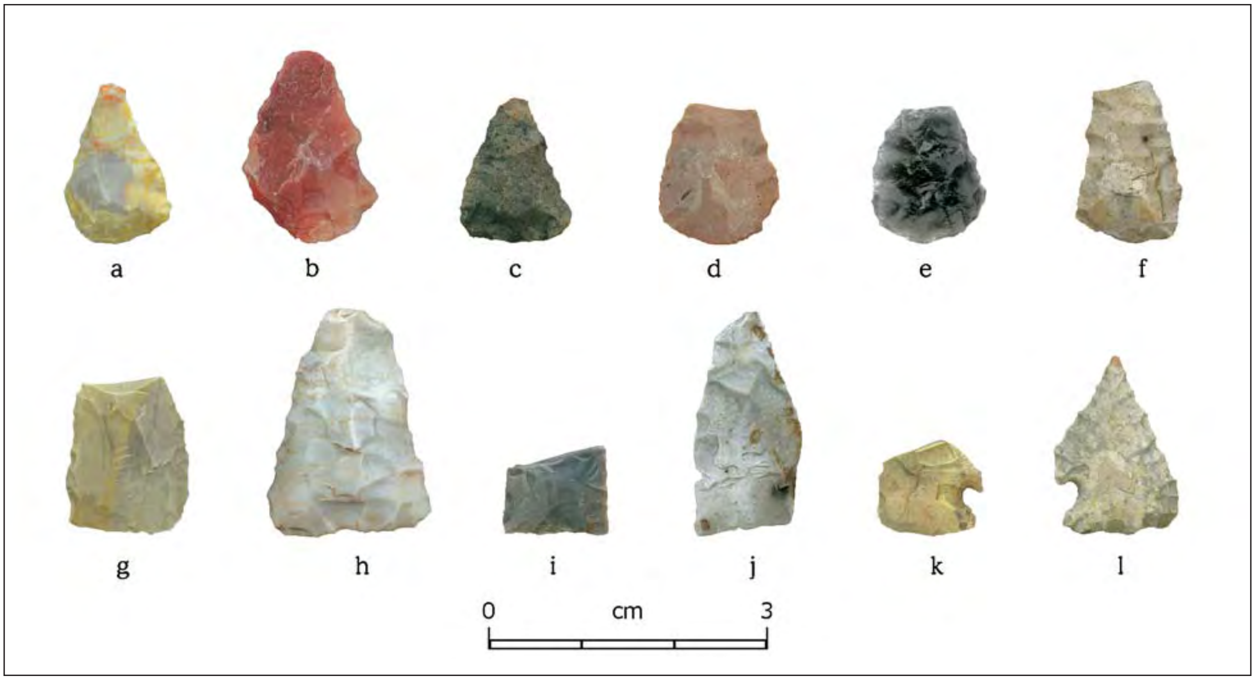

Figure 96. Type 1 projectile points and preforms: (a-f) Type 1-A; (g-i) Type 1-B; (j) Type 1-C; (k) Type 1-A/3-A; (l) Type 1-B/3-B.

end (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 18 bifaces that could be assigned to the Type 1 category, all of which were recovered from Townsend (Fig. 96). Type 1-A was most common, with 11 specimens, followed by Type 1-B (n=4) and Type 1-C (n=1). Two other bifaces were missing parts of their bases and could only be assigned to the general Type 1 category. Most of these tools were made from various cherts (88.9 percent), with one example each of obsidian (5.6 percent) and an undifferentiated igneous material (5.6 percent). The latter is aphanitic in texture, with large crystalline hematitic inclusions. Materials used in the manufacture of these tools were invariably very fine grained and quite well suited to pressure flaking. Other than the obsidian specimen, exotic materials do not seem to occur.

Only four Type 1 points (22.2 percent) are unbroken: over half (55.6 percent) are missing their tips, one specimen each (5.6 percent) are medial and distal fragments, and two specimens (11.1 percent) are lateral fragments. Three of the complete specimens are Type 1-A, and are all made of chert (Figs. 96a-96c). Two seem to have been discarded because stepping left knots on a surface that could not be removed, so they could not be thinned any further. The fourth specimen is a special case and is discussed later.

Half of the Type 1 fragments exhibit break types indicative of fracture during manufacture: six are chert, and one is the undifferentiated igneous specimen. Three Type 1-A bifaces exhibit lateral snaps and are missing their tips (n=2) or tip and midsection (n=1). A Type 1-B biface exhibits a lateral snap and is missing its tip and midsection. A second Type 1-B biface is missing its tip because of a reverse fracture. The only example of a Type 1-C biface lost part of an edge from a lateral snap. A general Type 1 biface was discarded after an overshot flake removed much of an edge; this specimen also exhibits two snap fractures, which probably postdate discard.

Five Type 1 bifaces are missing their tips (n=4) or part of a lateral edge (n=1) and exhibit snap fractures, which are nondiagnostic because they can occur at any time in the life of an artifact. One of the former is obsidian (Fig. 96e), while the rest are made from various cherts. The presence of certain attributes suggest that at least three of these bifaces were discarded because of problems encountered during production. Two specimens that are missing their tips, a Type 1-A and a Type 1-B, have knots on a surface caused by step and hinge fractures, and were probably discarded because they could not be adequately thinned. The third specimen is missing part of a lateral edge and has a deep hinge fracture on one surface that may have contributed to discard. In each of these cases the snap fractures could have occurred while trying to thin the bifaces, but it is equally likely that they are attributable to post-discard processes.

Only one specimen exhibits a fracture attributable to use. This is a Type 1-A biface made from chert, which has an impact fracture at its distal end and is missing part of an edge because of a lateral snap. The latter break is usually attributed to a mistake made during manufacture, but in this case it was probably caused by twisting during the impact that also removed the tip.

Two specimens placed in this category are very interesting because they were abandoned or discarded during notching. Both bifaces are chert and have one corner notch cut into them. A Type 1-A/3-A was apparently discarded after partial notching when the tip was accidentally broken off during manufacture (Fig. 96k). The second specimen is a Type 1-B/3-B. It is unbroken, and no obvious flaking difficulties were noted, yet it is unfinished (Fig. 96l).

Of the 18 specimens assigned to this general category, 13 (72.2 percent) were either broken during manufacture or discarded because they could not be sufficiently thinned. Only one specimen (5.6 percent) was broken during use. Thus, most Type 1 bifaces represent projectile point preforms. While there is limited evidence for the use of unnotched projectile points, only one specimen displayed definite evidence of this pattern of use.

Leslie (1978:89) places all side-notched arrow points into the Type 2 projectile point category and recognizes six varieties. Type 2-A have convex bases, Type 2-B have straight bases, Type 2-C have concave bases, Type 2-D have straight bases with small basal notches, Type 2-E have concave bases with small basal notches, and Type 2-F have deep V-shaped basal notches (Leslie 1978:89). Only the first two varieties were identified in our sample, though a possible Type 2-F was also recovered.

Five points were assigned to the Type 2 category. All are chert, and all were found at the Townsend site. Only one Type 2-A point was identified; it is missing its tip due to an impact fracture, and half of its base was removed by a haft snap (Fig. 97a). Three examples of Type 2-B points were found. The most complete specimen exhibits snap fractures, so the timing of breakage is questionable (Fig. 97b). The other two specimens are represented by bases, both exhibiting probable haft snaps (Figs. 97c and 97d).

One specimen may be tentatively assigned to the Type 2-F category, though it is badly damaged, and the exact form of notching was undetermined. This specimen exhibits a deeply notched base, much of which was removed by potlid fracturing. This damage occurred after manufacture and reflects discard into an active fire.

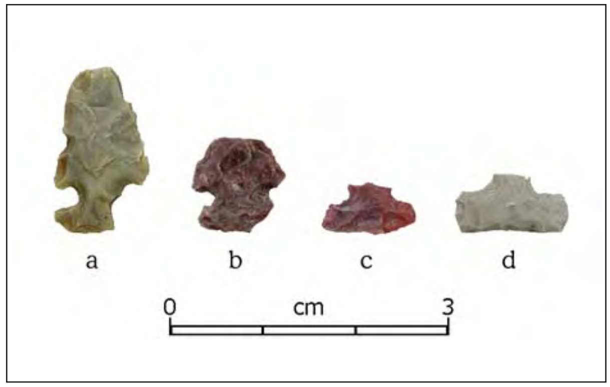

Figure 97. Type 2 projectile points: (a) Type 2-A; (b-d) Type 2-B; (e) possible Type 2-F.

It should be noted, however, that this base could also fit into the Type 1-D category, so its assignment to Type 2-F remains very tentative.

Leslie (1978:89) places all corner-notched arrow points into the Type 3 projectile point category and recognizes six varieties. Type 3-A have convex bases, Type 3-B have straight bases, Type 3-C have straight to slightly contracting stems and straight to convex bases, Type 3-D have bulb-like bases, Type 3-E have straight or bulb-like bases with slender blades and projecting barbs, and Type 3-F have straight or convex bases with slender serrated blades and projecting barbs (Leslie 1978:89).

Twenty-eight Type 3 points were recovered from the Townsend site and comprise 29.2 percent of the projectile point assemblage. No Type 3 points were found at other sites. Five varieties are represented, and only Type 3-E does not occur. Except for a single specimen of silicified wood, these points were manufactured from various cherts, none of which appear to be of nonlocal origin.

Type 3-A is the second most common type in this assemblage. Nine specimens were assigned to this category (32.1 percent). Three complete specimens were recovered (Figs. 98a-98c), one had its tip removed by a snap fracture (Fig. 98d), and the rest are represented by bases. Three and possibly four bases exhibit haft snaps, and so were broken during use and probably returned to the site for replacement. The last base has a snap fracture.

Type 3-B is the most common type in this assemblage, with 10 specimens assigned to this category (35.7 percent). Only one specimen is complete (Fig. 98e), and one is missing only its tip (Fig. 98f). The break on the latter is a nondiagnostic snap fracture. A third specimen consists of a partial base and midsection, and also exhibits snap fractures. The seven remaining fragments are all bases. Four exhibit haft snaps, indicating that

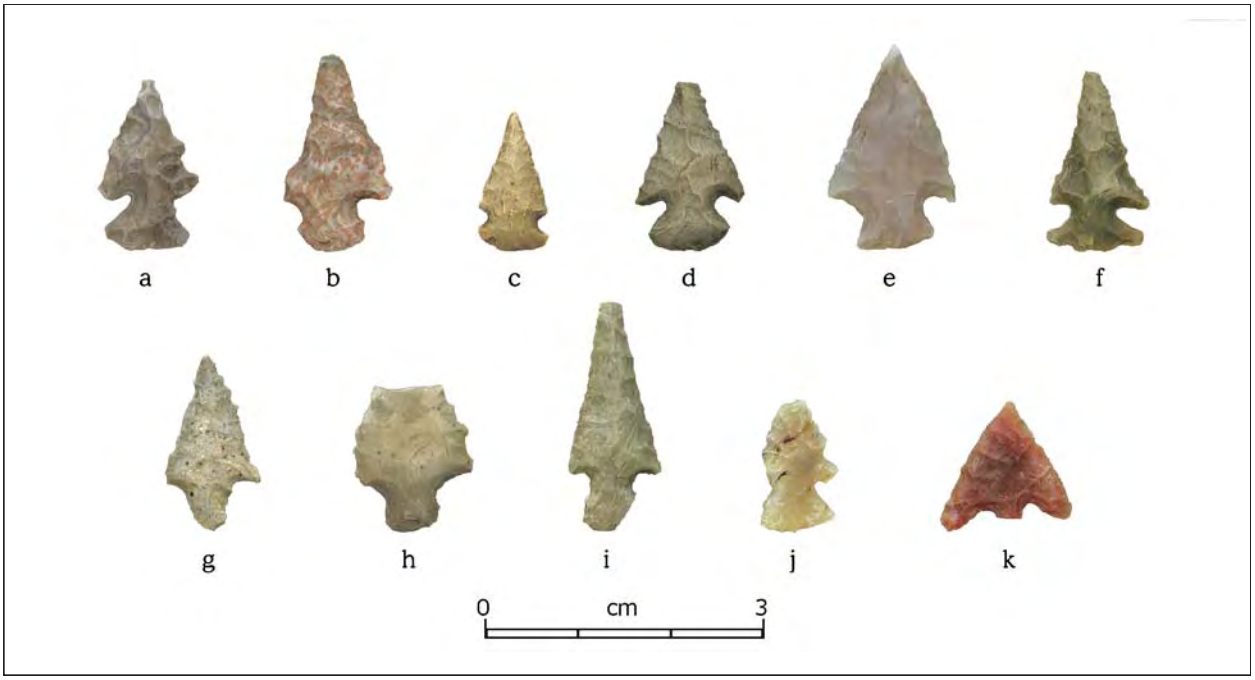

Figure 98. Type 3 projectile points: (a-d) Type 3-A; (e-f) Type 3-B; (g) Type 3-C; (h-i) Type 3-D; (j) possible Type 3-F; (k) Type 3.

they were broken during use and returned to Townsend for replacement. The other three have snap fractures.

A single complete Type 3-C point was identified. It has wide corner notches and a contracting stem. Four examples of Type 3-D arrow points were also found. None are complete, though a serrated specimen is only missing its tip (Fig. 98h), and another is missing its tip and part of the base (Fig. 98i). The breaks on both of these specimens are snap fractures. The two remaining Type 3-D points are represented by bases, and both exhibit haft snaps, indicating they were broken during use. A possible Type 3-F point is represented by a base and part of a midsection (Fig. 98j). The remaining blade edge on this specimen appears to have been deeply serrated, and it was broken during use, the tip having been removed by an impact fracture.

Three other fragmentary points were assigned to the general Type 3 category because they are missing their bases. One specimen (Fig. 98k) has distinct barbs and may represent a Type 3-C, though this is questionable. The base was removed from this point by a snap fracture. Two other specimens are midsections of corner-notched points. One exhibits a haft snap, and the other has snap fractures.

Leslie (1978:117) considers Type 4 projectile points to mostly represent preforms for large arrow points or small dart points, though he notes that some may have been finished tools. Three chert bifaces were assigned to this category because they are substantially larger than the Type 1 preforms, but they are unnotched and therefore potentially unfinished. Unlike the other point types discussed thus far, only one of these specimens was found at Townsend. The others came from LA 117255 and LA 117257.

The specimen from Townsend is a whole middle-stage biface discarded because of excessive stepping on both surfaces that prevented further thinning, and it is therefore a preform (Fig. 99a). When thinned to the extent that notching was possible, this biface would

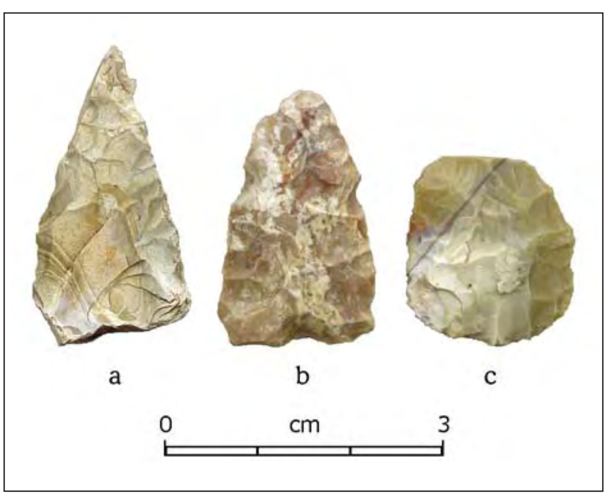

Figure 99. Type 4 projectile points: (a) Townsend; (b) LA 117255; (c) LA 117257.

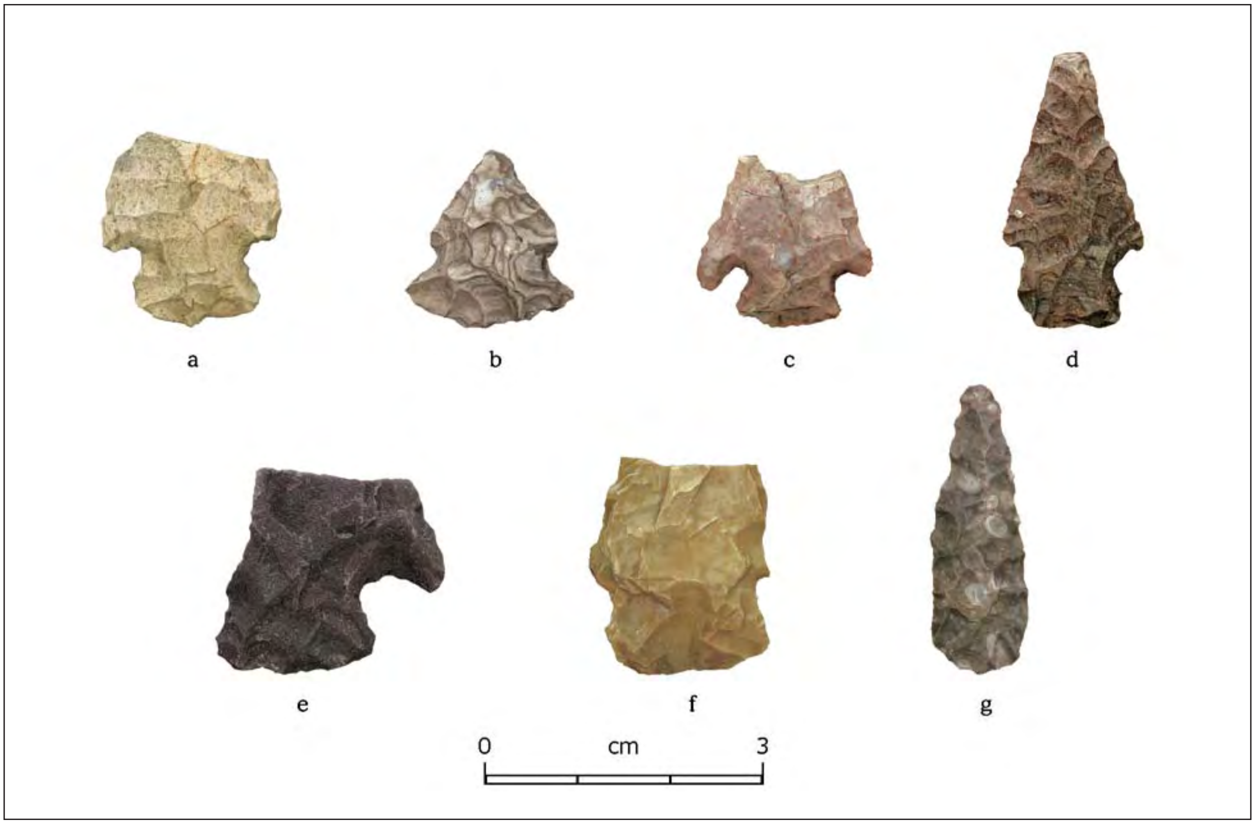

Figure 100. Large arrow or small dart points, and dart points: (a) possible Type 5; (b) Type 6-D; (c) Type 8-A; (d) Type 8-B; (e) Type 8-D; (f) Type 9; (g) Type 10-A.

have been reduced to the size of an arrow point. The specimen from LA 117255 is another middle-stage biface abandoned during production because of stepping on one surface that prevented satisfactory thinning (Fig. 99c). Like the example from Townsend, when sufficiently thinned to allow notching, this biface would have been reduced to arrow-point size. In contrast, the example from LA 117257 is a late-stage biface that is missing its tip because of a snap fracture. This preform appears to be ready for notching and may have been discarded because the tip snapped off during production. In any event, it is sufficiently thinned to permit notching and is of a size that could have served either as a small dart or large arrow point.

Type 5 projectile points include side-notched large arrow or small dart points with convex bases, with no varieties defined (Leslie 1978:117). Considering their description and Leslie's (1978:120) illustrations, this type is very similar to the medium-sized lateral-notched points discussed by Moore (1999a). The difference between side- and lateral-notching in that context was based on the size of the notch opening and angle of the barbs in relation to the point midline. Points with narrow notch openings and barb angles approaching 90 degrees were classified as side-notched, while those with wide notch openings and obtuse barb angles were considered lateral-notched. One specimen from Townsend was tentatively assigned to this type (Fig. 100a), with its tip removed by a snap fracture. The size of this specimen suggests that it was used on a dart.

Leslie (1978:117) classifies corner-notched large arrow or small dart points as Type 6 projectile points, which he separates into four varieties according to hafting element shape. Type 6-A points have expanding stems with convex bases, with shoulders that are pronounced to well-barbed (Leslie 1978:119). Type 6-B points are similar to Type 6-A except their bases are mostly straight (Leslie 1978:121). Type 6-C points have wide stems that are straight, contracting, or slightly expanding, with straight or convex bases and slight to pronounced shoulders (Leslie 1978:122). Type 6-D points have wide expanding stems, convex bases, and weak to pronounced shoulders; they appear to have been resharpened, and the stem usually makes up half or more of their length (Leslie 1978:124).

Only one specimen from Townsend was assigned to this category (Fig. 100b). This point is made of San Andres chert, and is classified as a Type 6-D. Like most

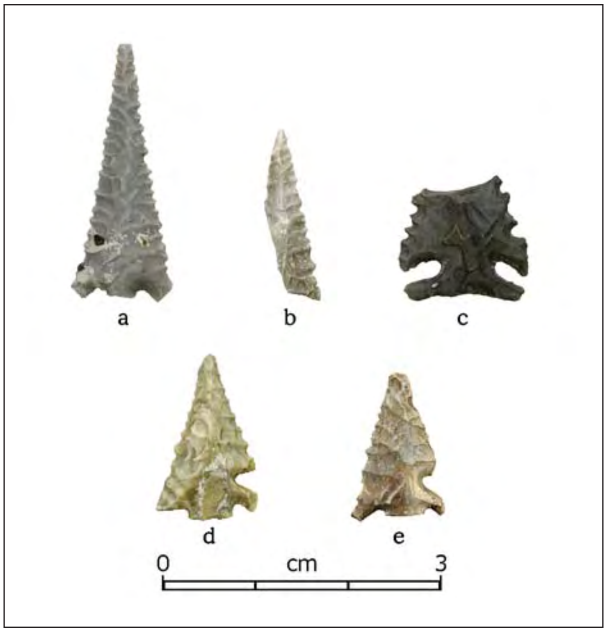

Figure 101. Aberrant projectile points: (a) corner-notched arrow point with finely serrated blade; (b) finely serrated arrow point tip; (c) deeply corner-notched arrow point with finely serrated blade; (d-e) corner-notched arrow points with finely serrated blades and one extra side-notch.

points of this variety illustrated by Leslie (1978:126), this specimen has been resharpened and probably began life as a Type 9.

Type 7 projectile points mostly represent dart preforms. The type is divided into two styles (Leslie 1978:125): large triangular unnotched preforms with convex bases (Type 7-A), and large triangular unnotched preforms with straight bases (Type 7-B). No definite specimens of this type were recovered, though some of the larger undifferentiated bifaces may represent preforms that were broken during the early stages of dart point manufacture.

Type 8 projectile points include most corner-notched dart points and are 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). Points belonging to this category were only found at the Townsend site. Of the eight specimens in this category, three are Type 8-A, two are Type 8-B, two are Type 8-D, and one could not be assigned to a specific variety.

One Type 8-A point is siltstone; the others are varieties of chert. The most complete specimen is missing its tip, which was removed by an impact fracture (Fig. 100c). The others are represented by bases, one of which exhibits a possible haft snap, and the other a nondiagnostic snap fracture. Thus, one and possibly two points in this category broke during use.

Fig. 100d shows the most complete of the two Type 8-B points. This specimen is chert, and a snap fracture has removed its tip. After the tip was broken the point was reused. Blade edges adjacent to the tip are rounded, and wear runs into the break, indicating that use occurred after breakage. Striations running perpendicular to the blade edge were visible at 95x, suggesting rotary use. Thus, this point was reused as a perforator, probably a drill. The second specimen in this category is silicified wood and consists of part of a base exhibiting a nondiagnostic break.

Both Type 8-D points are bases, though one also includes part of the midsection (Fig. 100e). The latter is made from a local light purple quartzite and exhibits a snap fracture. The second specimen is made from Edwards Plateau chert and has a possible haft snap. The final example of this type could not be assigned to a specific variety because it consists of a midsection which is missing both tangs. This specimen is chert and exhibits a possible impact fracture and a haft snap.

The Type 9 projectile point designation contains all lateral-notched dart points and was not subdivided (Leslie 1978:135-136). Only one point was placed in this category, a chert base and midsection from Townsend that exhibits a snap fracture (Fig. 100f).

Type 10 projectile points have long slender blades with no notches or shallow lateral notches and are thought to have been used on darts (Leslie 1978:125). This category is divided into three varieties: Type 10-A is unnotched, Type 10-B has shallow lateral notches, and Type 10-C is notched or unnotched with exaggerated serrations (Leslie 1978:125). While many examples of Type 10-A may have been preforms, Leslie (1978:137) feels that some may have been used as unnotched projectile points.

The only example of this type from our assemblage is a complete specimen of a Type 10-A from Townsend. This point is a narrow late-stage biface with beveled edges, indicating that it was resharpened (Fig. 100g). It appears to be a finished tool that could have been used as a projectile point, a knife, or both.

A total of 31 specimens, all from the Townsend site, are considered unidentified projectile points. Fragments that could not be assigned to any of the above types because of their fragmentary nature or because they differ greatly from the types included in this scheme can be categorized as eccentrics. Five specimens fall into the latter category, all of which are made from chert. A long, slender corner-notched arrow point with a finely serrated blade is missing its base and tangs, and exhibits a snap fracture (Fig. 101a). This specimen is a very thin and well-made masterpiece of flintknapping. The tip of a similar point is also represented and exhibits a crenated fracture indicating that it was weakened during thermal treatment (Fig. 101b). A third specimen could be considered a variant of Type 3 but differs from all specimens illustrated by Leslie (1978). This arrow point has very deep, narrow corner notches, a slightly concave base, and finely serrated blade edges (see Fig. 100c). Its tip was removed by an impact fracture, so it was broken during use. The two remaining specimens are corner-notched arrow points that are almost identical in form to one another. Both are missing their bases from nondiagnostic snap fractures; they have fairly long tangs, finely serrated blade edges, and an extra side-notch (see Figs. 100d and 100e).

The other 26 specimens in this category are unidentifiable chert projectile point fragments (Table 88). Two bases (proximal fragments) are from arrow points and exhibit nondiagnostic breaks. All 10 midsections are also from arrow points: 5 (50 percent) have snap fractures, 3 (30 percent) have manufacturing breaks, and 2 exhibit use-related breaks. The manufacturing breaks include two lateral snaps and one crenated fracture. The latter specimen is also crazed, suggesting the break followed a crack caused by incorrect thermal treatment and probably occurred when pressure was applied during manufacture. The use-related breaks include a specimen with a serrated blade that has an distal impact fracture and a proximal haft snap, and a specimen with a distal snap fracture and a proximal haft snap. Both of these fragments were probably returned to the Townsend site in carcasses.

Only 1 of 14 tips is a fragment of a dart point. This specimen exhibits a lateral snap, which is indicative of production breakage. The remaining 13 fragments are arrow point tips. Nondiagnostic snap fractures were noted on six specimens, one of which is serrated. The tip and one blade edge of the latter are heavily rounded, suggesting that this specimen was also used as a drill before it was broken. Seven tips exhibit impact fractures, indicating that they broke during use and were probably returned to the Townsend site in carcasses. Examination of the tips under ultraviolet light suggests that one was made from an exotic material.

Table 88. Unidentifiable projectile point fragments from Townsend

Fragment	Unidentified Point Type	Dart Points	Arrow Points
Proximal	-	-	1
Medial	-	-	10
Distal	2	1	11
Total	2	1	23

Provenience

All but two of the projectile points and preforms were recovered from the Townsend site (LA 34150). Those exceptions are both Type 4 preforms, one from LA 117255, the other from LA 117257. The former was discarded after being broken during manufacture, while the latter exhibits a nondiagnostic break. Identifiable specimens are considered in detail, while fragments are discussed in a more cursory fashion.

Area A contained 77.7 percent of the whole and fragmentary points from the Townsend site, including most of the Type 1 arrow points/preforms (16; 88.9 percent). Two specimens were recovered from Structure 2 fill, including a Type 1-A that was broken in manufacture and a Type 1-B/3-B that was discarded after one notch was cut. While no Type 1 points were found in Structure 5, a Type 1-A/3-A broken in production after one notch was cut was found south of this structure, and an unbroken Type 1-A was recovered from the area between Structures 2 and 5. Six other preforms were found in extramural areas near these structures, including four Type 1-A and one Type 1-B preforms that were broken in manufacture and/or discarded because of manufacturing flaws, and a Type 1-A that was broken in use. The last preform from this area is a Type 1-A obsidian base with an uncertain provenience.

Three Type 2 arrow points (60 percent) were found in Area A. A Type 2-B base with a possible haft snap was recovered from Structure 2 fill, and two specimens were found in an extramural area west of Structure 2. The latter include a Type 2-F base that was damaged by fire at some time after manufacture and a Type 2-A that was damaged during use and probably discarded when the shaft to which it was attached was refurbished.

Type 3 arrow points were the most common type recovered from Townsend, and 82.1 percent came from Area A. Three fragments exhibiting haft snaps were found in structural fill: a Type 3-B base in Structure 2, a Type 3-B base in Structure 3, and a Type 3 midsection in Structure 5. Fifteen points falling into this category were found near Structures 2 or 5. Specimens from west and southwest of Structure 2 include a Type 3 midsection, a complete Type 3-A and a Type 3-A base, two Type 3-B bases (one damaged by fire after manufacture, the other with a haft snap), and a Type 3-D base with a probable haft snap. Specimens found south and southeast of this structure include a whole resharpened Type

3-A, two Type 3-A bases with haft snaps, a Type 3-A and a Type 3-B, both complete except for missing tips, and a probable Type 3-C, which is missing its base. A Type 3-B base and a Type 3-D base, both with haft snaps, were found north of Structure 5, a Type 3-F with an impact fracture came from just west of that structure, and a Type 3-B base with a possible haft snap came from the area between Structures 2 and 5. Two Type 3-A bases were found near Structure 3: one to the north, and one to the southeast (with a possible haft snap). Other corner-notched arrow points from Area A include a complete Type 3-C and a Type 3-D missing its tip.

The only Type 4 point found at Townsend was recovered from Structure 2 and could represent a preform for a large arrow point or a small dart point. This specimen was abandoned because step fracturing on both surfaces prevented satisfactory thinning. Likewise, the only example of a Type 6-D dart point was found just east of Structure 5. This specimen is made from San Andres chert and has been extensively resharpened.

The only Type 5 medium-sized dart point found at Townsend, a base and midsection, was recovered from just south of Structure 6. Similarly, the only Type 9 dart point from the site, a base and midsection, was found in Structure 4 fill.

Most of the remaining dart points fall into the Type 8 category, 75 percent of which were recovered from Area A. Two were found in the far northern part of Area A, including a Type 8-A with its tip removed by an impact fracture and a fragment of a Type 8-B base. Three specimens were found north and northeast of Structure 3, including two Type 8-D bases (one of which is made from Edwards Plateau chert and has a haft snap) and a Type 8-B that lost its tip and was reused as a drill. The last Type 8 dart point from this area was found southeast of Structure 3, a midsection exhibiting a haft snap and a possible impact fracture. A single Type 10-A dart point (resharpened) was found northeast of Structure 3.

All five eccentric arrow points were found in Area A. Two specimens are very similar in shape with deep corner notches, finely serrated blades, and one extra side notch; both are missing their bases. One was found just south of Structure 3, and the second was recovered from just east of Structure 2. A third point has deep corner-notches, a slightly concave base, and a finely serrated blade, but it is missing its tip and has no extra notch. This point was found east-southeast of Structure 2. The two final specimens may be from similar points. One is corner-notched with a long, narrow blade that has finely serrated, slightly concave edges and is missing its base. This point was found just south of Structure 2. The second is represented by the tip of a long, narrow point with finely serrated blade edges. This point was recovered from Structure 5 fill.

Like the other point categories, most of the unidentifiable fragments were found in Area A (73.1 percent). With one exception, they were recovered near Structures 2, 3, and 5. One fragment appears to have been part of a dart point, 16 are arrow point fragments, and 2 are unidentifiable as to size. An indeterminate fragment of a probable arrow point was found in Structure 2 fill. Structure 3 fill contained an arrow point midsection that snapped during manufacture and an arrow point tip. Two arrow point fragments were also found in Structure 5, including the midsection of a serrated point with a haft snap and impact fracture, and an unidentified base.

The remaining fragments consist of tips (n=10) and midsections (n=4)—portions that tend to lack identifying characteristics. One tip is from a dart point and was broken during manufacture. The remaining tips are from arrow points. One was broken during manufacture, five exhibit impact fractures, and three have nondiagnostic breaks. Of the four midsections, one was broken during manufacture, one exhibits a haft snap, one exhibits a crenated fracture from improper heat treatment and probably broke during manufacture, and the last specimen has nondiagnostic breaks.

Area B yielded the second highest percentage of points from the Townsend site (19.1 percent). Type 1 preforms/points found in this area include a Type 1 that was discarded after being ruined by an overshot flake from Structure 1 fill, a Type 1-C broken during production from Feature 37, and a Type 1-B broken during production from north of Structure 1. Two Type 2 arrow points (40 percent) were also found in this area: a base with a probable haft snap in Structure 1 fill and a Type 2-B base and midsection with a snap fracture from south of the structures in this provenience. Four Type 3 arrow points (14.3 percent) were recovered from Area B: three from in and around Structure 1, including a Type 3-D that is missing its tip, a complete Type 3-A from structural fill, a Type 3-B base and midsection from northeast of the structure, and a Type 3-B base from the southern part of the area that lacks association with any structure.

Seven arrow point fragments (26.9 percent) that cannot be assigned to any specific types were found in Area B. Two tips and a midsection were recovered from Structure 1 fill. A tip was removed by an impact fracture, and the other fragments exhibit snap fractures. The four remaining specimens were not associated with any structures and include a base, two midsections, and a tip. The latter appears to have been reused as a drill, with heavy rounding evident on blade edges at the distal end.

A single Type 8-A base with a possible haft snap was recovered from Area C at Townsend. Projectile points were scarce in Townsend West or Area D. They include a whole Type 3-B arrow point and a Type 8-A dart point base.

Dating

The ability of projectile points to provide dates for a site is greatly surpassed by other types of materials. Points are really only suitable for this purpose when other temporally sensitive materials are lacking, or when the presence of multiple components must be established. However, the latter must be approached carefully since many groups salvaged projectile points from earlier sites and reused them in a variety of ways. Thus, the simple presence of an earlier projectile point in a component is not necessarily an indication of multiple components. Similarly, projectile points should not be used to negate more accurate temporal indicators unless there is compelling evidence for a problem with those dating methods.

Ten assemblages from seven sites are available for analysis. Unfortunately, projectile points were only recovered from six proveniences on three sites, four of which are from the Townsend site. Only two projectile points were found on sites other than Townsend—one each from LA 117255 and LA 117257. The former has been dated to the Late Archaic period, while the latter provided no temporally sensitive materials. Both sites produced a single Type 4 preform of a size suitable for the production of either arrow or dart points. Thus, these specimens have little temporal sensitivity. While the Type 4 preform from LA 117255 could be considered potential corroboration of the Late Archaic date assigned to that site, the same can not be said for the specimen from LA 117257. Unfortunately, that site must remain undated.

The projectile point assemblage from the Townsend site includes examples of nearly all of the major types defined by Leslie (1978), though not all varieties are represented. The distribution of pottery at the site suggests that Area A dates to the early Ceramic period and Area B to the late Ceramic period. These conclusions are supported by radiocarbon dates obtained from structures and features. Areas C and D were assigned to the Late Archaic period by radiocarbon dates. The distribution of certain types of projectile points can be used to amplify these temporal data, though their association with well-dated components will be more useful in refining dates for the regional projectile point typology developed by Leslie (1978).

That typology is based on a detailed examination of over 10,000 projectile points from nearly 300 sites in southeast New Mexico (Leslie 1978:88). Unfortunately, no radiocarbon dates were available at the time of the study, so dates assigned to types come from outside the area or from associated temporally sensitive artifacts (Leslie 1978:88-89). Thus, while based on considerable data, the assigned time spans are questionable in many cases. Still, this typology provides a way in which to order the projectile points from these assemblages, and it can be partly evaluated in light of dates assigned to the few components that produced multiple projectile points.

In general, Leslie (1978:125) feels that dart points reflect a pre-Ceramic, or pre-A.D. 950 date. No definite dart point preforms (Type 7) were identified in our study, though it is possible that some of the larger specimens in the general biface category represent fragments of preforms broken during production or after tools were abandoned for some other reason. All varieties of Types 8 and 9 dart points are assigned to the general Late Archaic or "Hueco phase." While Leslie (1978) assumes the pre-Ceramic extended as late as A.D. 950, dates from Townsend East suggest that this may be as much as 350 years too late, with pottery occurring in the area by at least the A.D. 600s. In southwest New Mexico, the Hueco phase has more recently been dated to between 900 ± 150 B.C. and A.D. 200 ± 100 (MacNeish and Beckett 1987, 1994; MacNeish 1993). At this point, it appears that no accurate date can be assigned to these types, and they will simply be assumed to represent the Late Archaic period.

Type 10 points are leaf-shaped Maljamar points (Leslie 1978:137-141) and occur with and without lateral notching and serrations. Leslie (1978) assigns this type to the general Hueco phase, again suggesting a Late Archaic affinity. In more recent studies in southwest New Mexico, the Maljamar point is assigned to both the Fresnal and Hueco phases, which date between 2600 ± 200 B.C. and A.D. 200 ± 100 (MacNeish and Beckett 1987, 1994; MacNeish 1993). While dates for this style may differ somewhat in southeast New Mexico, they were probably also used in that area from the late Middle Archaic through the Late Archaic.

Thus, the dart points recovered from the Townsend site are primarily indicative of use during the Late Archaic, though one style may also have been used during the late Middle Archaic. While dates for arrow points are somewhat better because of their association with various types of pottery, they also remain a bit vague. Type 1 includes unnotched triangular forms thought to have been arrow point preforms, and in some cases, unnotched points. Leslie (1978) suggests that Types 1-A and 1-B occurred throughout the Ceramic period, with no real temporal differences. In the Highland Mogollon area, this general style is also contemporaneous with the Ceramic period and occurs in temporal contexts ranging from the early Pithouse period through the late Pueblo period (Moore 1999a). Unnotched forms with straight or concave bases tend to be restricted to the Pueblo period (A.D. 1000 to 1350+). This is consistent with experimental flintknapping data, which suggest that straight- and concave-base preforms are better suited to the production of side-notched points, while convex-base preforms are better for the manufacture of corner-notched points. However, this is a generality and not a hard and fast rule. Types 1-C and 1-D have more limited temporal occurrences and are dated to the late prehistoric period, ca. A.D. 1250 to 1500 for Type 1-C and A.D. 1400 to 1500 for Type 1-D (Leslie 1978:94-96). Most Types 1-A and 1-B were probably preforms, though some may have been finished tools. Types 1-C and 1-D almost certainly represent finished point forms and resemble historic period styles from Texas (Hester 1977).

Straight- and convex-base corner-notched points (Types 3-A and 3-B) appear to date from the beginning of the Ceramic period to around A.D. 1200 (Leslie 1978:107). Types 3-C through 3-F are dated between ca. A.D. 1000 or 1050 to shortly before A.D. 1200 (Leslie 1978:111). Type 3-C has a long, slender stem that is parallel-edged to slightly contracting, which Leslie (1978:110) suggests resembles the Alba or Bonham types defined in Texas (Suhm and Jelks 1962). The manufacture of this type seems to have begun sometime later than Types 3-A and 3-B and ended while they were still being made. Type 3-D has a long, narrow parallel-edged to slightly expanding stem which forms a bulb-like base, and a possible comparison with the Bonham point is suggested (Leslie 1978:111). Leslie (1978:113-114) feels that Types 3-E and 3-F are similar to the Livermore points of Texas, though some of his illustrated specimens differ greatly from that type as shown by Suhm and Jelks (1962).

Side-notched forms are consistently assigned later dates and often shorter periods of manufacture. Side-notched points with convex bases (Type 2-A) fall into the latter category and are dated between A.D. 1200 and 1300 (Leslie 1978:96). Straight-base forms (Type 2-B) were much longer lived, occurring from A.D. 1200 until the end of the sequence around A.D. 1500 (Leslie 1978:99). Concave-base forms (Type 2-C) were also manufactured through most of this period, occurring between ca. A.D. 1250 and 1500 (Leslie 1978:101). Basally notched forms (Types 2-D through 2-F) were more temporally restricted. Types 2-D and 2-E appeared around A.D. 1350 and lasted until ca. A.D. 1500 (Leslie 1978:102, 105). The latter is equated with the Harrell point as defined in Texas (Leslie 1978:105; Suhm and Jelks 1962). The manufacture of Type 2-F seems to have begun after A.D. 1400 and ended by around 1500 (Leslie 1978:106). This type is considered similar to the Toyah point (Leslie 1978:106) and is representative of the terminal period of prehistoric occupation.

Leslie (1978:116) summarizes temporal relationships between arrow point types in a graph, which shows some interesting trends, though the exact dating of styles remains uncertain. According to his scheme there was only a slight temporal overlap between corner-notched and side-notched forms. The initial production of side-notched Type 2-A (just before A.D. 1200) is thought to have slightly overlapped the end of the period in which corner-notched Types 3-C through 3-F were used, but by the time Type 2-B began to be made (ca. A.D. 1200), the only corner-notched forms still in use were Types 3-A and 3-B. Convex-base side-notched arrow points (Type 2-A) were no longer used after about A.D. 1300, and at that time production of convex-base preforms (Type 1-A) also seems to have ended. Straight-base preforms were apparently made throughout the sequence. Concave-base preforms (Type 1-C) appeared when straight-base, side-notched points (Type 2-B) began to be produced (ca. A.D. 1200), and concave-base, side-notched points (Type 2-C) appeared slightly later (ca. A.D. 1250). This is contrary to expectations, since concave-base preforms should appear concurrently with concave-base side-notched points.

Other side-notched types were introduced after about A.D. 1350 and were used until the end of the sequence. Deeply concave unnotched points (Type 3-D) were introduced before A.D. 1450, and convex-base unnotched points (Type 1-A) reappeared at the same time. The latter is consistent with late protohistoric and historic use of unnotched points across most of the Southwest and into the Great Basin (Holmer 1986; Hester 1977; Kearns 1996).

There are potential problems with this scheme. In an examination of projectile points from southwest New Mexico, Moore (1999a) found that the Highland Mogollon projectile point assemblage was accumulative rather than exclusive. When a new point type was introduced it tended to supplement earlier forms, not replace them. Thus, while side-notched points dominate that assemblage after their introduction, corner-notched forms were used until the end of the sequence. In contrast, the Pueblo occupants of northwest New Mexico tended to replace older forms with new ones, so that corner-notched arrow points mostly disappeared after the introduction of side-notched forms in a way that is very similar to the scheme proposed for southeast New Mexico by Leslie (1978). However, the Pueblo occupants of the northern Rio Grande continued to manufacture corner-notched points long after side-notched forms were adopted. Corner-notched arrow points occur in association with classic period farming sites in the Ojo Caliente Valley (Moore and Boyer 1998) and were manufactured at a seventeenth-century farmstead near Pecos Pueblo (Moore n.d.a). Thus, only further study can determine how the projectile point assemblage in southeast New Mexico was structured.

Table 89. Temporal information and types of projectile points for structures at the Townsend site.

Attribute	Structure 1	Structure 2	Structure 3	Structure 5	Structure 6
Radiocarbon dates (calibrated 2 sigma)	A.D. 1005-1175	A.D. 670-870	A.D. 655-785 A.D. 650-910 or 920-955	A.D. 625-770 A.D. 890-1185	A.D. 615-690
Major pottery types	El Paso Brown Jornada Brown Chupadero Black-on-white Mimbres white ware corrugated	El Paso Brown Jornada Brown	El Paso Brown Jornada Brown	El Paso Brown Jornada Brown	El Paso Brown
Projectile point types	Type 1 (1) Type 3-A (1) Type 3-B (1) Type 3-D (1) Type 2-B (1)	Type 4 (1) Type 1-A (2) Type 1-B (1) Type 3 (1) Type 3-A (3) Type 3-B (3) Type 2-B (1) Eccentric (1)	Type 8 (1) Type 10-A (1) Type 1 (1) Type 1-A (2) Type 1-B (1) Type 3-A (2) Type 3-A (1) Eccentric (1)	Type 6-D (1) Type 1-A (3) Type 3 (1) Type 3-A (1) Type 3-B (2) Type 3-D (1) Type 3-F (1) Eccentric (2)	Type 5 (1)

Five areas at Townsend contained both projectile points and more temporally sensitive materials that can be examined in light of this discussion. They include the zones in and around Structures 2, 3, 5, and 6 in Area A, and Structure 1 and surrounding zone in Area B. Table 89 presents temporal data for these areas. Structure 1 yielded the latest radiocarbon date and is the only structure that contained both Chupadero Black-on-white and Mimbres white ware. No dart points were associated with this structure, and the corner-notched point assemblage is consistent with a late Ceramic period date. The presence of a single side-notched point (Type 2-B) is also consistent with the other temporally sensitive materials.

Structure 2 is more confusing. This house was radiocarbon dated to the early Ceramic period and contained only brown wares (Table 89). Most of the associated points reflect that date. Several preforms are arrow point size (Type 1), and a single Type 4 could have been used for either a large arrow or dart point. Seven of eight finished arrow points are corner-notched, and one is side-notched. Except for the latter, this assemblage reflects a solid early Ceramic period date. However, in addition to the side-notched point, a possibly associated area west and southwest of Structure 2 contained five corner-notched points, two side-notched points, and five arrow point preforms. Two possibilities must be considered, and data are insufficient for selecting which may be more likely. First, the date for this structure may be too early. The only radiocarbon date is on mesquite, and it was quite small. Since we could not ascertain that only outer rings were present, this is a low quality sample (Smiley 1985:71-72), with possible discrepancies of up to several hundred years between this date and the actual period of use. Only brown wares were recovered from Structure 2, but the number of sherds was low, so sample error could be responsible for the absence of more diagnostic decorated wares. The second possibility is that this area contains multiple components, with an ephemeral late Ceramic period occupation overlying early Ceramic period remains.

Radiocarbon and ceramic dates suggest that Structure 3 was occupied during the early Ceramic period. Most of the associated projectile point assemblage reflects this date: the only preforms recovered from this area are arrow point-sized, and the four arrow points are all corner-notched. However, two dart points were also found near Structure 3. A Type 10 point which has been resharpened could easily have served as a knife rather than a projectile point, but a Type 8 point fragment was almost certainly used on a dart. This suggests two possibilities: either darts were still used alongside arrows in the early Ceramic period, or there is an underlying Late Archaic component in this area. It is not unreasonable to assume that darts continued to be used after the introduction of the bow: dart points occur at Highland Mogollon sites as late as A.D. 1150 to 1300 (Moore 1999a). However, a small area about 5 m north of Structure 3 contains three additional Type 8 dart points as well as two large biface fragments. This increases the possibility that multiple components are present.

Structure 5 yielded two radiocarbon dates, one placing it solidly in the early Ceramic period and a second placing it toward the end of the early Ceramic and near the beginning of the late Ceramic period. Like Structure 2, this house yielded only brown wares, but the number of sherds was low. Since Structures 2 and 5 were separated by only a few meters, some points must be considered associated with both structures, especially those found in the area between them. Thus, there is a bit of an overlap in projectile point assemblages. While no side-notched points were directly associated with Structure 5, two corner-notched points are types that seem to occur late in the early Ceramic period. These are the specimens assigned to the Type 3-D and 3-F categories, which Leslie (1978:116) feels were used between A.D. 1000 and 1200. If these dates are correct, the later radiocarbon date is a more accurate reflection of the period of occupation.

Structure 6 seems to date solidly to the early Ceramic period. This is suggested by a single radiocarbon date, as well as a small ceramic assemblage. The presence of a single large arrow/small dart point (Type 5) may also support this date, though it cannot be highly relied upon. Unfortunately, a paucity of chronometric data for Structure 6 leaves us without a solidly reliable date, and the single projectile point found close to it adds little to those data.

Projectile point dates tend to corroborate other types of chronometric data in some instances, but in other cases they suggest there may be problems with assigned dates or the number of components represented. Structure 1 has been assigned a general late Ceramic period date. Projectile point data tend to weakly support this date for Structure 1.

Structures 2 and 5 are also near one another in Area A, and Structure 3 is not too distant. This part of the site has been assigned a general early Ceramic period date. If these structures were occupied concurrently, the projectile point assemblage suggests an occupation very late in the early Ceramic period or very early in the late Ceramic period. This seems more likely than an ephemeral late Ceramic period occupation overlying just Structure 2 and the area west of it.

The projectile points associated with Structure 3 correspond to an early Ceramic period occupation but provide no information that could more accurately help determine the placement of this structure within that period. However, the distribution of dart points in Area A seems to suggest the presence of an earlier component dating to the Late Archaic period, a possibility that can be explored in more depth using data from the debitage assemblage.

Activities Reflected by the Formal Tool Assemblage

The presence of formal chipped stone tools and their condition can provide information on the types of activities that may have occurred at a site. However, one must keep several caveats in mind. Generally, formal tools remaining at a site after abandonment represent those that were broken, lost, or replaced because of excessive wear. Formal tools that retained value were usually carried off or cached for later use or retrieval. Thus, only part of the formal tool assemblage is likely to be represented at a site, which means that many of the activities performed at that locale using formal chipped stone tools are either unrepresented or must be defined using other data. Formal tools are also often salvaged from earlier sites and reused, potentially creating confusion about temporality. Formal tools can be traded and are often manufactured at a different locale from where they were used and discarded.

Another caveat concerns structural fill. Artifacts generally accumulate in pit structures in two ways: they were deposited by natural processes like colluvial movement, or they were intentionally deposited by human action. In the former case, materials found in a structure consist of artifacts that were discarded during site occupation and reflect activities that occurred during that time (providing the site was not reoccupied before the pit structure was filled). The latter case tends to occur when a pit structure was abandoned, but the site continued to be occupied. In this situation, abandoned structures were often used for trash disposal, and materials found within them reflect activities performed at nearby houses rather than the one in which they were found. Since the structures excavated at Townsend East were shallow and do not seem to have been used for trash disposal, we can be fairly certain that the artifacts they contain reflect activities that occurred during their occupation. However, reoccupation of certain areas must still be kept in mind as potential causes of mixed deposits.

The following discussion summarizes data presented earlier in this chapter for each provenience that yielded formal tools. Tables 90 through 92 present summaries of the activities indicated for each of these proveniences.

Area A, Townsend

Postulated activities for areas within Area A are shown in Table 90. The area in and around Structure 2 contained the largest number of tools recorded for any provenience. The two cobble tools from this area may have been used as hammerstones in general chipped stone reduction, and one may also have been used to chop materials like wood, bone, or antler. Several tools reflect the manufacture of large and small bifaces, including an undifferentiated biface and projectile point preform discarded because of manufacturing flaws, and two projectile points broken during manufacture.

Table 90. Activities reflected in formal tool assemblages from Area A at Townsend East.

Activity	Structure 2	Structure 3	Structure 5	Structure 6	Other Areas
General chipped stone reduction	•				•
Large biface manufacture	•	• (?)	•		•
Small biface manufacture	•	•	•		• (?)
Cutting/chopping wood, bone, or antler	•	•			•
Recycling materials	•	•			•
Refurbishing projectile shafts	•	•	•		•
Processing carcasses	•	•	•		
General hunting	•	•	•	•	•
Perforating hard or semihard materials	•	•			
General cutting tasks		•	•		
Hide, wood, bone, or antler working					•

Table 91. Activities reflected in formal tool assemblages from Areas B, C, and D at Townsend.

Activity	Townsend East				Townsend West
	Area B Structure 1	Area B Structure 4	Area B Other	Area C	Area D
General chipped stone reduction			•		
Large biface manufacture	•	•	•		
Small biface manufacture	•			•	
Cutting/chopping wood, bone, or antler	•		•		
Recycling materials			•	•	
Refurbishing projectile shafts	•			•	
Processing carcasses	•				
General hunting	•	•	•		•
Perforating hard or semihard materials			•		
General cutting tasks					
Hide, wood, bone, or antler working	•				

Table 92. Activities reflected in formal tool assemblages from other sites.

Activity	LA 117248	LA 117255	LA 117257
General chipped stone reduction			
Large biface manufacture			
Small biface manufacture		•	
Cutting/chopping wood, bone, or antler			
Recycling materials			
Refurbishing projectile shafts			
Processing carcasses			
General hunting			•
Perforating hard or semihard materials			
General cutting tasks			
Hide, wood, bone, or antler working	•	•	

Another undifferentiated biface fragment was intentionally smashed and is indicative of material recycling. A drill fragment would have been used to perforate semihard to hard materials. Hunting-related activities are indicated by the condition of several projectile points and fragments. Bases exhibiting haft snaps were broken during use, returned to the site, and discarded when refurbishing the shafts to which they were attached. Midsections and tips exhibiting impact fractures or haft snaps were also broken during use. However, in this case they were probably returned to the site in carcasses and discarded during processing. Whole points and fragments with nondiagnostic breaks can only be used to suggest general hunting activities. Points reflecting all three of these activities were recovered in and around Structure 2.

Tools found in and around Structure 3 reflect a similar, though slightly different, range of activities. Large and small tool manufacture is evidenced by an undifferentiated biface that may have been discarded because of a manufacturing flaw and parts of three projectile points that were broken during manufacture. A denticulate would have been used to saw hard or semihard materials like wood, bone, or antler. A corner-notched arrow point base exhibits a haft snap indicative of discard during shaft refurbishing, as does a corner-notched dart point base. The midsection of a dart point exhibits both a haft snap and an impact fracture, and would have been discarded when a carcass was processed. A third dart point base was reshaped into a hafted drill after it was broken and is indicative of two activities: material recycling and perforating. Yet another dart point was resharpened and may actually have been manufactured as a knife or reused for general cutting tasks. Several projectile point fragments exhibiting nondiagnostic breaks also occur in this area and are indicative of general hunting activities.

A shorter list of tasks is suggested by the formal tools found in and near Structure 5. Production of both large and small bifaces probably occurred in this area, as indicated by an undifferentiated biface and two points that were broken during manufacture, and a third point that was discarded after encountering a material flaw. Two arrow point bases with haft snaps and a base/midsection exhibiting an impact fracture are indicative of discard during shaft refurbishing, while an arrow point tip removed by an impact fracture was probably discarded while processing a carcass. An extensively resharpened dart point was also found in this area and was probably collected from an earlier site and used as a knife for general cutting tasks, or was manufactured with that purpose in mind.

While several formal tools were recovered from the area between Structures 2 and 5, the tasks they are indicative of replicate several of those already defined for those areas and thus add little to this discussion. Tools found in sections of Area A that cannot be linked to specific structures suggest several tasks. They include hammerstones and biface-cores (general chipped stone reduction), several undifferentiated bifaces that were broken during manufacture (large biface production), an arrow point preform with a nondiagnostic break (small biface production?), a denticulate (cutting wood, bone, or antler), a dart point with its tip removed by an impact fracture (shaft refurbishing), points that are unbroken or exhibit nondiagnostic breaks (general hunting tasks), and end scrapers (hide, wood, bone, or antler working).

The only formal tool from Structure 6 is a dart point fragment exhibiting a nondiagnostic break. This suggests general hunting tasks.

Area B, Townsend

Postulated activities for specific areas in Area B are shown in Table 91. The only cobble tool recovered from this area was associated with Structure 1 and was probably used to chop hard or semihard materials. A uniface from Structure 1 is part of an end scraper which, when hafted, was probably used to work hard or semihard materials including leather, wood, bone, and antler. Large biface manufacture is indicated by the recovery of three edge bites. Small biface manufacture is suggested by the presence of two point preforms discarded because of manufacturing errors or breaks. Several other small bifacial tools recovered from this area indicate a variety of tasks. A side-notched point base which exhibits a haft snap was probably discarded during shaft refurbishing, and a tip removed by an impact fracture was undoubtedly discarded while processing a carcass. A whole point and several fragments exhibiting nondiagnostic breaks are indicative of general hunting tasks.

Comparatively few formal tools were recovered in and around Structure 4. An edge bite from structural fill was the only good evidence of formal tool production in this area and is indicative of large biface manufacture. A projectile point fragment exhibiting a nondiagnostic break suggests general hunting tasks.

Tools from parts of Area B that could not be linked to a specific structure suggest several tasks (Table 91). They include a biface-core (general chipped stone reduction), undifferentiated bifaces broken during manufacture (large biface production), a probable biface-core that was reworked (recycling), a point broken during manufacture (small biface production), a biface fragment reworked into a spokeshave (recycling; cutting wood, bone, or antler), and a projectile point reused as a drill (recycling; perforating).

Areas C and D, Townsend

Table 91 shows presumed activities assigned to Area C and Townsend West or Area D on the basis of formal tool assemblages. No cobble tools or unaltered unifaces were found in Area C, but a uniface that was partly chipped into a bifacial tool before being discarded was found here and suggests material recycling as well as small biface manufacture. The only projectile point from this part of the site exhibits a haft snap and was probably discarded during shaft refurbishing.

No cobble tools or unifaces were found in Area D. The only undifferentiated biface from this area exhibits a nondiagnostic break and cannot be used as direct evidence of large biface production. Only two points were found in Area D: a whole arrow point and a dart point fragment with a nondiagnostic break, both of which are evidence of general hunting tasks.

Other Sites

Activities suggested by formal tools for sites other than Townsend are shown in Table 92. The only formal tool recovered from LA 117248 was an end scraper, which was probably used to work hides, wood, bone, or antler. LA 117255 also yielded an end scraper, as well as the only undifferentiated biface that was not recovered from Townsend. No function can be assigned to the latter because it lacks diagnostic characteristics. A dart or arrow point preform from LA 117255 was broken in manufacture and is indicative of small biface production. LA 117257 yielded a single projectile point with a nondiagnostic break, which is indicative of general hunting tasks.

Conclusions

This examination of the formal tool assemblage has provided quite a bit of information on potential activities performed at proveniences that can be used to supplement data from other analyses to provide a more comprehensive idea of how the sites examined by this project were used. While the discussion of temporal information provided by projectile points often corroborated dates provided by pottery and radiocarbon samples, it also raised questions concerning the existence of multiple components in parts of Townsend East. For example, projectile point typology suggests that radiocarbon dates for Structure 2 and possibly Structure 5 may be too early, or that there is an overlapping late Ceramic period use of that area. Additionally, the possible association of at least one dart point with Structure 3 may indicate the existence of an underlying Late Archaic component in that part of the site.

The first potential temporal anomaly has already been considered, and we concluded that a more accurate date for use of the area containing Structures 2 and 5 is late in the early Ceramic period or very early in the late Ceramic period. However, this possibility is based on essentially untested temporal ranges assigned by Leslie (1978) to corner-notched and side-notched arrow points, which may be incorrect. Especially questionable is his estimated beginning date for the adoption of side-notched points, around A.D. 1200. This form appeared in the Highland Mogollon region during the late Pithouse period (A.D. 750 to 1000) and was common in northwest New Mexico by the Pueblo II period (A.D. 900 to 1000). This seemingly suggests that side-notched arrow points were introduced to southeast New Mexico at a significantly later date than in adjacent regions. While this is feasible, it is much more likely that Leslie's (1978) beginning date for side-notched points is off by 200 years or more, and that this notching system was adopted late in the early Ceramic period rather than during the late Ceramic period. If this conclusion is correct, the apparent anomaly does not exist. Unfortunately, further testing of this idea is beyond the available data and would require a set of well-dated sites or proveniences containing the necessary point types.

The second potential anomaly can be tested with available data, though not in this chapter. Formal tools comprise only part of a chipped stone assemblage, and

Table 93. Chipped stone artifact populations for proveniences at Townsend.

Component	No. of Artifacts	Percentage of Entire Population	No. of Artifacts in Sample Assemblage	Percentage of Component Population
Area A (north of 214N)	10,935	73.1	2,175	19.9
Area B (south of 214N)	3,375	22.6	865	25.6
Area C	233	1.6	220	98.7
Townsend West (Area D)	414	2.8	413	99.8

in this case a fairly minuscule part. As noted earlier, the formal tools that remain at archaeological sites tend to be those that were lost, broken, or worn out and replaced. Much of the picture is therefore missing, but parts can be filled in by studying debris that was discarded during flintknapping or was briefly used without modification and then tossed out. Such an approach can help us to examine the possibility that an Archaic component existed in the vicinity of Structure 3. For reasons that will be discussed in the next section, we would expect to find more evidence of large biface manufacture in this part of the site than in areas which are not suspected of containing earlier components. Thus, discussion of the formal tool assemblage does not necessarily end here; it will be necessary to revisit this discussion and our conclusions as we examine the debitage assemblage.

The Chipped Stone Assemblages

Chipped stone assemblages from seven sites were examined during this analysis. Temporal data indicate that the largest site—the Townsend site (LA 34150)—can be divided into four components. Thus, a total of ten assemblages are available for examination. Unfortunately, accurate dates can only be assigned to five components, four of which are from Townsend. On the basis of radiocarbon dates, LA 117255 and Areas C and D at Townsend are assigned to the Late Archaic period. Ceramic data and radiocarbon dates suggest that Area A at Townsend primarily represents an early Ceramic period occupation, while Area B at the same site was used during the late Ceramic period. Though two Chupadero Black-on-white sherds were recovered from LA 117250, their association with the few chipped stone artifacts from that site is questionable, so it is uncertain whether or not that component dates to the late Ceramic period. Since the chipped stone assemblage from LA 117250 is too small for good comparison to the others, this possible date has little value.

All ten assemblages are not directly comparable. They range in size from a low of two artifacts at LA 117250 to a high of 10,935 from Area A at Townsend. Indeed, analysis of the entire assemblage from Townsend was precluded by its very large size, and only a sample was subjected to intensive analysis, with the balance being rough sorted. The next section discusses the drawing of that sample, and whether or not it is representative of the entire assemblage.

Sampling the Townsend Assemblage

The Townsend site was divided into four components, each of which was separately dated. As Table 93 shows, assemblages from these components were widely variable in size, ranging from nearly 11,000 to just under 250. Because this variability is so extreme, no attempt at proportional sampling was made. Proportional sampling, though in theory a statistically sound method, would have resulted in severe underrepresentation of the two smaller assemblages. Instead, nearly all artifacts from the latter were subjected to intensive analysis, while targeted samples were drawn from the two larger assemblages. A small number of artifacts from Areas C and D were not included in the intensive analysis because they were missed during sorting or had their provenience designation changed too late for inclusion. A few artifacts were recovered from auger tests in parts of the site outside the boundaries of Areas A through D, and were also not included in the intensive analysis sample.

Proveniences from Areas A and B that were selected for sampling included structural remains, features, and extramural grids adjacent to structures. In order to

Table 94. Distribution of major artifact morphology categories for the entire and sample populations; frequencies and column percentages.

Artifact Morphology Category	Entire Population	Sample Population
Angular debris	1,222 8.2%	404 11.0%
Core flakes	12,578 84.2%	2,975 81.0%
Biface flakes	879 5.9%	206 5.6%
Cores	109 0.7%	40 1.1%
Cobble tools	5 0.03%	3 0.1%
Unifaces	9 0.1%	4 0.1%
Bifaces	144 1.0%	41 1.1%

Table 95. Distribution of major artifact morphology categories for the entire and sample populations from each component at Townsend; frequencies and column percentages.

Component	Chi-square	DF	Significance	Phi
Area A	8.2978	6	0.217	0.0250
Area B	80.1477	6	<0.0005	0.1402
Area C	0.0753	5	1.000	0.0129
Townsend West (Area D)	0.0003	4	1.000	0.0006

Table 96. Distribution of major material categories for the entire and sample populations from each component at Townsend; frequencies and column percentages.

Component	Chi-square	DF	Significance	Phi
Area A	46.2993	16	0.0001	0.0591
Area B	35.9208	13	0.0006	0.0939
Area C	0.1349	9	1.0000	0.0173
Area D	0.0163	12	1.0000	0.0044

increase sample size so that at least 20 percent of the artifacts from these areas were intensively analyzed, materials from other grids were added to the sample population. This was done by generating isoplethic distributions of artifacts from the rough sort and intensive analysis sample, and by comparing them to determine whether areas were underrepresented in the sample. When an area seemed inadequately represented in the sample, materials from one or more grids were added to the population.

All other artifacts were rough sorted by material type and artifact morphology categories, counted, and entered into a data base. Formal tools recognized during this analytic stage were separated out for intensive analysis, because this class of artifact comprised only a very small part of the total assemblage yet could provide an unproportionally large amount of important behavioral information.

Table 94 shows the distribution of major artifact morphology categories for the entire population from Townsend versus the sample. A chi-square analysis run on the distribution in Table 94 indicates that different populations are represented (chi-square=38.87, DF=6, significance=<0.0005, phi=0.046), though this relationship is weak. This suggests that there may be no real correspondence between the entire population and the sample. This was not entirely unexpected, since the sample was designed to examine proveniences that were considered likely to provide good information rather than drawing proportionately from different artifact morphology categories.

When both sets of populations from Townsend Areas A through D are examined in the same way, there is a significant resemblance in three of four cases (Table 95), the only exception being Area B. While this is not surprising for Areas C and D, since nearly complete assemblages from those components were examined, it is somewhat surprising for Area A. At this level of examination, three of four sample assemblages from Townsend are representative of the basic distributions of artifact morphology categories in the entire populations from those areas.

A similar analysis can be accomplished for the distribution of basic material type categories for these components, again keeping in mind that a very high degree of correspondence is expected for Areas C and D. As was the case with the artifact morphology categories, there does not appear to be any correspondence between the sample and the entire population of chipped stone from Townsend when the distribution of material types is examined (chi-square=93.60, DF=17, significance=<0.0005, phi=0.071). The results of examining the distributions of material categories for each component are shown in Table 96. While the distributions of material categories are virtually identical for the sample and entire populations in Areas C and D, there does not seem to be any correspondence between populations from Areas A and B.

This discussion suggests that the samples from Areas A and B at Townsend may not always be representative of the entire assemblages from those components. For that reason, whole populations will be used in this discussion whenever possible. Unfortunately, only artifact morphology and material type were recorded for the rough-sorted artifacts. This may affect the strength of conclusions drawn from discussions of debitage attributes for Areas A and B, but it will not affect our discussions of Areas C and D. Because all tools noted during rough sort were included in the intensive analysis to provide a comprehensive view of the potential activities that occurred at this site, discussions of that part of the assemblage in the last chapter were not affected by sample error.

It should also be noted that the sampling design for Townsend led us to examine artifacts that had the highest probability of association with potentially datable features and structures, and hence, with specific occupations. Materials that were not found in direct association with structures or features could not be dated, so their actual relationship to materials from adjacent parts of the site is questionable.

Material Selection

Several variables can be examined to provide an idea of material selection parameters, including material type, presence of local versus exotic rocks, and texture. Unfortunately, while material type was recorded for the entire assemblage from these sites, material texture and some of the attributes used to define exotic origin were only recorded for the full analysis sample. Thus, we will have to work with two data bases in this discussion, with only a representative sample being available from Townsend for some variables.

Though numerous material types were defined during this analysis, here they are combined into gross categories for ease of discussion. Thus, all varieties of chert are collapsed into a single category, and so on. Table 97 illustrates the distribution of material categories for each component. As noted earlier, there is little comparability between components because of the wide range of artifact totals. Indeed, five assemblages contain less than 100 artifacts, and only two contain more than 1,000. The comparative lack of data from the former indicates that only general similarities and differences may be definable.

Since silicified wood is essentially a chert (Luedtke 1992:32-33), those categories can be merged. Cherts are the most common overall and account for at least 40 percent of each assemblage, except for LA 117248. However, there is quite a bit of variation, with cherts comprising over 75 percent of four components, three of them from Townsend, and less than 55 percent for the remainder. Obsidian is rare in each component, and the highest percentage occurs at LA 117255. Nonglassy igneous materials occur in all assemblages containing more than 11 artifacts, and basalt and rhyolite are fairly common. Other igneous types are much rarer and more limited in the number of assemblages in which they occur. Sedimentary materials (other than cherts) occur in all assemblages containing more than 70 artifacts and tend to comprise higher percentages of those assemblages than do the igneous materials as a class. Limestone is the most common sedimentary material, followed by siltstone. Other sedimentary types are comparatively rare. Metamorphic materials are also moderately common in assemblages containing more than 11 artifacts. Quartzite tends to dominate this class of materials, and quartzitic sandstone and undifferentiated metamorphic materials bring up a distant second and third. Massive quartz is a mineral that can be of either igneous or metamorphic derivation, and it is very rare overall, occurring in only four assemblages.

The large number of material types may be masking patterns of selection. With this in mind, Table 98 was constructed by collapsing material types into gross categories determined by geologic origin, with the exception of cherts, which were left as a separate category. Unknown materials were dropped from this analysis, and massive quartz was arbitrarily assigned to the metamorphic category. As Table 98 shows, even when material types are collapsed into grosser categories, quite a bit of variability remains. Cherts are by far the most common and dominate each assemblage except for LA 117248. Sedimentary and metamorphic materials comprise similar percentages of the overall assemblage, while igneous materials are the least abundant. However, while sedimentary materials are the second most common type in two cases, metamorphics dominate in one and are the second most common type in four. Thus, while sedimentary and metamorphic materials comprise similar percentages of the overall assemblage, metamorphics were actually more heavily selected for use in most cases.

Dates are only available for five assemblages, hindering our ability to examine material use through time. Indeed, since both the early and late Ceramic periods are each represented by only a single component, the utility of such a comparison might be questioned. However, each Ceramic period assemblage from Townsend represents multiple loci and presumably episodes of use, rather than single occupations. Thus, materials derived from individual occupational episodes for these compo-

Table 97. Material type categories for each component; frequencies and column percentages.

Material Type	Townsend Area A	Townsend Area B	Townsend Area C	Townsend Area D	LA 51095	LA 117246	LA 117248	LA 117250	LA 117255	LA 117257
Unknown	11 0.1%	4 0.1%	2 0.9%	1 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Chert	8,230 75.3%	2,844 84.3%	189 81.1%	195 47.1%	23 38.3%	6 54.5%	38 31.7%	1 50.0%	32 39.0%	63 90.0%
Silicified wood	33 0.3%	5 0.1%	0 0.0%	1 0.2%	1 1.7%	0 0.0%	1 0.8%	0 0.0%	2 2.4%	3 4.3%
Obsidian	10 0.1%	2 0.1%	4 1.7%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	4 4.9%	0 0.0%
Igneous, undifferentiated	32 0.3%	8 0.2%	0 0.0%	1 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Basalt	543 5.0%	173 5.1%	5 2.1%	21 5.1%	1 1.7%	0 0.0%	2 1.7%	0 0.0%	4 4.9%	1 1.4%
Granite	2 0.02%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 0.8%	0 0.0%	0 0.0%	0 0.0%
Rhyolite	60 0.5%	20 0.6%	4 1.7%	21 5.1%	2 3.3%	0 0.0%	1 0.8%	0 0.0%	2 2.4%	0 0.0%
Andesite	7 0.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 1.2%	0 0.0%
Sedimentary, undifferentiated	14 0.1%	0 0.0%	1 0.4%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Limestone	830 7.6%	89 2.6%	3 1.3%	90 21.7%	6 10.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Sandstone	5 0.05%	3 0.1%	0 0.0%	1 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Siltstone	179 1.6%	46 1.4%	4 1.7%	43 10.4%	6 10.0%	0 0.0%	11 9.2%	0 0.0%	7 8.5%	0 0.0%
Shale	0 0.0%	0 0.0%	0 0.0%	1 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Metamorphic, undifferentiated	1 0.01%	2 0.1%	0 0.0%	1 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 1.2%	0 0.0%
Quartzite	934 8.5%	174 5.2%	17 7.3%	37 8.9%	19 31.7%	5 45.5%	58 48.3%	1 50.0%	28 34.1%	2 2.9%
Quartzitic sandstone	43 0.4%	4 0.1%	4 1.7%	1 0.2%	1 1.7%	0 0.0%	8 6.7%	0 0.0%	1 1.2%	0 0.0%
Massive quartz	1 0.01%	1 0.03	0 0.0%	0 0.0%	1 1.7%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 1.4%
Total	10,935	3,375	233	414	60	11	120	2	82	70
Period	Early Ceramic	Late Ceramic	Late Archaic	Late Archaic	Unknown	Unknown	Unknown	Unknown	Late Archaic	Unknown

Table 98. Gross material categories for each component; frequencies and column percentages.

Material Category	Townsend				LA 51095	LA 117246	LA 117248	LA 117250	LA 117255	LA 117257	Total
	Area A	Area B	Area C	Area D							
Cherts	8,263 75.6%	2,849 84.5%	189 81.8%	196 47.5%	24 40.0%	6 54.5%	39 32.5%	1 50.0%	34 41.5%	66 94.3%	11,667 76.3%
Igneous	654 6.0%	203 6.0%	13 5.6%	43 10.4%	3 5.0%	0 0.0%	4 3.3%	0 0.0%	10 12.2%	1 1.4%	931 6.1%
Sedimentary	1,028 9.4%	138 4.1%	8 3.5%	135 32.7%	12 20.0%	0 0.0%	11 9.2%	0 0.0%	8 9.8%	0 0.0%	1,340 8.8%
Metamorphic	979 9.0	181 5.4%	21 9.1%	39 9.4%	21 35.0%	5 45.5%	66 55.0%	1 50.0%	30 36.6%	3 4.3%	1,346 8.8%
Total	10,924	3,371	231	413	60	11	120	2	82	70	15,284

nents have already been merged into composite assemblages. The Archaic components probably represent individual occupational episodes, and by combining them we are in actuality rendering them comparable to the Ceramic period assemblages.

Table 99 compares frequencies and percentages of gross material categories for dated components. These three assemblages are significantly different from one another, though the results are somewhat weak (chi-square=337.56, DF=6, significance=<0.0005, Cramer's V=0.106). While the Ceramic period assemblages appear at first glance to be fairly similar, in reality they also represent different populations (chi-square=156.35, DF=3, significance=<0.0005, phi=0.104). Certain trends in material use are visible in these assemblages: cherts are more heavily used through time, while sedimentary and metamorphic materials steadily decrease in use. After an initial decrease by a third between the Late Archaic and early Ceramic periods, the level of igneous material use holds steady through the end of the sequence.

Table 99. Gross material categories for each time period; frequencies and column percentages.

Material Category	Archaic	Early Ceramic	Late Ceramic
Cherts	419 57.7%	8,263 75.6%	2,489 84.5%
Igneous	66 9.1%	654 6.0%	203 6.0%
Sedimentary	151 20.8%	1,028 9.4%	138 4.1%
Metamorphic	90 12.4%	979 9.0%	181 5.4%

Local versus exotic material use. Materials were classified as local or exotic depending on how distant their presumed source was from where they were used. In general, materials were considered local if a source was no more than 10 to 15 km away from the site at which they were found. This distance is based on ethnographic studies which suggest that a 20 to 30 km round trip is the maximum distance that hunter-gatherers will comfortably walk in a day (Kelly 1995:133). While more distant regions were undoubtedly used, this zone represents the area that was most heavily exploited on a day-to-day basis around residential sites.

Three methods were used to identify potentially exotic materials. First, they were examined visually to determine whether they matched the physical description of known exotics. Examples of this class of material includes Alibates chert and obsidian. These materials are visually distinct, though there are cherts that are similar to Alibates chert and can be mistaken for it at this level of analysis (Banks 1990:89). Few exotic materials are expected to have been identified by this method, but those that were are almost certainly evidence of long-distance movement or exchange.

The second way in which exotic materials were identified involved the use of ultraviolet light to identify Edwards Plateau chert imported from Texas. The methods used in this analysis, adopted from Wiseman et al. (2000:71-79), involved visual identification of potential specimens of Edwards Plateau chert and their response to fluorescence under long- and short-wave ultraviolet light. Specimens considered possible candidates for assignment to this category included those with the proper texture (very fine-grained) and color (tan to gray). Under ultraviolet light, specimens of Edwards Plateau chert fluoresce medium orange-brown, or bright orange or yellow (Wiseman et al. 2000:78).

This examination was necessitated by the close resemblance between some cherts originating in the San Andres Formation in southeast New Mexico and Edwards Plateau chert from Texas (Wiseman et al. 2000:78-79). Lacking a means of differentiating between materials from these sources would result in an inability to determine whether a significant portion of an assemblage was of local or extralocal origin. While experiments conducted by Wiseman et al. (2000) suggest that most San Andres cherts do not fluoresce to the same colors as Edwards Plateau chert, a few specimens unfortunately fluoresced to medium orange-brown, a similar reaction to that of some Edward Plateau cherts. At least one source of San Andres chert that fluoresces similarly to Edwards Plateau chert is found in the Roswell area (B. Hamilton, personal communication, 2001), further complicating matters. For this reason, only specimens that combined the requisite physical appearance with a bright orange/yellow fluorescence were considered definite examples of Edwards Plateau chert. Those that fluoresced to medium orange-brown were considered possible examples of Edwards Plateau chert, keeping in mind that they could also be of local origin. Most materials examined using this method are expected to be identified as locally available, though a few specimens from distant sources may be isolated.

Type of cortex (when present) on some materials was the third method used to determine whether they were of local or exotic origin. This criterion was only used to define exotic origins for metamorphic and igneous materials. Geologically, this part of southeast New Mexico is dominated by carbonate and evaporate rocks of Permian age (Kelley 1971; USGS 1965). Thus, as a rule only sedimentary rocks, including limestone and chert, outcrop in the area. In order to access igneous and metamorphic rocks directly, one would have to travel west to the Sacramento and Capitan Mountains, or far to the north. However, a fairly wide range of materials are available in lower gravel beds along the Pecos River, including quartz, chert, quartzite, granite, rhyolite, schist, and diorite (Kelley 1971:32). Presumably, a similar range of materials is available in gravel deposits along the major west-to-east flowing tributaries of the Pecos.

The primary method of distinguishing igneous and metamorphic materials that were obtained at or near their source (outcrops) from those that were likely collected from local gravel deposits is examining the type of cortex present on weathered nodule surfaces. When present, cortex on materials obtained from gravel deposits will show abundant evidence of mechanical transport: it will be battered and worn smooth with few or no sharp edges. Cortex on materials collected at or near outcrops may exhibit evidence of chemical weathering, but there should be no signs of mechanical transport: cortex should not be battered and rounded, and there may be very sharp edges. These criteria were applied to cortex on igneous and metamorphic materials from the project area to determine potential sources. Considering that most of the sites, with the possible exception of LA 117246, are on or near pediment gravel deposits (as shown in map separates presented in Kelly 1971), few exotic igneous and metamorphic materials are expected to occur in these assemblages.

Three exotic materials were identified visually: Alibates chert, Tecovas chert, and obsidian. Alibates chert is actually a silicified or agatized dolomite that outcrops near Amarillo, Texas, just south of the Canadian River. The area in which this material outcrops is geologically localized (Banks 1990:92). Since this area drains toward the east, mechanical transport of Alibates chert in a westerly direction toward our project area is unlikely. Thus, all Alibates chert artifacts recovered from these sites represent materials obtained from a distant location. Tecovas chert outcrops in the Tecovas Formation, which extends into southeastern New Mexico but does not occur near the project area. For this reason, artifacts made from Tecovas chert are considered to be of nonlocal origin. The final category of visually identified exotic materials is obsidian, a type of volcanic glass that does not occur naturally in southeast New Mexico. Two varieties of obsidian were identified: a general obsidian category and Polvadera obsidian. Though no attempt was made to source the obsidian artifacts recovered by this study, they probably originated in the Jemez Mountains of north-central New Mexico. Of the numerous sources that have been identified in that area (Wolfman 1994), Polvadera obsidian is the only type that can be visually identified with consistency and confidence. That is because this particular variety of obsidian has small volcanic ash particles embedded in it (Wolfman 1994:47), giving it a very distinct appearance.

Using rough sort data for debitage and full analysis information for tools, 20 Alibates chert, 2 Tecovas chert, 17 generic obsidian, and 3 Polvadera Peak obsidian artifacts were identified in the overall assemblage. Slightly more than two-thirds of these artifacts were recovered from the Townsend site, while the rest were found at LA 117255 and LA 117257. The early Ceramic period assemblage from Area A at Townsend yielded 16 artifacts that were visually identified as exotics, including 10 pieces of generic obsidian and 6 pieces of Alibates chert. Five artifacts of exotic origin were found in the late Ceramic assemblage from Area B at Townsend, including two pieces of Alibates chert, one piece of Tecovas chert, and two pieces of generic obsidian. Both Late Archaic assemblages from Townsend also contained exotic materials: Area C yielded two Alibates chert, one Tecovas, one generic obsidian, and three Polvadera Peak obsidian artifacts. Area D contained a single piece of Alibates chert. Four pieces of generic obsidian were recovered from the Late Archaic component at LA 117255, while nine pieces of Alibates chert were found in the assemblage from LA 117257, for which no date could be provided.

Data from the full analysis were used to define likely examples of Edwards Plateau chert. A total of 81 gray or tan cherts fluoresced medium orange-brown or bright orange/yellow, indicating the possibility that they are Edwards Plateau chert from West Texas. Nearly all (80 specimens) were recovered from Townsend; the last specimen was found at LA 117248. Only 12 specimens fluoresced bright orange/yellow, indicating definite identification as Edwards Plateau chert. All of these specimens were recovered from Townsend: eight from the early Ceramic period assemblage from Area A, one from the late Ceramic period assemblage from Area B, and three from the Late Archaic assemblage from Area D. The remaining specimens fluoresced medium orange brown and were categorized as possible Edwards Plateau chert. They include 36 pieces of gray chert and 2 of tan chert from Townsend Area A, 11 pieces of gray chert from Townsend Area B, 4 pieces of gray chert and 1 of tan from the Late Archaic component at Townsend Area C, 8 pieces of gray chert from Townsend West Area D, and 1 piece of gray chert from LA 117248.

Unfortunately, cortex type was not recorded during the rough sort, so only a sample is available from two of the Townsend components. Of 4,018 artifacts in the full analysis sample, 80.2 percent lack any cortex. Considering these factors, cortex type can only be used to provide some clues to material source. Table 100 provides cortex type data for major material categories.

Table 100. Material type by cortex type for the full analysis sample; frequencies and row percentages.

Material Type	Waterworn Cortex		Nonwaterworn Cortex		Indeterminate Cortex Type	
	N	%	N	%	N	%
Unknown	1	100.0	-	-	-	-
Local cherts	291	49.0	36	6.1	267	44.9
Possible exotic cherts	10	58.8	-	-	7	41.2
Exotic cherts	2	33.3	1	16.7	3	50.0
Silicified wood	4	57.1	-	-	3	42.9
Igneous, undifferentiated	1	50.0	-	-	1	50.1
Basalt	22	59.5	5	13.5	10	27.0
Granite	2	100.0	-	-	-	-
Rhyolite	3	20.0	2	13.3	10	66.7
Andesite	2	66.7	-	-	1	33.3
Sedimentary, undifferentiated	-	-	-	-	1	100.0
Limestone	27	39.1	3	4.3	39	56.5
Sandstone	1	25.0	-	-	3	75.0
Siltstone	8	17.8	6	13.3	31	68.9
Metamorphic, undifferentiated	1	100.0	-	-	-	-
Quartzite	94	61.8	18	11.8	40	26.3
Massive quartz	2	100.0	-	-	-	-
Totals	471	49.1	71	7.4	417	43.5

Cortex type was not accurately defined in a high percentage of cases. This is probably due to one or more of four factors: cortex occurs on platforms and not on dorsal surfaces, cortex has very restricted coverage, materials were only transported by water a short distance, or chemical and mechanical weathering cannot be accurately distinguished from one another. Cortex type was unidentifiable in 59.3 percent of 150 cases where it occurred only on flake platforms; these artifacts comprise 21.3 percent of the unidentifiable cortex assemblage. Another 25.7 percent of this assemblage occurred on artifacts with a cortical coverage of 10 percent or less. Thus, in nearly 53 percent of these cases, very restricted cortical coverage was responsible for our inability to define cortex type

Inability to distinguish between chemical and mechanical weathering is probably only operative for materials that are highly susceptible to chemical weathering, like limestone and sandstone. These materials comprise 6.9 percent of the cortical debitage overall and 10.1 percent of the unidentifiables. Limited amounts of cortex actually account for 37.9 percent of the unidentifiable cortex for these materials. Correcting for this leaves only 3.8 percent of the artifacts with unidentifiable cortex type attributable to difficulty in distinguishing between mechanical and chemical weathering.

Eliminating cases in which cortex is only present on platforms, cortical coverage is 10 percent or less. Eliminating cases in which cortex occurs on materials that are highly susceptible to chemical weathering leaves 180 cases in which cortex type could not be identified, or 43.2 percent of the total cases in which cortex type was unidentifiable. Of the remaining cases, 86.1 percent occur in three material types: local cherts, siltstones, and quartzites. Since local cherts are available both in gravel deposits and at outcrops, an inability to define cortex type is no hindrance to analysis. In the other cases this inability is probably due to mechanical transport over relatively short distances. Explaining why we cannot identify cortex type in these cases contributes nothing to understanding the type of source these materials were obtained from, but in most instances it does suggest that unidentifiable cortex type may not equate to procurement at the source.

With this said, we will now turn to an examination of procurement sources, dropping artifacts with unidentifiable cortex from consideration. This leaves a total of 542 artifacts with some degree of cortical coverage in our sample, of which only 13.1 percent exhibits nonwaterworn cortex. However, three materials—chert, limestone, and sandstone—are available locally in outcrops, so the occurrence of nonwaterworn cortex on these materials does not carry the same significance as it does for materials available only from more distant sources. Removing these materials from consideration increases the percentage of artifacts exhibiting nonwaterworn cortex by about a quarter, to 17.4 percent. Interestingly, only 1 of 13 artifacts representing definite and possibly exotic materials exhibits nonwaterworn cortex, indicating that most of those materials were procured from secondary deposits rather than at or near their sources.

Nonwaterworn cortex occurs in only four of the remaining material categories, including basalt (n=5), rhyolite (n=2), siltstone (n=6), and quartzite (n=18). These, then, are the only artifacts that can be defined as exotics on the basis of cortex type. They include 2 specimens (basalt and quartzite) from Townsend Area A, 1 (basalt) from Townsend Area B, 3 (siltstone) from Townsend West Area D, 2 (rhyolite and quartzite) from LA 51095, 11 (quartzite) from LA 117248, 11 (1 rhyolite, 3 siltstone, 2 basalt, and 5 quartzite) from LA 117255, and 1 (basalt) from LA 117257.

Table 101 summarizes types and numbers of definite and possible exotics for each component and provides totals for each category. These represent the minimum number of exotics for each assemblage. This is especially true of two components from Townsend, where exotics defined on the basis of cortex type were drawn from samples rather than entire populations. This should be kept in mind when Table 102 is considered, which shows percentages of definite and potential exotic artifacts for each component by time period. Exotic materials were only identified in assemblages containing 70 or more artifacts, and their lack in smaller assemblages could easily be attributable to sample error.

Comparison of the dated components shows that Archaic assemblages contain much higher percentages of exotic materials than those from the Ceramic periods, averaging 4.1 percent definite exotics, rising to 5.9 percent when all possible exotics are considered. While these conclusions are based on a lot of assumptions, this trend matches our expectations. There should be evidence of a decreasing trajectory in the use of exotic materials as dependence on agriculture increases. But where does this leave the undated components? Little can be said about the two assemblages that contain less than 70 artifacts except that, as noted earlier, sample error may be responsible for the absence of exotics from these assemblages. High percentages of potential exotic materials in assemblages from LA 117248 and LA 117257 may suggest that they represent Archaic occupations, but it is dangerous to base such an assumption on a single attribute. Similarly, the percentage of exotic materials in the LA 51095 assemblage is close to the mean percentage of exotics for Late Archaic assemblages, but it would again be dangerous to read too much into this. However, this analysis does suggest that we should be alert for other similarities between these

Table 101. Distribution of exotic materials identified in site assemblages; totals including possible exotic materials in parentheses.

Site/Component	Alibates Chert	Tecovas Chert	Obsidian	Polvadera Peak Obsidian	Definite Edwards Plateau Chert	Possible Edwards Plateau Chert	Other Exotics (Cortex Type)	Total
Townsend Area A	6	-	10	-	8	38	2	26 (64)
Townsend Area B	2	1	2	-	1	17	1	7 (24)
Townsend Area C	2	1	1	3	-	5	-	7 (12)
Townsend West (Area D)	1	-	-	-	3	8	3	7 (15)
LA 51095	-	-	-	-	-	-	2	2
LA 117246	-	-	-	-	-	-	-	0
LA 117248	-	-	-	-	-	1	11	11 (12)
LA 117250	-	-	-	-	-	-	-	0
LA 117255	-	-	4	-	-	-	11	15
LA 117257	9	-	-	-	-	-	1	10

Totals include (possible exotic materials).

three assemblages and the Late Archaic components in order to determine whether they might also represent Archaic occupations.

Material texture. Different materials are suited to different tasks (Chapman 1977). While obsidian is excellent for the production of cutting tools because it is easily flaked and possesses sharp edges, it is too fragile to be used for heavy-duty chopping. Conversely, while basalt and quartzite have duller edges and are less efficient as cutting tools, they are well suited to pounding or chopping because they are dense and resist shattering. The suitability of materials for specific tasks also varies according to texture. Fine-grained materials possess sharper edges than coarse materials and are more amenable to the production of formal tools because they are more easily and predictably flaked. For example, fine-grained basalt produces nearly as good a cutting edge as obsidian or chert, while coarse-grained basalt may only be suitable for chopping or pounding. Thus, texture can provide an indication of the uses to which materials were put.

Table 102. Percentages of assemblages comprised of exotic materials by component date.

Component Date	Component	Definite Exotics (%)	All Possible Exotics (%)
Late Archaic	Townsend Area C	3.1	5.5
	Townsend West (Area D)	1.7	3.6
	LA 117255	18.5	18.5
Early Ceramic	Townsend Area A	0.2	0.6
Late Ceramic	Townsend Area B	0.2	0.7
Unknown	LA 51095	3.3	3.3
	LA 117246	0.0	0.0
	LA 117248	9.2	10.0
	LA 117250	0.0	0.0
	LA 117257	14.3	14.3

Selection parameters for material texture also vary with degree of mobility. Mobile populations in the Southwest tended to select high-quality materials, because much of their chipped stone industry focused on the manufacture and use of large bifaces. In contrast, sedentary peoples tended to focus on the removal of flakes from cores for use as informal tools, with a lesser emphasis on the manufacture and use of small bifaces. Sedentary populations also mostly used locally available materials, while mobile populations often carried high quality rocks to areas that lacked suitable material sources.

Information on material texture and quality was only recorded for artifacts included in the full analysis sample. Thus, while Areas A and B from Townsend were sampled, complete or nearly complete assemblage data are available for the other eight components. As Table 103 shows, fine-grained materials dominate the overall assemblage, with medium-grained materials bringing up a distant second place. The glassy and coarse-grained categories are represented by a single material type apiece, and comprise only very small percentages of the overall assemblage. This was expected for the glassy category, since by definition only obsidian could be assigned to it. However, the rarity of coarse-grained materials was surprising, especially since only local cherts are included in this category. Overall, fine-grained materials of all types were heavily selected for. With the exception of the unknown category, only nine material types—igneous undifferentiated, granite, rhyolite, andesite, sandstone, siltstone, metamorphic undifferentiated, quartzite, and massive quartz—are composed of less than 90 percent fine-grained materials. Six of these material categories contain seven or fewer artifacts, so sample error could be responsible for lower percentages of fine-grained materials. However, it is interesting to note that, with the probable exception of sandstone, none of these materials outcrop locally and were probably only available in gravel deposits.

Table 104 provides material texture summaries for each component, with glassy and fine-grained materials combined. In general, assemblages that contain the most artifacts also have the highest percentages of glassy and fine-grained materials. With one exception (LA 117257), assemblages containing more than 200 artifacts have more than 80 percent glassy/fine-grained materials (and in three of four cases, more than 90 percent), while those with fewer than 200 artifacts tend to have percentages lower than 80 percent. Other than sample error in the smaller assemblages, there seems to be no ready explanation for this phenomenon.

Table 105 summarizes material texture percentages by period for dated components. These results are rather surprising. Our expectation was that assemblages representing periods of greater mobility (Late Archaic) would contain higher percentages of glassy and fine-grained materials than those representing a more sedentary lifestyle (Ceramic periods). These results are the exact opposite of our expectations. Perhaps by collapsing all materials together we have succeeded in eliminating more meaningful variation. Another way of examining materials is by their fracturing capabilities and durability. Aphanitic materials (very fine-grained) tend to fracture easily and often lack durable edges. Grainier materials do not fracture as easily, but often have durable edges that are able to withstand the pressures caused by chopping and battering. The former category includes cherts, obsidians, silicified woods, aphanitic igneous materials, dolomite, and limestone. The latter contains nonaphanitic forms of igneous rocks, as well as most metamorphic and other sedimentary rocks.

Materials are grouped by grain size and durability in Table 106. Fine-grained sedimentary rocks include cherts, limestone, dolomite, obsidian, and silicified wood, while the nonaphanitic sedimentary category contains all other sedimentary rocks. Igneous materials are divided into aphanitic and nonaphanitic categories, while the nonaphanitic metamorphic category includes all metamorphic rocks. This table continues the tendencies seen in Table 105, with Late Archaic sites containing a smaller combined percentage of aphanitic materials than Ceramic period assemblages. There could be several reasons for this pattern, including activities that required more durable materials, or access to a greater area and thus a wider range of materials for Archaic components. These possibilities are considered again after more data are presented.

Reduction Strategies

Two basic chipped stone reduction strategies can be defined for the post-Paleoindian occupation of the Southwest: efficient and expedient. Efficient reduction entailed manufacture of tools in anticipation of use, enabling them to be transported from camp to camp until needed. This 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 resharpened, and those made to replace parts of existing composite tools. A fourth category can be added to this list: specialized bifaces. The latter were made for a single purpose and tend to be associated with expedient strategies where efficiency and weight conservation were not especially important considerations. Bifaces with multiple functions and those with long use-lives were mostly associated with mobile lifestyles where efficiency was critical. However, these associations were certainly not exclusive; mobile people also made specialized bifaces while sedentary people manufactured general-purpose bifaces. The difference is more a matter of degree: there was less use of specialized bifaces by mobile people and less use of general-purpose bifaces by sedentary people. Thus, it is not necessarily the number of bifaces or amount of evidence for biface manufacture in an assemblage that is indicative of reduction strategy and lifestyle, but the types of bifaces that were made and used.

The first two categories of bifaces defined by Kelly (1988) were of necessity large in size. Bifaces that functioned as cores, general-purpose tools, and blanks for

Table 103. Material type by texture for the full analysis assemblage; frequencies and row percentages.

Material Type	Glassy	Fine	Medium	Coarse
Unknown	0 0.0%	8 72.7%	3 27.3%	0 0.0%
Local cherts	0 0.0%	2,623 92.5%	207 7.3%	6 0.2%
Possible exotic cherts	0 0.0%	65 98.5%	1 1.5%	0 0.0%
Definite exotic cherts	0 0.0%	15 100.0%	0 0.0%	0 0.0%
Silicified wood	0 0.0%	18 94.7%	1 5.3%	0 0.0%
Obsidian	11 100.0%	0 0.0%	0 0.0%	0 0.0%
Igneous, undifferentiated	0 0.0%	4 66.7%	2 33.3%	0 0.0%
Basalt	0 0.0%	43 100.0%	0 0.0%	0 0.0%
Granite	0 0.0%	1 50.0%	1 50.0%	0 0.0%
Rhyolite	0 0.0%	37 61.7%	23 38.3%	0 0.0%
Andesite	0 0.0%	3 75.0%	1 25.0%	0 0.0%
Sedimentary, undifferentiated	0 0.0%	4 100.0%	0 0.0%	0 0.0%
Limestone	0 0.0%	284 92.5%	23 7.5%	0 0.0%
Sandstone	0 0.0%	5 71.4%	2 28.6%	0 0.0%
Siltstone	0 0.0%	74 85.1%	13 14.9%	0 0.0%
Silicified siltstone	0 0.0%	146 99.3%	1 0.7%	0 0.0%
Shale	0 0.0%	1 100.0%	0 0.0%	0 0.0%
Dolomite	0 0.0%	19 95.0%	1 5.0%	0 0.0%
Metamorphic, undifferentiated	0 0.0%	3 75.0%	1 25.0%	0 0.0%
Quartzite	0 0.0%	274 74.9%	92 25.1%	0 0.0%
Massive quartz	0 0.0%	1 50.0%	1 50.0%	0 0.0%
Total Percent	11 0.3%	3,628 90.3%	373 9.3%	6 0.1%

the replacement of broken or lost tools had to be large to be useful. Similarly, bifaces manufactured with long use-lives in mind also had to be comparatively large to enable them to be resharpened. On the other hand, specialized bifaces needed to be no larger than was required for the task at hand. Projectile points provide a good contrast 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 can be used as knives, since they possess a fairly long edge and were usually set into detachable foreshafts. When broken they can often be reworked into a new form. Thus, they can serve as general-purpose 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 the notches often caused them to break during use, and because of their small size and the location of most breaks they could not be resharpened. Small projectile points were effectively limited to a single function, and quite often could only be used once. Other small bifaces, like drills, also tended to be used for a single purpose. Thus, we differentiate between the manufacture of large bifaces and small bifaces in this analysis.

Efficient and expedient debitage assemblages modeled. Several attributes can be used to assess an assemblage and determine whether the reduction strategy was efficient, expedient, or a combination of both. Unfortunately, no single indicator will provide this information, so a range of attributes must be used.

Assemblages reflecting a purely expedient strategy should contain much lower percentages of noncortical debitage than those in which a purely efficient strategy was employed. Cortex is usually brittle and chalky and does not flake with the ease or predictability of unweathered material. This can cause problems during tool manufacture, so cortex is usually removed early in the tool production process. The manufacture of large bifaces is rather wasteful, and quite a few flakes must be removed before the proper shape is achieved. These flakes are carefully struck, and are generally smaller and thinner than flakes removed from cores. Thus, as bifaces are manufactured, large numbers of interior flakes lacking cortical surfaces are removed, and the proportion of noncortical debitage increases. The removal of cortex is

Table 104 Material texture percentages for all components in the full analysis sample.

Component	Glassy and Fine	Medium	Coarse
Townsend Area A	93.6	6.3	0.1
Townsend Area B	90.4	9.4	0.2
Townsend Area C	91.8	8.2	0.0
Townsend West (Area D)	83.1	16.5	0.5
LA 51095	76.7	23.3	0.0
LA 117246	72.7	27.3	0.0
LA 117248	79.2	20.8	0.0
LA 117250	50.0	50.0	0.0
LA 117255	78.0	22.0	0.0
LA 117257	88.6	11.4	0.0
Mean	90.6	9.3	0.1

Table 105. Material texture percentages for dated components.

Period	Glassy and Fine	Medium	Coarse
Late Archaic	85.2	14.5	0.3
Early Ceramic	93.6	6.3	0.2
Late Ceramic	90.4	9.4	0.2

Table 106. Material texture type percentages by period for dated components.

Period	Fine-Grained Sedimentary Rocks	Aphanitic Igneous Rocks	Nonaphanitic Igneous Rocks	Nonaphanitic Sedimentary Rocks	Nonaphanitic Metamorphic Rocks
Late Archaic	71.6	0.6	4.6	10.8	12.4
Early Ceramic	86.7	0.3	1.5	4.7	6.8
Late Ceramic	85.8	0.0	3.7	5.8	4.6

not as high a priority in expedient reduction, so the chance that a given piece of debitage will possess some cortical surface is higher.

The presence of biface flakes is usually good evidence that tools were made at a site, though it is usually impossible to determine absolute number or type. A polythetic set of attributes was used to distinguish biface flakes from core flakes in this analysis. Flakes fulfilling at least 70 percent of the attributes were classified as biface flakes, while those that did not were considered to be core flakes. Biface flake length is indicative of the size of the tool being made, and lengths of 15 to 20 mm or more suggest that large bifaces were manufactured. However, when only small biface flakes are found 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. Large percentages of biface flakes in an assemblage suggests that tool production was an important activity. When those flakes are long, it is likely that large bifaces were made or used, and this in turn 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.

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 flakes removed during tool production. 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 usually modified to facilitate removal. While core platforms were also modified on occasion, this technique was not as common because the same degree of control over size and shape were unnecessary unless a core was being systematically reduced. Since this rarely occurred in the Southwest, it is likely that a large percentage of modified platforms in an assemblage is indicative of tool manufacture, while the opposite connotes core reduction. When there is 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. Thus, a high ratio of flakes to angular debris is considered indicative of tool manufacture, while a low ratio implies core reduction. Unfortunately, this is a bit simplistic, because the production of angular debris also depends on the type of material being worked, the technique used, and the amount of force applied. Brittle materials shatter more easily than elastic materials, and hard hammer percussion tends to produce more recoverable pieces of angular debris than soft hammer percussion or pressure flaking. 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.

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 n.d.a). 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.

Much flake breakage during reduction is caused by secondary compression, in which outward bending causes 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 (see Fig. 94). 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 causes 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. But since snap fractures can also indicate post-reduction damage, this may be the weakest of the attributes used to examine reduction strategy.

Platform lipping is indicative of reduction technology, and is marginally related to strategy. Platform lipping is usually indicative of pressure flaking or soft-hammer percussion, though it sometimes occurs on flakes removed by hard hammers (Crabtree 1972). The former techniques were usually used to manufacture tools, so a high percentage of lipped platforms suggests a focus on tool manufacture rather than core reduction.

The pattern of scars left by earlier removals on the dorsal surface of a flake can also help define reduction strategy. Since bifacial 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 bidirectionally (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 on a site 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.

Few of the attributes examined by this study are accurate independent indicators of reduction strategy. However, when combined, they should allow us to fairly accurately determine how materials were reduced at a site. A purely efficient debitage assemblage should contain high percentages of noncortical 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. Purely expedient debitage assemblages should contain lower percentages of noncortical 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. Unfortunately, "pure" assemblages are rare, and most can be expected to combine tool manufacture and core reduction.

Dorsal cortex and reduction stage. While cortex has been discussed in the context of material source, its relation to reduction stage and hence strategy remains to be considered. Cortex is the weathered outer rind on nodules and is rarely suitable for flaking or tool use. Further, outer sections of nodules transported by water often contain microcracks created by cobbles striking one another, creating a zone with unpredictable flaking characteristics. Thus, cortical zones are typically removed and discarded because they lack the flaking characteristics of nodule interiors. Flakes have progressively less dorsal cortex as reduction proceeds, so dorsal cortex data can be used to examine reduction stages. Early stages are characterized by high percentages of flakes with lots of dorsal cortex, while the opposite suggests the later stages.

Reduction can be divided into two basic stages: core reduction and tool manufacture. Flakes are removed for use or modification during core reduction. Primary core reduction includes initial core platform preparation and removal of the cortical surface. Secondary core reduction is the striking of flakes from core interiors. This difference is rarely as obvious as these definitions make it seem. Both processes often occur simultaneously, and seldom is all cortex removed before secondary reduction begins. In essence, they represent opposite ends of a continuum, and it is difficult to determine where one stops and the other begins. In this analysis, core flakes that are considered to be evidence of primary reduction have 50 percent or more of their dorsal surfaces covered by cortex, while secondary core flakes have less than 50 percent dorsal cortex. This distinction can also provide information on the condition of cores used at a site. For example, a lack of primary flakes suggests that initial reduction occurred elsewhere, while the presence of few secondary flakes may indicate that cores were carried off for further reduction. Tool manufacture refers to the purposeful modification of debitage into specific forms. Primary core flakes represent the early stage of reduction, while secondary core flakes and biface flakes represent later stages.

The distribution of dorsal cortex for flakes is shown in Table 107. All but one of the assemblages that contain more than 40 flakes are dominated by noncortical flakes, suggesting that reduction at those locations was also dominated by the later reduction stages. The exception is LA 117248, which contains very high percentages of cortical flakes, indicating that the reduction trajectory for that site may have differed from that of most others. The very low percentage of noncortical flakes in this assemblage suggests that primary core reduction may have been the main reduction activity performed at this site, presumably on materials that were obtained locally.

The structure of most other assemblages containing more than 40 flakes is consistent with the later reduction stages: cores that were carried to sites in an already reduced condition, transport of flakes only, or tool manufacture. Percentages of primary and cortical secondary flakes for LA 51095 and LA 117255 may indicate some local acquisition and initial core reduction, but sample error could also be responsible for the comparatively high percentages of primary flakes in these assemblages.

Unfortunately, the situation is not quite as simple as Table 107 makes it appear, because there is quite a bit of variation in cortical coverage within material types. This is illustrated in Table 108. Materials that could not be assigned to a specific type were only found at Townsend, occurring in very small numbers in all four

Table 107. Dorsal cortex percentage categories for flakes from all components, frequencies and row percentages.

Component	0%	1-49%	50-100%
Townsend Area A	1,621 85.9%	168 8.9%	98 5.2%
Townsend Area B	661 86.0%	51 6.6%	57 7.4%
Townsend Area C	166 89.2%	12 6.5%	8 4.3%
Townsend West (Area D)	261 77.7%	43 12.8%	32 9.5%
LA 51095	18 48.6%	7 18.9%	12 32.4%
LA 117246	1 25.0%	2 50.0%	1 25.0%
LA 117248	14 16.5%	35 41.2%	36 42.4%
LA 117250	0 0.0%	0 0.0%	1 100.0%
LA 117255	38 65.5%	9 15.5%	11 19.0%
LA 117257	50 82.0%	5 8.2%	6 9.8%

components. Since only noncortical specimens of unknown materials were analyzed, it is likely that they were brought in as existing cores or flakes. The distribution of cortical coverage for cherts suggests that some primary reduction may have occurred in all components containing more than 40 flakes. However, these assemblages contain cherts of both local and nonlocal origin. Gray cherts fluorescing warm to bright from all four components at Townsend appear to have been brought to the site as nodules or only slightly reduced cores. Primary flakes comprise 5.2, 8.9, 5.6, and 12.5 percent of these categories for Areas A through D, respectively—proportions that seem consistent with this conclusion. Very few primary flakes were found among the other probable nonlocal cherts. Indeed, three (9.7 percent) warmly fluorescing tan chert flakes from Townsend Area B were the only other primary flakes among the potentially exotic specimens. This may mean that the warmly fluorescing gray cherts, at least, were actually obtained locally. Otherwise, mainly local cherts were reduced from nodules or cores that had previously had very few flakes removed from them.

Several materials occur only as noncortical flakes or in small enough numbers to suggest that they were either not struck in situ or were reduced from cores that already had most of the cortex removed from them. These materials include silicified wood, obsidian, igneous undifferentiated, granite, rhyolite, andesite, sedimentary undifferentiated, shale, metamorphic undifferentiated, and massive quartz. This leaves only a small selection of materials that, along with the cherts, were almost certainly reduced in situ: basalt, limestone, siltstone, quartzite, and quartzitic sandstone. The few sandstone flakes identified in these assemblages were probably struck in situ as well, but occur in very small numbers in only a few assemblages.

Several varieties of basalt are represented in these assemblages. In four of five cases where basalt occurs, at least two varieties are present. The distribution of dorsal cortex on flakes in these varieties suggests that little if any reduction of locally procured basalt occurred. Most basalt appears to have arrived at these sites as existing cores or flakes. Limestone seems to have been reduced from nodules in at least two assemblages: Areas A and B at Townsend. There are fairly high percentages of primary core flakes present in both cases, though few cortical secondary flakes occur. Limestone may also have been reduced from nodules at Townsend West or Area D. In other assemblages this material was probably carried in as already reduced cores or flakes.

Siltstone nodules may have been reduced to cores in six assemblages: Areas A, B, and D at Townsend, LA 51095, LA 117248, and LA 117255. However, in all six cases only a few flakes of this material are present and represent between two and five varieties per assemblage. This reduces the number of cases in which in situ reduction from nodules is likely to only one: black silicified siltstone at Area D on Townsend. Otherwise, siltstones appear to have arrived at components as partly reduced cores or flakes.

Most quartzites also seem to have arrived at these sites as partly reduced cores or flakes. The only probable exceptions are in the LA 117248 assemblage, where some initial reduction of purple and dark purple quartzites may have occurred. Similarly, when examining materials by varieties rather than as a whole, quartzitic sandstone nodules may have been reduced at LA 117248; otherwise this material appears to have arrived as partly reduced cores or flakes.

So, what does this mean? It is unlikely that most flakes were carried to these sites for potential use, with the probable exception of exotic materials like Alibates, Tecovas, and Edwards Plateau cherts. Considering the variety of materials in most components, most probably arrived in the form of partly reduced cores, with the possible exceptions noted above. Since this is the most likely scenario, dorsal cortex distributions are of little use in helping to define reduction strategy, because part of the picture is missing—in most cases, primary reduction is underrepresented. The main exception to this is the assemblage from LA 117248, where primary reduction seems overrepresented. While this discussion does little to clarify reduction strategy in most cases, it does provide ancillary information on the condition of cores coming onto sites. In most cases, cores were not transported to sites for initial reduction. Rather, they were partly reduced elsewhere, either at quarry locations (perhaps like LA 117248), at other sites, or both.

Flake platforms. Platforms are remnants of core or tool edges that were struck to remove flakes. Various types of platforms can be distinguished, providing information about the condition of the artifact from which a flake was removed as well as reduction technology. Cortical platforms are usually evidence of early-stage core reduction, especially when dorsal cortex is also present. Single-facet platforms occur at any time during reduction but are most often associated with flakes removed from cores. Multifacet platforms are evidence of previous removals along an edge; they occur on both core and biface flakes and suggest that the parent artifact was subjected to a considerable amount of earlier reduction.

Platforms were often modified to facilitate flake removal by retouching and/or abrading edges. While abrasion can occur on most types of platforms, retouch is a distinct platform type. Thus, abrasion can occur on single-facet and multifacet platforms, but retouch cannot. Both modifications result from rubbing an abrader across an edge—movement perpendicular to the edge removes microflakes and retouches it, while parallel movement abrades it. These processes increase the exterior angle of a platform, strengthening it and reducing the risk of shatter. Stronger platforms also increase control over the shape and length of flakes.

Platform types could not be defined in many instances. The most common reason for this was breakage in which the proximal fragment is absent. Two other processes also obscure platforms. A platform that is unmodified or poorly prepared will sometimes crush when force is applied or excessive force is used. Though the impact point is often still visible on a crushed platform, its original configuration is impossible to determine. Platforms can also collapse when force is applied, detaching separately and leaving a scar on the dorsal or ventral surface. Part of the platform is occasionally preserved on one or both sides of the scar. While these remnants are usually too small to allow identification of the original platform type, they show where impact occurred and indicate that even though the platform is missing, flake dimensions may be complete. Platforms can also be damaged by use or impact from natural processes; these were recorded as obscured.

The distribution of platform types by component is shown in Table 109. Three assemblages contain high percentages of cortical platforms, and five have moderately high percentages. However, two of the assemblages with high percentages of cortical platforms contain less than five flakes apiece, and so can be discounted. This leaves only the LA 117248 assemblage with a high percentage of cortical platforms, which is consistent with the very high percentage of primary flakes noted for this assemblage in the previous section. Though one might expect cortical platforms to be accompanied by varying degrees of dorsal cortex, this is not necessarily the case. With proveniences containing less than five flakes eliminated (LA 117246 and LA 117250), there are only three assemblages in which more than about a third of the cortical platforms occur on flakes with dorsal cortex: LA 51095 (80 percent), LA 117248 (85.7 percent), and LA 117255 (50 percent). Flakes with cortical platforms in the five remaining assemblages are dominated by specimens lacking dorsal cortex, ranging from a low of 63.3 percent in the Townsend West Area D assemblage to a high of 83.3 percent in the LA 117257 assemblage.

Two of the components in which high percentages of flakes with cortical platforms also have dorsal cortex (LA 51095 and LA 117255) contain rather small percentages of cortical platforms (13.5 and 17.2 percent, respectively). This characteristic is probably not very meaningful in these cases, because the apparent correlation between cortical platforms and dorsal cortex could simply be due to sample error. However, this is not the case for the LA 117248 assemblage, in which over 40 percent of the flakes have cortical platforms. This tends to confirm that the main focus of chipped stone reduction at LA 117248 was initial core preparation through primary reduction. For most other proveniences, cortex simply seems to have been a flat area suitable for striking, producing large percentages of flakes with cortical platforms but lacking dorsal cortex.

Single-facet platforms are the most common type in most assemblages containing more than five flakes. As discussed above, cortical platforms were the most common type in the LA 117248 assemblage, while single-facet platforms in Townsend Area C and LA 117257 assemblages were slightly outnumbered by multifacet platforms. In all three of these cases, single-facet platforms were the second most common type. Where multifacet platforms were not the most common type, they tended to be the second most abundant except at LA 117248 and LA 117255.

Modified platforms occur in all but four assemblages, two of which contain less than five flakes apiece. They are conspicuously absent from the LA 117248 assemblage, again suggesting that initial core reduction was the focus of chipping at that locality. Collapsed and/or crushed platforms occur in all assem-

Table 108. Distribution of dorsal cortex percentage categories by material type for flakes from all components; frequencies and row percentages.

Material	Townsend Area A			Townsend Area B			Townsend Area C			Townsend West (Area D)		
	0%	1-49%	50-100%	0%	1-49%	50-100%	0%	1-49%	50-100%	0%	1-49%	50-100%
Unknown	5 100.0%	- -	- -	3 100.0%	- -	- -	2 100.0%	- -	- -	1 100.0%	- -	- -
Cherts	1,394 85.0%	174 10.6%	72 4.4%	596 87.5%	45 6.6%	40 5.9%	150 88.2%	13 7.6%	7 4.1%	127 67.2%	43 22.8%	19 10.0%
Silicified wood	6 85.7%	1 14.3%	- -	3 100.0%	- -	- -	- -	- -	- -	1 100.0%	- -	- -
Obsidian	3 100.0%	- -	- -	3 100.0%	- -	- -	4 100.0%	- -	- -	- -	- -	- -
Igneous, undifferentiated	2 66.7%	- -	1 33.3%	1 50.0%	- -	1 50.0%	- -	- -	- -	1 100.0%	- -	- -
Basalt	63 86.3%	6 8.2%	4 5.5%	39 83.0%	7 14.9%	1 2.1%	3 75.0%	1 25.0%	- -	14 70.0%	2 10.0%	4 20.0%
Granite	- -	- -	1 100.0%	- -	- -	- -	- -	- -	- -	- -	- -	- -
Rhyolite	18 90.0%	2 10.0%	- -	9 90.0%	1 10.0%	- -	4 100.0%	- -	- -	14 66.7%	4 19.0%	3 14.3%
Andesite	1 50.0%	- -	1 50.0%	- -	1 100.0%	- -	- -	- -	- -	- -	- -	- -
Sedimentary, undifferentiated	2 100.0%	- -	- -	- -	1 100.0%	- -	1 100.0%	- -	- -	- -	- -	- -
Limestone	162 86.6%	6 3.2%	19 10.2%	23 65.7%	1 2.9%	11 31.4%	3 100.0%	- -	- -	79 89.8%	7 8.0%	2 2.3%
Sandstone	3 100.0%	- -	- -	1 33.3%	- -	2 66.7%	- -	- -	- -	- -	1 100.0%	- -
Siltstone	29 85.3%	4 11.8%	1 2.9%	13 76.5%	3 17.6%	1 5.9%	2 66.7%	- -	1 33.3%	32 74.4%	8 18.6%	3 7.0%
Shale	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 100.0%	- -	- -
Metamorphic, undifferentiated	1 100.0%	- -	- -	- -	1 100.0%	- -	- -	- -	- -	1 100.0%	- -	- -
Quartzite	115 85.8%	12 9.0%	7 5.2%	31 88.6%	1 2.9%	3 8.6%	13 92.9%	1 7.1%	- -	35 94.6%	- -	2 5.4%
Quartzitic sandstone	7 63.6%	2 18.2%	2 18.2%	3 75.0%	1 25.0%	- -	2 66.7%	1 33.3%	- -	1 100.0%	- -	- -

Table 108 continued.

Material	LA 51095			LA 117246			LA 117248		
	0%	1-49%	50-100%	0%	1-49%	50-100%	0%	1-49%	50-100%
Cherts	8 40.0%	7 35.0%	5 25.0%	1 20.0%	3 60.0%	1 20.0%	9 25.0%	14 38.9%	13 36.1%
Silicified wood	1 100.0%	- -	- -	- -	- -	- -	- -	- -	1 100.0%
Basalt	1 100.0%	- -	- -	- -	- -	- -	- -	1 50.0%	1 50.0%
Rhyolite	- -	- -	1 100.0%	- -	- -	- -	- -	- -	- -
Limestone	5 83.3%	1 16.7%	- -	- -	- -	- -	- -	- -	- -
Siltstone	2 40.0%	- -	3 60.0%	- -	- -	- -	1 9.1%	7 63.6%	3 27.3%
Quartzite	5 33.3%	3 20.0%	7 46.7%	1 25.0%	3 75.0%	- -	9 16.7%	21 38.9%	24 44.4%
Quartzitic sandstone	- -	- -	1 100.0%	- -	- -	- -	1 14.3%	4 57.1%	2 28.6%
Massive quartz	- -	1 100.0%	- -	- -	- -	- -	- -	- -	- -

Material	LA 117250			LA 117255			LA 117257		
	0%	1-49%	50-100%	0%	1-49%	50-100%	0%	1-49%	50-100%
Cherts	- -	1 100.0%	- -	20 69.0%	6 20.7%	3 10.3%	50 82.0%	6 9.8%	5 8.2%
Silicified wood	- -	- -	- -	- -	1 100.0%	- -	2 100.0%	- -	- -
Obsidian	- -	- -	- -	4 100.0%	- -	- -	- -	- -	- -
Basalt	- -	- -	- -	2 66.7%	- -	1 33.3%	- -	1 100.0%	- -
Rhyolite	- -	- -	- -	- -	1 100.0%	- -	- -	- -	- -
Andesite	- -	- -	- -	- -	- -	1 100.0%	- -	- -	- -
Siltstone	- -	- -	- -	4 50.0%	2 25.0%	2 25.0%	- -	- -	- -
Metamorphic, undifferentiated	- -	- -	- -	1 100.0%	- -	- -	- -	- -	- -
Quartzite	- -	- -	1 100.0%	11 50.0%	4 18.2%	7 31.8%	- -	- -	1 100.0%
Quartzitic sandstone	- -	- -	- -	1 100.0%	- -	- -	- -	- -	- -
Massive quartz	- -	- -	- -	- -	- -	- -	- -	- -	1 100.0%

Table 109. Distribution of flake platform types by component; frequency and column percentages.

Platform Type	Townsend Area A	Townsend Area B	Townsend Area C	Townsend Area D	LA 51095	LA 117246	LA 117248	LA 117250	LA 117255	LA 117257
Cortical	108 5.7%	35 4.6%	17 9.1%	30 8.9%	5 13.5%	1 25.0%	35 41.2%	1 100.0%	10 17.2%	6 9.8%
Single facet	444 23.5%	181 23.5%	33 17.7%	112 33.3%	15 40.5%	2 5.0%	19 22.4%	- -	14 24.1%	8 13.1%
Single facet and abraded	32 1.7%	5 0.7%	6 3.2%	2 0.6%	- -	- -	- -	- -	1 1.7%	- -
Multifacet	258 13.7%	97 12.6%	34 18.3%	40 11.9%	9 24.3%	- -	5 5.9%	- -	2 3.4%	9 14.8%
Multifacet and abraded	39 2.1%	13 1.7%	4 2.2%	3 0.9%	- -	- -	- -	- -	4 6.9%	4 6.6%
Retouched	21 1.1%	4 0.5%	1 0.5%	2 0.6%	- -	- -	- -	- -	1 1.7%	- -
Retouched and abraded	11 0.6%	1 0.1%	2 1.1%	- -	- -	- -	- -	- -	- -	2 3.3%
Abraded	18 1.0%	22 2.9%	2 1.1%	3 0.9%	- -	- -	- -	- -	1 1.7%	- -
Collapsed	232 12.3%	65 8.5%	11 5.9%	24 7.1%	- -	- -	9 10.6%	- -	2 3.4%	10 16.4%
Crushed	26 1.4%	18 2.3%		8 2.4%	- -	- -	- -	- -	3 5.2%	1 1.6%
Absent	439 23.3%	237 30.8%	51 27.4%	74 22.0%	4 10.8%	- -	11 12.9%	- -	13 22.4%	12 19.7%
Broken in manufacture	259 13.7%	90 11.7%	25 13.4%	38 11.3%	4 10.8%	1 25.0%	6 7.1%	- -	6 10.3%	7 11.5%
Obscured	- -	1 0.1%	- -	- -	- -	- -	- -	- -	1 1.7%	2 3.3%

blages that contain more than 40 flakes, though in varying percentages. Missing platforms (broken in manufacture and absent) comprise about 30 percent or more of most assemblages, the exception being LA 117248.

In order to allow a more accurate comparison between components, platforms were combined into modified and unmodified categories, and missing or obscured platforms were dropped from consideration. These data are shown in Table 110. There are very high percentages of modified platforms in the LA 117255 and LA 117257 assemblages, a fairly high percentage in the Townsend Area C assemblage, and moderately high percentages in the Townsend Areas A and B assemblages. Of the components that contain flakes with modified platforms, only the Townsend West Area D assemblage has a fairly low percentage. Multiple populations are indicated when the distribution of platforms in the three Late Archaic assemblages are compared (chi-square=12.559, DF=2, significance=0.002, phi=0.197). However, when the assemblage from Area D on Townsend West is dropped, there is a very high correlation in the distribution of platform categories between the two remaining Late Archaic assemblages (chi-square=0.655, DF=1, significance=0.419, phi=0.07). There is an even more significant correlation when the LA 117257 assemblage is compared to the Late Archaic assemblages from Townsend Area C and LA 117257 (chi-square=0.9, DF=2, significance=0.637, phi=0.075).

A similarly high degree of resemblance occurs when the distribution of platform categories is compared for the two Ceramic period assemblages from Areas A and B at Townsend (chi-square=0.042, DF=1, significance=0.838, phi=0.006). When these assemblages are compared to those from the Late Archaic (with the addition of LA 117257) for the same characteristic, a fairly high degree of correlation again occurs (chi-square=3.67, DF=4, significance=0.452, phi=0.05). A similar degree of correlation continues to occur when LA 117257, which was undated, is dropped from consideration (chi-square=2.33, DF=3, significance=0.507, phi=0.041). Thus, when only platform modification is considered, the LA 117257 assemblage is very similar to two of the dated Late Archaic assemblages. Both of the Ceramic period assemblages are also very similar to those from the Late Archaic, as well as the LA 117257 assemblage. This suggests an essential continuity of reduction strategy, at least in terms of this single attribute.

To summarize this discussion of platforms, five assemblages—Townsend Areas A, B, and D, LA 117255, and LA 117257—contain moderately high to high percentages of modified platforms, and statistically can be considered to represent a single population with a high degree of confidence. Since two of these assemblages are Late Archaic in date and two are from the Ceramic period, there appears to be a continuity in the level of biface reduction from the former period to the latter, at least as far as this attribute is concerned. While the high degree of correlation between LA 117257 and the Late Archaic assemblages could mean that the former also represents an Archaic occupation, this possibility is weakened when the high degree of correlation with the Ceramic period assemblages is considered. Only one other assemblage—Area D from Townsend West—contains modified platforms. While this assemblage was dated to the Late Archaic, the comparatively low percentage of modified platforms separates it out. Rather than being indicative of temporal trends, platform modification is probably more related to behavioral tendencies in these assemblages. In other words, the low percentage of modified platforms for Townsend West Area D indicates that chipped stone reduction had a different focus in that component.

A second component with a different reduction focus seems to be LA 117248. The very high percentage of cortical platforms in this assemblage coupled with a lack of modified platforms and a high percentage of flakes with both dorsal cortex and cortical platforms seems indicative of early-stage nodule or core reduction.

Table 110. Modified and unmodified platform categories for each component; frequencies and row percentages.

Component	Unmodified	Modified
Townsend Area A	810 87.0%	121 13.0%
Townsend Area B	313 87.4%	45 12.6%
Townsend Area C	84 84.8%	15 15.2%
Townsend Area D	182 94.8%	10 5.2%
LA 51095	29 100.0%	- -
LA 117246	3 100.0%	- -
LA 117248	59 100.0%	- -
LA 117250	1 100.0%	- -
LA 117255	26 78.8%	7 21.2%
LA 117257	23 79.3%	6 20.7%

Table 111. Distribution of debitage types in components; frequencies and row percentages.

Component	Angular Debris	Core Flakes	Biface Flakes	Notching Flakes	Bipolar Flakes	Pot Lids
Townsend Area A	236 11.1%	1,766 83.1%	111 5.2%	5 0.2%	5 0.2%	3 0.15%
Townsend Area B	77 9.1%	688 81.3%	81 9.6%	- -	- -	- -
Townsend Area C	22 10.6%	182 87.5%	4 1.9%	- -	- -	- -
Townsend West (Area D)	69 17.0%	331 81.7%	5 1.2%	- -	- -	- -
LA 51095	14 27.5%	37 72.5%	- -	- -	- -	- -
LA 117246	5 55.6%	4 44.4%	- -	- -	- -	- -
LA 117248	26 23.4%	85 76.7%	- -	- -	- -	- -
LA 117250	1 50.0%	1 50.0%	- -	- -	- -	- -
LA 117255	11 15.5%	55 77.5%	2 2.8%	- -	1 1.4%	2 2.8%
LA 117257	5 7.6%	54 81.8%	6 9.1%	- -	1 1.5%	- -

The other assemblages do not seem to fit with any of these six. In two cases (LA 117246 and LA 117250) this is because of their very small size. The remaining assemblages—LA 51095 and LA 117255—seem to be quite a bit different, which could be a function of sample size, but could also be indicative of a different focus in reduction strategy.

Debitage type and condition. The distribution of debitage types is shown in Table 111. Several tendencies are visible in this table. First, and perhaps most important, there seems to be a break between assemblages containing less than 20 percent angular debris and those with more than 20 percent angular debris. The two assemblages with the highest percentages of angular debris also contain less than 10 pieces of debitage each and can be discounted because of small sample size. This leaves only LA 51095 and LA 117248 with comparatively high percentages of angular debris. In addition to this similarity, neither of these assemblages contains biface flakes and, as noted earlier, both contain high percentages of flakes with cortical platforms and dorsal cortex. Earlier, small sample size for LA 51095 led us to discount the latter, but when debitage distributions are also considered, that may have been a bit hasty.

Only three components appear to contain comparatively high percentages of biface flakes: Areas A and B from Townsend, and LA 117257. This may be illusory, since most modified platforms are probably also indicative of biface reduction. This possibility is addressed below. Notching flakes are specialized biface flakes and are indicative of the late stages of hafted biface production. This type of flake was only found in Area A at Townsend. Bipolar flakes are indicative of core reduction, but instead of being struck from a core with minimal support, cores are supported on hard anvils in this technique. Bipolar reduction is generally used to reduce small nodules or cores from which usable flakes could not be otherwise struck and is more indicative of reduction technique than strategy. This type of flake occurs in small percentages in three assemblages. Pot lids are the final type of debitage noted in these assemblages and are evidence of damage occurring because of improper thermal treatment; they can be equated to angular debris.

The percentages of biface flakes that occur in every component in Table 111 are interesting, because they seem to contradict platform data. Analysis of those data suggested that tool manufacture was far more prevalent in six of the eight components that contain more than five flakes, and that it did not occur in the other two. The distribution of biface flakes in Table 111 suggests that tool manufacture was less common in the six components that contained modified platforms. This apparent discrepancy needs to be clarified before proceeding further. Nearly 61 percent of flakes with modified platforms were classified as core flakes, yet core platform modification tends to be uncommon in the northern Southwest. Could these flakes actually be misclassified biface flakes?

The term "misclassified" may be too strong. As noted in the discussion of analytic methods, the polythetic set used to identify biface flakes only distinguishes ideal specimens, and flakes that did not fit the model were classified as core flakes by default. It would be risky to simply reclassify all core flakes with modified platforms as biface flakes, because some core platforms certainly could have been modified to facilitate flake removal. It is equally unrealistic to continue classifying all of these specimens as core flakes. In order to rectify this situation, several attributes were used to reclassify specimens that might actually be examples of removal from bifaces. Core flake fragments with modified platforms, less than 50 percent dorsal cortex, and with a thickness of less than 5 mm were reclassified as biface flakes; if specimens were whole, their length-to-width ratio also had to be 1:1 or higher. In this way, 102 out of 124 core flakes with modified platforms were redefined as biface flakes. These changes are shown in Table 112, which reduces artifact morphology categories to three by combining pot lids with angular debris, bipolar flakes with core flakes, and notching flakes with biface flakes. Proportions of flakes changed in 6 of 10 assemblages.

When assemblages containing less than 10 artifacts are dropped, the distribution of morphological types suggests that two populations are represented: assemblages containing biface flakes (n=6) and those that lack them (n=2). The two assemblages that lack biface flakes—LA 51095 and LA 117248—appear to represent a single population, though the relationship is weak (chi-square=0.305, DF=1, significance=0.581, phi=0.043).

Late Archaic components comprise half of the six remaining assemblages, and represent different populations (chi-square=15.159, DF=4, significance=0.004, Cramer's V=0.105). However, with Townsend West Area D removed there is a significant resemblance between the Townsend Area C and LA 117255 assemblages (chi-square=3.294, DF=2, significance=0.193, phi=0.109). When the Ceramic period components from Townsend are compared, they represent different populations (chi-square=7.368, DF=2, significance=0.025, phi=0.050). The LA 117257 assemblage weakly resembles the Late Archaic assemblages from Townsend Area C and LA 117255 (chi-square=6.957, DF=4, significance=0.138, Cramer's V=0.100), but its closest correspondence, again weak, is with the late Ceramic period component from Area B on Townsend (chi-square=1.149, DF=2, significance=0.563, phi=0.036). Which temporal association is more realistic remains to be seen.

This examination suggests the presence of at least four distinct populations. The first consists of the LA 51095 and LA 117248 assemblages, which contain comparatively high percentages of angular debris and no biface flakes. The second population includes two Late Archaic assemblages—Area C from Townsend and LA 117255. The two Ceramic period assemblages (Townsend Areas A and B) are the other two populations. LA 117257 is most comparable to the Townsend Area B assemblage, but it is also similar to the Late Archaic assemblages.

The ratio between flakes and angular debris can be a good indicator of reduction strategy, and is shown for each component in Table 112. Again discounting components with less than 10 pieces of debitage, the assemblages with the lowest flake-to-angular debris ratios are

Table 112. Distribution of debitage types in components after reclassification of core flakes with modified platforms; frequencies and row percentages.

Component	Angular Debris	Core Flakes	Biface Flakes	Flake/ Angular Debris
Townsend Area A	239 11.2%	1,710 80.4%	177 8.3%	7.90:1
Townsend Area B	77 9.1%	676 79.9%	93 11.0%	9.99:1
Townsend Area C	22 10.6%	169 81.3%	17 8.2%	8.46:1
Townsend West (Area D)	69 17.0%	324 80.0%	12 3.0%	4.87:1
LA 51095	14 27.5%	37 72.5%	- -	2.64:1
LA 117246	5 55.6%	4 44.4%	- -	0.80:1
LA 117248	26 23.4%	85 76.7%	- -	3.27:1
LA 117250	1 50.0%	1 50.0%	- -	1.00:1
LA 117255	13 18.3%	51 71.8%	7 9.9%	4.46:1
LA 117257	5 7.6%	51 77.3%	10 15.2%	12.20:1

Table 113. Flake portions by component; frequencies and row percentages.

Component	Indeterminate	Whole	Proximal	Medial	Distal	Lateral
Townsend Area A	- -	555 29.4%	483 25.6%	243 12.9%	288 15.3%	318 16.9%
Townsend Area B	- -	188 24.4%	190 24.7%	95 12.4%	115 15.0%	181 23.5%
Townsend Area C	- -	38 20.4%	64 34.4%	36 19.4%	21 11.3%	27 14.5%
Townsend West (Area D)	- -	107 31.8%	78 23.2%	32 9.5%	57 17.0%	62 18.5%
LA 51095	- -	13 35.1%	11 29.7%	4 10.8%	4 10.8%	5 13.5%
LA 117246	- -	2 50.0%	1 25.0%	1 25.0%	- -	- -
LA 117248	- -	31 36.5%	20 23.5%	4 4.7%	10 11.8%	20 23.5%
LA 117250	- -	- -	- -	- -	- -	1 100.0%
LA 117255	- -	18 31.0%	16 27.6%	7 12.1%	4 6.9%	13 22.4%
LA 117257	1 1.6%	10 16.4%	27 44.3%	11 18.0%	5 8.2%	7 11.5%

those from LA 51095 and LA 117248. These ratios are probably indicative of simple core-flake reduction, with little or no tool manufacture occurring. Two Late Archaic components have moderate ratios—Area D from Townsend West and LA 117255—suggesting that core reduction was more systematic or that some tool manufacture occurred. The four remaining assemblages have high flake-to-angular debris ratios, which are indicative of systematic core reduction, quite a bit of tool manufacture, or both.

Debitage condition refers to whether or not flakes are broken. Types of breaks can also provide important assemblage information. Only flakes are considered in this discussion because angular debris were regarded as whole by definition. Table 113 shows the distribution of flake portions for each assemblage. Indeterminate fragments are rare or nonexistent in all assemblages. Whole flakes comprise variable percentages of each assemblage. LA 117248 contains the highest and LA 117257 the lowest. Proximal fragments are especially common in the LA 117257 assemblage and occur in lower but fairly similar percentages in other components except for Townsend Area C, where they are somewhat more common. Medial fragments occur in moderate percentages in each assemblage except LA 117248, where they are fairly rare. However, medial fragments usually comprise less than half the percentage of proximal fragments, even when they are common. Distal fragments occur in higher percentages than medial fragments in over half the components and are much less common than proximal fragments in assemblages containing more than five flakes. Lateral fragments are fairly common, comprising higher percentages of assemblages than distal fragments in every case containing more than five flakes, and higher percentages than medial fragments in six of eight cases.

A similarity in percentages of proximal and distal fragments might indicate that most breakage was caused by trampling. However, as Table 113 shows, proximal fragments greatly outnumber distal fragments in all assemblages containing more than five flakes. Thus, it is likely that most breakage occurred during reduction rather than after flakes were discarded. Breakage types are illustrated for core and biface flake fragments in Table 114 for assemblages containing more than five flakes.

Snap fractures dominate all core flake assemblages, and at the 95 percent confidence level there is a small, weak chance that they represent a single population (chi-square=13.146, DF=7, significance=0.069,

Table 114. Breakage patterns for core and biface flakes for each component containing more than 5 flakes; frequencies and row percentages

Component	Core Flakes		Biface Flakes	
	Snap Fractures	Manufacturing Breaks	Snap Fractures	Manufacturing Breaks
Townsend Area A	704 58.3%	504 41.7%	79 63.7%	45 36.3%
Townsend Area B	345 66.3%	175 33.7%	45 73.8%	16 26.2%
Townsend Area C	80 59.3%	55 40.7%	7 53.8%	6 46.2%
Townsend West (Area D)	131 59.3%	90 40.7%	4 50.0%	4 50.0%
LA 51095	14 58.3%	10 41.7%	- -	- -
LA 117248	36 66.7%	18 33.3%	- -	- -
LA 117255	21 58.3%	15 41.7%	2 50.0%	2 50.0%
LA 117257	22 51.2%	21 48.8%	7 100.0%	- -

phi=0.077). Core flake breakage patterns are very similar for LA 51095 and LA 117248 (chi-square=0.911, DF=1, significance=0.340, phi=0.110). Though the results are weak, core flake breakage patterns are nearly identical for the three Late Archaic assemblages (chi-square=0.012, DF=2, significance=0.994, phi=0.006). When LA 117257 is compared with the Late Archaic components, a single population is again weakly represented (chi-square=1.038, DF=3, significance=0.792, phi=0.049). The Ceramic period assemblages from Townsend (Areas A and B) seem to weakly represent two different populations (chi-square=9.920, DF=1, significance=0.002, phi=0.076), and when the LA 117257 assemblage is compared to them, separate populations are again indicated (chi-square=11.498, DF=2, significance=0.003, phi=0.081).

Snap fractures also dominate in most of the biface flake assemblages, though equal percentages of snap fractures and manufacturing breaks occur in two cases. There is a weak correlation between the five biface flake assemblages that contain both break categories (chi-square=4.06, DF=4, significance=0.398, phi=0.139). There is a weak, high-percentage chance that the Late Archaic assemblages from Townsend (Areas C and D) represent a single population (chi-square=0.012, DF=1, significance=0.913, phi=0.020). The Ceramic period assemblages from Townsend (Areas A and B) may also represent a single population, though this relationship is weak and low percentage (chi-square=2.355, DF=1, significance=0.125, phi=0.093). There is a weak but very good chance that LA 117257 and the two Late Archaic assemblages that contain both break patterns (Townsend Areas C and D) belong to the same population (chi-square=0.109, DF=2, significance=0.951, phi=0.053). Unfortunately, there is also a somewhat smaller chance that LA 117257 is part of the same population as the Ceramic period assemblages from Townsend (chi-square=2.483, DF=2, significance=0.289, phi=0.095).

In general, results of this analysis may mean two things. First, as suggested earlier, most breaks in all components probably occurred during flake removal rather than by trampling at a later time. Second, overall similarities in breakage patterns may indicate that reduction techniques varied little through time. For core flakes, a high degree of correspondence between Late Archaic assemblages, Ceramic period components, and assemblages from LA 51095 and LA 117248 suggest that they represent three separate, though somewhat similar, populations. In turn, this may indicate slight variation in core reduction technology, though this is in no way certain. Overall, less temporal variation in biface reduction technology may be indicated. The two Archaic biface flake assemblages that contain both manufacturing breaks and snap fractures are very similar, while those from the Ceramic period may belong to the same population, but do not seem as similar. The LA

Table 115. Core and biface flake platform lipping information for each component; frequencies and row percentages.

Component	Core Flakes		Biface Flakes	
	Lipped	No Lipping	Lipped	No Lipping
Townsend Area A	121 15.6%	656 84.4%	66 41.8%	92 58.2%
Townsend Area B	33 11.8%	246 88.2%	39 49.4%	40 50.6%
Townsend Area C	20 24.1%	63 75.9%	6 35.3%	11 64.7%
Townsend West (Area D)	21 11.3%	165 88.1%	2 16.7%	10 83.3%
LA 51095	2 6.9%	27 93.1%	- -	- -
LA 117246	1 33.3%	2 66.7%	- -	- -
LA 117248	4 6.2%	60 93.8%	- -	- -
LA 117250	- -	1 100.0%	- -	- -
LA 117255	8 30.8%	18 69.2%	5 71.4%	2 28.6%
LA 117257	5 18.5%	22 81.5%	5 50.0%	5 50.0%

117257 core flake assemblage is very similar to those of the Late Archaic components and is quite different from the Ceramic period assemblages. The biface flake assemblage from LA 117257 is very similar to those of the Late Archaic components, but it also resembles the Ceramic period components, though the level of similarity is much lower.

Platform lipping and dorsal scar orientation. Data on flake platform lipping are shown in Table 115; only assemblages containing more than five flakes are considered any further in this section. The highest percentages of platform lipping on core flakes occurs in two of the three Late Archaic assemblages—Area C from Townsend and LA 117255—while the undated assemblage from LA 117257 contains the third largest percentage. Not surprisingly, the lowest percentages occur in the LA 51095 and LA 117248 assemblages. Overall, these assemblages represent multiple populations (chi-square=20.456, DF=7, significance=0.005, phi=0.118). There are significant differences in the distribution of platform lipping on core flakes for the three Late Archaic components (chi-square=10.922, DF=2, significance=0.004, phi=0.192). However, when only the assemblages from Area C at Townsend and LA 117255 are considered, there is a weak but fairly high degree of similarity (chi-square=0.462, DF=1, significance=0.497, phi=0.065). When LA 117257 is compared to the latter two assemblages, a significant resemblance is again suggested (chi-square=1.085, DF=2, significance=0.581, phi=0.089). Core flake lipping patterns in the LA 51095 and LA 117248 assemblages are very similar, though the relationship is weak (chi-square=0.020, DF=1, significance=0.888, phi=0.015). When the Ceramic period assemblages from Townsend are compared, they also seem to represent a single population (chi-square=2.311, DF=1, significance=0.129, phi=0.047).

Platform lipping is far more prevalent in biface flake assemblages, except for Townsend West Area D. There is a significant similarity between the other five assemblages that contain biface flakes (chi-square=7.675, DF=5, significance=0.175, phi=0.165). There is a fairly strong but small chance that the three Late Archaic assemblages represent a single population (chi-square=5.756, DF=2, significance=0.056, phi=0.400). However, this relationship is probably skewed by the small percentage of unlipped platforms on biface flakes in the LA 117255 assemblage. With this component removed, the relationship between the remaining components has a much higher level of significance (chi-square=1.222, DF=1, significance=0.269, phi=0.205). When LA 117257 is compared to the three Archaic assemblages, there is a fairly strong and significant relationship (chi-square=6.209, DF=3, significance=0.102, phi=0.367). There is a higher level of significance in this relationship when LA 117255 is dropped from consideration (chi-square=2.779, DF=2, significance=0.249, phi=0.267). A similar level of correspondence is visible in the relationship between the two Ceramic period assemblages from Townsend (chi-square=1.231, DF=1, significance=0.267, phi=0.072). When LA 117257 is compared to the Ceramic period assemblages, the resemblance is significant, but weak (chi-square=1.356, DF=2, significance=0.508, phi=0.074).

Platform lipping tends to result from soft hammer percussion or pressure flaking, but also sometimes occurs during hard hammer reduction. Percentages of lipped versus nonlipped platforms for core flakes in Table 115 suggest that, overall, more soft hammer reduction was used for core reduction in the Archaic assemblages than in the Ceramic period components. There is a significant difference between assemblages from these periods (chi-square=14.845, DF=4, significance=0.005, phi=0.105). Little soft hammer percussion seems to have been used for core reduction at the two sites where initial core reduction seems to have been a major activity (LA 50195 and LA 117248); these assemblages are very similar to one another but not to the other component groups. Thus, once again, three populations can be defined. A very significant resemblance was visible between LA 117257 and the Late Archaic assemblages when the distribution of lipped platforms on core flakes was examined, but this site also has a significant, though weak, similarity to the Ceramic period components (chi-square=2.624, DF=2, significance=0.269, phi=0.049).

In general, there was a significant similarity in percentages of lipped versus unlipped platforms in assemblages containing biface flakes. This suggests that the basic techniques of biface reduction did not vary much through time. In general, higher significance levels were obtained when only Archaic or Ceramic period assemblages were compared. While this suggests that reduction technology was more consistent within than between time periods, it could also simply be due to sample error. There is a significant resemblance in the distribution of lipped and unlipped platforms between the LA 117257 assemblage and those dated to both the Late Archaic and Ceramic periods. However, since there is a significant relationship between all of these assemblages, this was expected.

Presence or absence of opposing dorsal scars by flake type is shown in Table 116. Opposing dorsal scars represent prior removals from platforms at the opposite edge of a core or biface from that used to remove the flake being examined. Some consider the presence of this type of scar indicative of biface manufacture, but as Table 116 illustrates, opposing dorsal scars can occur on core flakes as well.

Table 116. Opposing scars on distal termination for core and biface flakes by provenience; frequencies and row percentages.

Component	Core Flakes: No Opposing Scars	Core Flakes: Opposing Scars	Biface Flakes: No Opposing Scars	Biface Flakes: Opposing Scars
Townsend Area A	1,675 98.2%	30 1.8%	167 97.1%	5 2.9%
Townsend Area B	661 97.8%	15 2.2%	92 98.9%	1 1.1%
Townsend Area C	166 98.2%	3 1.8%	16 94.1%	1 5.9%
Townsend West (Area D)	322 99.4%	2 0.6%	12 100.0%	- -
LA 51095	35 94.6%	2 5.4%	- -	- -
LA 117246	4 100.0%	- -	- -	- -
LA 117248	79 92.9%	6 7.1%	- -	- -
LA 117250	1 100.0%	- -	- -	- -
LA 117255	48 96.0%	2 4.0%	6 85.7%	1 14.3%
LA 117257	46 92.0%	4 8.0%	7 70.0%	3 30.0%

Overall, only 2.1 percent of core flakes and 3.5 percent of biface flakes exhibit opposing dorsal scars. With assemblages containing fewer than five flakes removed, multiple populations are indicated for the distribution of opposing dorsal scars on core flakes (chi-square=26.762, DF=7, significance=0.0004, phi=0.093). Similarly, there is no correspondence between these assemblages when the distribution of opposing dorsal scars on biface flakes is examined (chi-square=25.693, DF=7, significance=0.0006, phi=0.287). With multiple populations indicated for both classes of flakes, further examination will be made using the three groups defined in earlier analyses.

Since the LA 51095 and LA 117248 assemblages contain no biface flakes, they can only be compared for core flakes. As has so often been the case, there is a highly significant resemblance between these assemblages, though the relationship is weak (chi-square=0.102, DF=1, significance=0.749, phi=0.029). There is also a significant, though weak, relationship in percentages of opposing dorsal scars on core flakes for the Late Archaic assemblages from Townsend Areas C and D, and LA 117255 (chi-square=4.351, DF=2, significance=0.114, phi=0.090). When LA 117257 is compared to the Archaic assemblages there is no apparent similarity (chi-square=14.367, DF=3, significance=0.003, phi=0.156). This relationship cannot be tested for biface flakes from these components, because too many cells are empty or contain one case.

There is a significant similarity in the distribution of opposing dorsal scars on core flakes from the Ceramic period components in Areas A and B from Townsend (chi-square=0.551, DF=1, significance=0.458, phi=0.015). A similar relationship is also visible in the biface flake assemblages from these components (chi-square=0.915, DF=1, significance=0.339, phi=0.059), though the very small number of biface flakes with opposing platforms makes the accuracy of these results suspect. Surprisingly, LA 117257 is significantly different from the Ceramic period assemblages for both core flakes (chi-square=9.774, DF=2, significance=0.008, phi=0.063) and biface flakes (chi-square =24.057, DF=2, significance=0.00001, phi=0.296).

Opposing dorsal scars on core flakes are indicative of reduction along the same surface from platforms situated opposite one another. There is little evidence of

Table 117. Flake, core, and biface data and associated ratios for all components.

Component	Artifact Morphology Categories						Assemblage Ratios		
	Core Flakes	Small Biface Flakes	Large Biface Flakes	Cores	Small Bifaces	Large Bifaces	Core Flake to Core	Small Biface Flake to Small Biface	Large Biface Flake to Large Biface
Townsend Area A	934	81	23	26	67	36	35.9:1	1.2:1	0.6:1
Townsend Area B	308	60	10	1	25	8	308.0:1	2.4:1	1.3:1
Townsend Area C	98	1	3	8	1	3	12.3:1	1.0:1	1.0:1
Townsend West (Area D)	181	2	2	5	2	1	36.0:1	1.0:1	2.0:1
LA 51095	24	-	-	9	-	-	2.7:1	-	-
LA 117246	3	-	-	2	-	-	1.5:1	-	-
LA 117248	52	-	-	9	-	-	5.8:1	-	-
LA 117255	32	-	2	9	1	1	3.6:1	-	2.0:1
LA 117257	31	1	5	3	-	1	10.3:1	-	5.0:1

this in any assemblage, suggesting that most core reduction did not proceed in this manner. The veritable lack of opposing dorsal scars on biface flakes is rather surprising, until it is remembered that a substantial percentage of this population consists of flake fragments rather than whole flakes. All in all, this attribute seems a weak indicator of similarities between assemblages.

Ratio of flakes to cores and bifaces. Table 117 presents raw counts of flakes, cores, and bifaces. Only whole specimens and proximal fragments are considered for the various flake categories, providing a minimum number of removals. Biface flakes and bifaces are both divided into large and small categories in this table. The division into separate categories was done at a width of 7 mm, with specimens that size and smaller being classified as removals from small bifaces, and wider flakes as removals from large bifaces. This division was based on an analysis of small and large fraction debitage from a seventeenth-century Pueblo site (LA 76138) near Pecos (Moore n.d.a). Small-fraction materials in that analysis were recovered using 1/8-inch or smaller mesh, and the large fraction was recovered using 1/4-inch mesh. This permitted recovery of nearly all identifiable debitage from selected locations. The width of biface flakes in the small fraction from LA 76138 ranged between 2 and 9 mm, with 97.5 percent falling into the 2 to 7 mm wide range. The same width range was used in this analysis to define small biface flakes. Wider biface flakes were assigned to the large biface category by default. The large biface category includes dart points, whole undifferentiated bifaces that are 7 mm or more thick, and undifferentiated biface fragments with a length or width of 20 mm or more. The small biface category includes arrow points and whole or fragmentary undifferentiated biface specimens that are less than 20 mm wide and less than 7 mm thick.

Since the only artifacts recovered from LA 117250 were a piece of angular debris and a lateral flake fragment, that site is not represented in Table 117, and it is not considered any further in this section. A cursory examination of Table 117 indicates that core reduction seems to have occurred in all assemblages, with the possible exception of LA 117246. There is no evidence for biface manufacture in three components: LA 51095, LA 117246, and LA 117248. At least some small biface production may have occurred in all four components from Townsend, and large biface manufacture is evidenced for those components in addition to LA 117255 and LA 117257.

Because there are problems with all three ratios in Table 117, they should be considered indicative rather than definitive. The core flake-to-flake ratio is affected by the removal of cores considered suitable for further reduction from a site, either at the time of abandonment or by later salvagers. Another process that can affect this ratio is the transport of flakes from one site to another. Biface flake-to-biface ratios are affected by removal of intact tools from a site, the salvaging of usable tools by later people, or by nonrecovery of very small biface flakes. In addition, the division of biface flakes into size categories is artificial and may obscure some of the patterning. While it is likely that large biface flakes were only produced during large biface manufacture, small biface flakes could have been struck during the production of either size of tool. Thus, these ratios are most useful when other data can be used to further examine them.

Core reduction seems to have occurred in the Ceramic period assemblages from Areas A and B at Townsend. More than one core was undoubtedly reduced in Area B; specimens other than the one examined in this assemblage may have been carried off or were not included in the full analysis sample. Indeed, when the entire rough-sort assemblage from this provenience is considered, the ratio of core flakes to cores falls to 50.9:1 (814 core flakes and 16 cores). Interestingly, using rough-sort data from Area A yields a core flake-to-core ratio of 35.1:1 (2,456 core flakes and 70 cores), which is almost identical to the ratio from the full analysis data. In either case, these ratios are very high and indicative of intense core reduction, removal of cores that were still suitable for use, or transport of flakes rather than cores to sites.

At least 12 materials (22.2 percent) are represented among the cores from the Townsend Area A sample, and flakes from all of these materials were recovered. This implies that at least some flakes correspond to all of the cores recovered there. There are no corresponding cores for 42 materials (77.8 percent) when all debitage and cores are considered, indicating that a lot of cores were carried away because they were still usable, or that many materials were imported as flakes rather than struck in situ from cores. Of the small array of potentially exotic materials, possible Edwards Plateau chert comprises only 1.6 percent of the debitage and is not represented by any cores. The possible Edwards Plateau debitage averages slightly less than 7 percent remnant dorsal cortex, and slightly more than 86 percent have no dorsal cortex at all. Of the 31 artifacts in this category there are four biface flakes, 29 core flakes, and three pieces of angular debris.

Since there is a lack of cores in the sample population from Townsend Area B due to sample error, we will use rough-sort data to discuss that component. A minimum of nine materials (18.4 percent) are represented among the cores in this assemblage, and flakes of all were recovered. Again, there seems to be a large array of materials with flakes but no corresponding cores—at least 40 (81.6 percent) in this case. Possible Edwards Plateau chert comprises only 1.9 percent of the debitage and none of the cores. This debitage has an average of about 18 percent dorsal cortex coverage, but 13 of 16 specimens (81.2 percent) have no dorsal cortex at all. Of the 16 artifacts in this category, there are 15 core flakes and one piece of angular debris.

As shown in Table 117, the core flake-to-core ratio for Area C on Townsend is moderate. A minimum of five materials (17.9 percent) are represented among the cores from that component, and flakes of all of these materials were recovered. Another 23 materials (82.1 percent) are represented by flakes but not cores. Possible Edwards Plateau chert comprises 2.4 percent of the debitage and none of the cores from this component. All five of these artifacts are core flakes, which average 10 percent dorsal cortical coverage; four (80 percent) have no dorsal cortex at all.

There is a high core flake-to-core ratio for Area D or Townsend West, mostly because of a lack of cores. Only two materials (6.7 percent) are represented by cores in this assemblage, and flakes of both materials were recovered. At least 28 materials (93.3 percent) are only represented by flakes. Possible Edwards Plateau chert comprises 2.0 percent of the debitage assemblage, and none of the cores from this assemblage. These artifacts include seven core flakes and one piece of angular debris, which average 11.3 percent dorsal cortex coverage; 5 (62.5 percent) have no dorsal cortex at all.

LA 51095 has a very low core flake-to-core ratio because of a fairly high number of cores. Five materials (38.7 percent) are represented among the cores, two of which (15.4 percent) have no corresponding flakes. Eight materials (61.3 percent) are only represented by core flakes. No potentially exotic materials were identified in this part of the assemblage.

The lowest core flake-to-core ratio for these components was recorded for LA 117246, undoubtedly due to the very small number of artifacts recovered. Overall, only three materials are represented in this assemblage; cores and core flakes occur in two (66.7 percent), and only one material (33.3 percent) is represented by core flakes but not cores. No potentially exotic materials were identified in this part of the assemblage.

A fairly moderate to low core flake-to-core ratio was derived for LA 117248 (Table 117). At least six materials (30 percent) are represented among the cores, and there are no corresponding core flakes for two of them (10 percent). Core flakes but no cores occur for 14 materials (70 percent). Possible Edwards Plateau chert comprises less than 1 percent of the core flakes in this assemblage and none of the cores. A single core flake of this material was recovered, which has 20 percent dorsal cortex coverage.

A fairly low core flake-to-core ratio was recorded for LA 117255 (Table 117). A minimum of five materials (29.4 percent) are represented among the cores, two of which (11.9 percent) have no corresponding core flakes. The 12 remaining materials (70.6 percent) are represented by core flakes only. The only potentially exotic material identified in this assemblage is obsidian, which is represented by flakes but not cores.

The core flake-to-core ratio for LA 117257 is moderate. At least three materials (37.5 percent) occur in the core population, one of which (12.5 percent) has no corresponding flakes. Five materials (62.5 percent) are represented by core flakes only. The only exotic material in this assemblage is Alibates chert, which is represented by core flakes but not cores.

Each of these assemblages contains materials represented by core flakes with no corresponding cores. Indeed, in all but one case (LA 117246), the number of materials in which cores occur are far outnumbered by those for which no cores were identified. In all likelihood, this is indicative of the transport of cores that were still usable to other locations (elsewhere on the site or to other sites) for continued use. In some cases, especially where exotic materials are concerned, prestruck debitage may have been transported between sites, but this is probably far less likely than the movement of cores from place to place.

The occurrence of cores with no corresponding flakes in several assemblages is perplexing. These cores may have been exhausted, but if so, why bother transporting them from the location at which they were reduced to another, and then discard them without striking any flakes? When other types of debitage are considered, all but one of these cores remain without corresponding debitage. The single case where a type of associated debitage other than core flakes may occur is one of two specimens in the LA 117255 assemblage. However, in that case, the material is a generic silicified wood, and the debitage is a bipolar flake, so any correspondence is unlikely. Each other case of a core with no corresponding debitage consists of a single specimen, and no other examples of those materials occur in the assemblages of debitage and cores. These cores may have been transported in case they were needed as sources of debitage but were discarded without further reduction because they were less suitable than materials that were locally available.

Possible Edwards Plateau chert occurs in small percentages in five of these nine assemblages. Cores of this material are lacking in each case, mostly flakes are represented, cortical coverage has a low average, and most of the debitage exhibit no dorsal cortex at all. These characteristics are consistent with the transport of mostly cleaned cores or bifaces of this material onto sites. While this does not prove that the gray/tan chert with medium fluorescence represents an exotic rather than a local material, it suggests that possibility. This material must remain classified as possible Edwards Plateau chert, but the data presented in this section tend to strengthen that possibility rather than weaken it.

Problems are also associated with biface flake-to-biface ratios. While the ratios presented in Table 117 certainly suggest that some biface manufacture occurred in six components, this is a generality; none of these flakes can be linked to specific bifaces. This is demonstrated by Table 118, which shows the distribution of biface flakes and bifaces by material for Areas A and B from Townsend. The largest number of specimens in these components are undifferentiated cherts that cannot be assigned to more specific types. Six of the more specific materials in Area A are represented by biface flakes only and five by bifaces only. A similar distribution is also visible in the Area B assemblage, where two types are represented by biface flakes only, and two by bifaces only. Bifaces that lack associated debitage were probably made elsewhere and discarded at these locations, while biface flakes that lack associated bifaces may be evidence of tool manufacture or refurbishing and transport of the finished tool elsewhere. However, by simplifying these data into the ratios shown in Table 117, we may be able to derive an indication of whether large or small bifaces were manufactured at a locale, as noted earlier.

None of the biface flake-to-biface ratios in Table 117 are particularly high, suggesting that little tool manufacture occurred in any of these components. However, the ratios from Areas A and B on Townsend were artificially reduced because these assemblages include all of the tools recovered from those components but only a sample of the debitage. There are two possible ways to rectify this problem. First, we can adjust numbers of bifaces proportionately to match the percentage of the overall assemblage represented by the debitage sample. This approach provides small biface flake-to-small biface ratios of 6.2:1 for Area A and 8.6:1 for Area B, which are much more suggestive of small biface manufacture. Recalculating the large biface flake-to-large biface ratio in the same way provides ratios of 3.3:1 for Area A and 5.0:1 for Area B, which are somewhat lower than those for smaller bifaces and debitage, but still suggestive of some in situ reduction.

The second way in which these ratios can be reexamined is to use overall biface flake-to-biface ratios derived from the debitage rough sort. Numbers of biface flakes defined during rough sort can be augmented slightly by adding specimens that were originally defined as core flakes but redefined as biface flakes in the full analysis. Table 119 presents these data, with combined ratios for the full analysis added for comparison, since small and large biface flakes cannot be separated for the rough sort data. Surprisingly, the adjusted ratios are fairly consistent. In both cases they indicate that the unadjusted full analysis ratios are far too low for these samples. The ratios that represent the rough sort data adjusted upward are probably the most accurate and underestimate the actual ratios by a bit. This is because only a percentage of the probable biface flakes that were originally identified as core flakes are corrected, since such a correction was impossible for flakes that were not examined in the intensive analysis sample.

Though comparisons of small biface-to-large biface ratios can provide interesting information, at least one more difficulty presents itself. While small biface flakes can and are removed during the manufacture of both large and small bifaces, large biface flakes tend to be associated only with production of large bifaces. By associating all small biface flakes with small bifaces, we are probably artificially reducing the large biface flake-to-large biface ratio. Thus, it might be best to simply combine all biface reduction data and deal with it as a whole rather than dividing it into size categories. This is shown in Table 120. Median corrected values are used

Table 118. Distribution of material types occurring in the biface flake and biface assemblages from the Ceramic period components on Townsend.

	Townsend Area A				Townsend Area B			
Material Type	Small Biface Flake	Large Biface Flake	Small Bifaces	Large Bifaces	Small Biface Flakes	Large Biface Flakes	Small Bifaces	Large Bifaces
Chert	•	•	•	•	•	•	•	
Alibates chert		•						
Edwards Plateau chert			•	•				
Possible Edwards Plateau chert	•		•	•			•	
San Andres chert				•				
Light gray chert	•					•		
Orange chert, white inclusions	•		•					
Red chert, gray inclusions					•		•	
Light orange chert	•							
Gray chert, no fluorescence	•	•	•	•	•	•	•	•
Gray chert, warm fluorescence	•	•	•		•	•	•	
Tan chert, no fluorescence	•	•	•	•			•	•
Tan chert, warm fluorescence	•				•	•		
White chert, yellow inclusions	•				•		•	
Light brown chert					•			
Brownish-red siltstone								•
Silicified wood	•		•	•				
Igneous undifferentiated				•				
Obsidian	•		•					
Red rhyolite	•							
Limestone		•						
Quartzite				•				
Light purple quartzite				•				

Table 119. Various biface flake to biface ratios for Areas A and B from Townsend East.

Biface Flake to Biface Ratio	Townsend Area A	Townsend Area B
Full analysis sample only	1.0:1	2.1:1
Full analysis sample with biface totals adjusted proportionately downward	5.2:1	8.8:1
Rough sort, unadjusted	5.7:1	8.6:1
Rough sort with number of biface flakes adjusted upward	6.3:1	8.9:1

Table 120. Combined biface flake to biface ratios for all components; median values used for Areas A and B from Townsend East.

Component	Biface Flake to Biface Ratios
Townsend Area A	5.7:1
Townsend Area B	8.6:1
Townsend Area C	4.3:1
Townsend West (Area D)	4.0:1
LA 51095	0:0
LA 117246	0:0
LA 117248	0:0
LA 117250	0:0
LA 117255	7.0:1
LA 117257	10.0:1

for Areas A and B from Townsend. These values now consider all biface flakes and not just whole or proximal fragments, so other values have been adjusted accordingly. These figures suggest that biface manufacture occurred in three components: Areas A and B from Townsend, and LA 117257. While the ratios for LA 117255 and LA 117257 are also indicative of biface manufacture, few biface flakes and fewer bifaces were recovered from those components, inflating this figure.

Large biface manufacture tends to yield quite a bit of debitage that can be recovered using 1/4-inch mesh, but the same does not hold true for small bifaces. In replicative experiments, debitage from the manufacture of multiple small and large projectile points was collected and passed through a series of screens. Though this experiment is ongoing, preliminary results indicate that most flakes produced by pressure flaking tend to pass through 1/4-inch mesh screen and would not have been recovered by the excavational methods used for some of these components. Pressure flaking tends to be the primary technique used in manufacturing small bifaces and is often used to finish edges on large bifaces. Thus, small biface manufacture can be much more difficult to identify than large biface production. Indeed, only when small biface flakes co-occur with more direct evidence of small biface manufacture can one conclude that small bifaces were actually made at a site.

Evidence of large biface manufacture tends to be more visible. Analysis of a site used on multiple occasions for large biface roughout near San Ildefonso (LA 65006) yielded between 20 and 35 percent large biface flakes per assemblage (Moore n.d.b). Around 50 percent or more of unobscured platforms on flakes from these components were modified (Moore n.d.b). While these data pertain to assemblages that mostly derive from large biface roughout, they provide comparisons that can be used to examine levels of biface manufacture in our assemblages.

Reviewing the discussion of formal tools in the last chapter provides direct evidence of biface manufacture in three components: Areas A and B from Townsend, and LA 117255. At least five generalized bifaces from Townsend Area A were broken during manufacture, and another six were abandoned during manufacture for a variety of reasons. However, at least three of the latter also exhibited manufacturing breaks, and the combination of these factors suggests that they may have been collected from earlier sites and partly reworked before being discarded at this location. There is plenty of other evidence of biface recycling in this assemblage. Six biface fragments were intentionally smashed to produce usable debitage, and a fragment of an Alibates chert biface was reworked. These seven bifaces were probably all salvaged from earlier sites. Thus, at least eight generalized bifaces from Townsend Area A appear to have been discarded because of production flaws or manufacturing breaks, and all were made from locally available materials.

At least some small biface production also occurred in Area A. Seven arrow point preforms were discarded because of manufacturing breaks or production flaws, and six arrow points were discarded for the same reasons. A large arrow/small dart point preform was discarded during manufacture, and a dart point tip was broken during manufacture. All of these specimens were made from locally available materials. Arrow points vastly outnumbered dart points in this assemblage, casting doubt on the direct association of dart points with the Ceramic period materials. This is supported by evidence for reworking on three of the seven dart points recovered from this area, implying that they may have been collected elsewhere for reworking into new forms.

There is also evidence of large biface manufacture in the assemblage from Area B on Townsend, including five generalized bifaces broken during manufacture and five edge bites. All of these tools are made from locally available materials. Two additional bifaces from this component are fragments that were probably collected elsewhere and reworked into new forms. An arrow point preform and two arrow points from this assemblage were broken during manufacture or discarded because of production flaws; all three were made from local materials.

Other direct evidence of biface manufacture or reworking comes from two components: a uniface reworked into a biface was recovered from Area C at Townsend, and a large arrow/small dart point broken during manufacture was recovered from LA 117255. While the former is probably evidence of recycling materials from an earlier site, the latter may be evidence of in situ tool production.

Evidence of biface manufacture in these assemblages has now been examined in a number of ways using several criteria. While this degree of detail might seem extreme, our examination has provided qualitative data that are important for understanding tool manufacture in these components. Discriminating between the manufacture of large generalized and small specialized bifaces is also critical to our understanding of chipped stone reduction trajectories through time, as discussed in an earlier section of this chapter.

Now it is time to sum up what we have learned about biface manufacture at these sites. Biface flakes were recovered from seven of ten components (Table 112). In three cases, they comprise 10 percent or more of the debitage assemblage, and in two cases they make up over 8 percent. While these percentages are hardly as large as those recorded for biface workshops at LA 65006 near San Ildefonso (Moore n.d.b), they suggest substantial biface flaking in those assemblages—Areas A, B, and C from Townsend, LA 117255, and LA 117257—at least compared to core reduction. When biface flake-to-biface ratios are adjusted (Table 120), there are fairly high ratios in three cases, and moderate ratios in three others. Direct evidence of biface manufacture in the form of tools discarded because of manufacturing breaks or production flaws were recovered from three components, two of which, Areas A and B from Townsend, also had fairly high corrected ratios of biface flakes to bifaces. The third, LA 117255, had a moderate corrected ratio.

Very good evidence exists for the manufacture of a range of large and small bifacial tools in assemblages from Areas A and B at Townsend. However, a number of finished bifacial tools were also probably brought in from elsewhere, especially projectile points. There are numerous examples of points that were broken during use and discarded in both assemblages, probably in conjunction with arrow shaft refurbishing. This creates noise in the assemblage that is difficult to remove. Also introducing noise are several bifaces in both assemblages that appear to have been salvaged from earlier sites for reworking. These specimens represent failures: partly completed tools that were discarded because of problems encountered during reworking. We cannot account for examples of this behavior where reworking was successful and new tools were produced. In other cases, biface fragments were collected from earlier sites and intentionally smashed to produce usable debitage. Again, this introduces noise. There are several instances where tools were made from materials that are not represented in debitage assemblages, and this is very indicative of the import of finished bifaces from elsewhere. We have also demonstrated that there are several instances where materials are represented by biface flakes but no bifaces (Table 118). This is indicative of biface manufacture (or refurbishing) and transport of the resulting product. While we can suggest the occurrence of these behaviors, we cannot quantify them because too much of the evidence (very small biface flakes and often the bifaces themselves) is missing from these assemblages.

The assemblage from Area C at Townsend also yielded some evidence of tool manufacture. A reworked uniface that was discarded while it was being reflaked into a bifacial form is the only direct evidence of biface manufacture. Unfortunately, it is made from an undifferentiated chert that cannot be linked to any of the biface flakes in this assemblage. The biface flakes are all chert, and at least four varieties were identified. However, no bifaces made from those materials were recovered, suggesting that they were transported. Only one variety of chert was represented by more than a single flake. This may mean that biface reduction was very limited at this locale, and that much of it involved the striking of flakes from biface-cores for use as informal tools, though no obvious evidence of such use was identified. Thirteen of 17 biface flakes from Area C were definitely struck from large bifaces. While the other four could have been struck from small bifaces, they also could have come from large tools. All in all, we can document the presence of multiple large bifaces at this component, but it is unlikely that any were manufactured in situ. Thus, there is very limited evidence of bifacial tool manufacture in this assemblage.

A similar situation also exists for the assemblage from Townsend West Area D. Discard because of manufacturing breaks or production flaws could not be specified for any of the three bifaces identified in this assemblage. Only one of 12 biface flakes was potentially removed from a small biface, which suggests that all probably came from large bifaces. Five specific materials were identified in the biface flake assemblage, and four are represented by single specimens. There are four examples in the fifth case, a common locally available gray chert. No good evidence of biface manufacture can be derived from these data. Instead, it is more likely that flakes were removed from bifaces for informal use. Unfortunately, no obvious evidence of such use was identified. As in Area C, we can document the presence of multiple large bifaces for this component, but there is no good evidence to suggest that any were manufactured in situ.

Absolutely no evidence of biface manufacture was found in four assemblages: LA 51095, LA 117246, LA 117248, and LA 117250. These assemblages contain no bifaces or biface flakes. When we get to LA 117255, we can again at least document the presence of bifaces. This assemblage contains a large arrow or small dart point broken during manufacture, evidence that at least some formal tool manufacture occurred there. Unfortunately, this point is made from an undifferentiated chert, as are six of seven biface flakes from LA 117255, and no direct association can be made between them. The only biface flake that could be assigned to a specific material was a brownish-red siltstone, for which no comparable biface occurs. Though a moderate biface flake-to-biface ratio was derived for this component, the comparatively small number of biface flakes that actually occur is probably more indicative of the removal of flakes from bifaces for use, and at least one chert biface flake shows evidence of informal tool use. Thus, very limited biface manufacture may have occurred at this location, as well as the use of large bifaces as sources for informal tools.

The highest biface flake-to-biface ratio was derived for LA 117257, mostly because that assemblage contains only one biface, a nearly complete large arrow/small dart point preform with a nondiagnostic break. Since it is made from an undifferentiated chert, it cannot be directly tied to any of the biface flakes in this assemblage (though eight are also undifferentiated cherts), and it is not evidence of biface manufacture. Two Alibates chert biface flakes indicate the presence of a formal tool made from that material, and judging from their size, it was a large biface. Indeed, only one biface flake in this assemblage may have been removed from a small biface, and that is questionable. As is the case with several other components, there really is no strong evidence of biface manufacture in this assemblage, despite the high biface flake-to-biface ratio. Instead, flakes were probably struck from large bifaces for use as informal tools, though no obvious evidence of such use was found.

The Core Assemblages

Core type and condition. Types and conditions of cores can provide further information on reduction strategy. Table 121 shows numbers of cores by morphology for each component except LA 117250, which contains no cores. Tested cobbles are nodules with one or two flakes struck from them, unidirectional cores have flakes removed from one platform, bidirectional cores have removals from two opposing platforms, multidirectional cores have removals from two (nonopposing) or more platforms, and bipolar cores were rested on a hard anvil and struck.

Multidirectional cores are the most common type overall (n=44; 61.1 percent) followed distantly by tested cobbles (n=19; 26.4 percent). Other types are rarer and include unidirectional (n=5; 6.9 percent), bidirectional (n=2; 2.8 percent), and bipolar (n=2; 2.8 percent). Not surprisingly, the assemblage from Area A at Townsend contains the most cores and is the largest assemblage overall. However, the second largest assemblage, Area B from Townsend, contains the smallest number of cores. This is mostly due to sample error, and the artifacts selected for full analysis come from areas that apparently did not yield cores. However, when core flake-to-core ratios were considered for the rough sort, Townsend Area B had the largest ratio, indicating either very intense core reduction or removal of cores from the site.

Examination of core assemblages is hampered by variability in sample sizes, materials represented, and core sizes. Thus, it is necessary to consider the cores as a single population before contrasting assemblages. Small samples of certain materials may also hamper our interpretation. Fortunately, some material types can be further collapsed to increase sample size. As discussed earlier, silicified wood is essentially a chert, so those materials can be merged. Similarly, quartzitic sandstone (orthoquartzite) is a form of quartzite with a sedimentary rather than a metamorphic origin (Church 1994:11-12), so those materials can also be combined. Core sizes represent estimates based on available measurements and are expressed as volume. Chert cores tend to be the smallest with a mean volume of 28.2 cc, while nonchert cores average 123.0 cc. Bipolar cores are the smallest type at 12.5 cc, followed closely by bidirectional cores at 13.0 cc. Overall, tested cobbles are the largest core type (133.7 cc), followed rather distantly by unidirectional (75.6 cc) and multidirectional (45.5 cc) types.

This distribution may be partly due to material type and sample size. All of the bidirectional and bipolar cores are cherts, while grainier materials are included in all other categories. Since grainier materials are usually more difficult to reduce to a small size, it is no surprise

Table 121. Core morphology by component; frequencies and row percentages.

Component	Tested Cobble	Unidirectional Core	Bidirectional Core	Multidirectional Core	Bipolar Core
Townsend Area A	3 11.5%	1 3.8%	2 7.7%	20 76.9%	- -
Townsend Area B	- -	- -	- -	1 100.0%	- -
Townsend Area C	3 37.5%	- -	- -	5 62.5%	- -
Townsend West (Area D)	- -	1 20.0%	- -	4 80.0%	- -
LA 51095	2 22.2%	- -	- -	7 77.8%	- -
LA 117246	- -	1 50.0%	- -	1 50.0%	- -
LA 117248	3 33.3%	1 11.1%	- -	4 44.4%	1 11.1%
LA 117255	7 77.8%	- -	- -	2 22.2%	- -
LA 117257	1 33.3%	1 33.3%	- -	- -	1 33.3%

that these types are the smallest. As Table 122 shows, nonchert cores have much larger mean volumes for two of the three types in which they occur. The only case in which this is not true is the unidirectional category, and that variation may be due to sample error since one chert unidirectional core has a volume of 257 cc, which is five times larger than the next largest specimen. If this core is discounted, the mean volume of chert unidirectional cores is only 20.4 cc, much smaller than the nonchert mean. Overall, therefore, chert cores are either reduced to a much smaller size than nonchert cores or they started out much smaller.

The level of core reduction can be estimated by examining the amount of cortical surface remaining. A complete lack of cortex usually indicates extensive reduction, while large amounts of cortex suggests limited reduction. Excluding bipolar cores, cortex percentages decrease as the number of platforms increase. Tested cobbles have the largest mean cortical coverage at 66.3 percent, followed by unidirectional (54.0 percent), bidirectional (40.0 percent), and multidirectional (27.7 percent). This essentially follows the same order as core volume, except in that case bidirectional cores were smaller on average than multidirectional cores. Bipolar cores have a mean cortical coverage of 45.0 percent yet were the smallest type overall. This is because the bipolar technique is generally only used to reduce nodules that are too small for more conventional methods.

Material type could be a controlling factor in both core size and amount of reduction performed. High-quality materials should be intensely reduced, especially if they are comparatively rare locally or imported. Lower-quality materials may not have been reduced to

Table 122. Mean volumes (cc) by core type for chert and nonchert materials.

Material	Tested Cobble	Unidirectional Core	Bidirectional Core	Multidirectional Core	Bipolar Core
Cherts	25.8	99.3	13.0	23.4	12.5
Noncherts	172.2	40.0	-	88.2	-

Table 123. Cortical coverage and mean volume for cores by material type.

Material	Percent Cortical Coverage	Mean Volume (cc)	Number of Specimens
Chert	29.3	28.2	39
Basalt	80.0	118.0	1
Granite	80.0	145.0	1
Rhyolite	66.7	63.3	3
Limestone	36.7	73.0	6
Siltstone	20.0	20.0	1
Quartzite	59.0	152.8	19

the same extent, especially if they were locally available. Table 123 shows mean core size and cortical coverage for each material class. Other than siltstone, of which only one specimen was recovered, chert cores are the smallest and had the most cortex removed from them. Chert cores are also the most common type in the assemblage (52.8 percent). Cores of igneous and metamorphic materials tend to have much higher percentages of cortical coverage remaining and are much larger than chert cores, on average.

Chert is usually highly desired and sought for making chipped stone tools because it is one of relatively few types of rock that can be broken in a controlled manner to produce sharp, durable edges (Luedtke 1992:73). When compared to other materials that break predictably, cherts tend to be among the most easily flaked (Callahan 1979:16; Crabtree 1972:4-5). Chert is the most common material class in these assemblages, comprising 73.1 percent of the debitage, 56.9 percent of the cores, and 91.8 percent of the formal tools. The only material in these assemblages that is better for flaking and formal tool manufacture is obsidian, which had to be imported and is consequently quite rare. Otherwise, there is evidence of a differential selection and treatment of materials based on flaking quality and grain size. Cherts are the most abundant materials in most components. They were dominantly selected for formal tool manufacture and by far dominate the debitage assemblage. Other materials in the core assemblage are lower quality and tend not to have been reduced to the same extent. Thus, material type does appear to have been a controlling factor in the amount of reduction performed on cores.

Cortex occurs on over 86 percent of the cores and provides information on material acquisition. Of the cores with cortical surfaces, 62.9 percent have waterworn cortex and were obtained from gravel deposits. Another 11.3 percent have nonwaterworn cortex and may have been procured at or near outcrops. Cortical type could not be accurately defined for the remaining 25.8 percent. While we cannot state that cores with indeterminate cortex came from a specific type of source, the likelihood is that they were mechanically transported away from their primary sources and procured from secondary sources, probably gravel deposits along local streams.

Material types for cores with nonwaterworn cortex are chert (n=4), rhyolite (n=1), and quartzite (n=2). Two of the chert cores were assigned to the generic category, one is a local gray chert, and one is Edwards Plateau chert. One quartzite specimen is a generic variety, while the other is purple quartzite. Cores with nonwaterworn cortex were recovered from only two components: Area A at Townsend (n=2) and LA 117255 (n=5). The specimens from Townsend Area A include both of the identifiable cherts (local gray and Edwards Plateau), while the remaining specimens were recovered from LA 117255. Since four of five specimens from LA 117255 were defined as tested cobbles (the sole exception being the purple quartzite), there may be a problem with either the identification of morphology or type of cortex present for the rhyolite and quartzite specimens, since those materials do not outcrop anywhere near this site. However, the presence of nonwaterworn cortex on the two remaining specimens, which are chert, suggests that there are outcrops of that material relatively close by.

Comparison of core assemblages. Table 124 presents basic core summary data for the assemblages that contain cores and shows little apparent patterning. However, when the two components that contain fewer than three cores are eliminated, some patterning becomes apparent. The cores from Townsend West, Area D have the smallest mean size and percentage of cortical coverage, which is consistent with the types of cores recovered from this component: 80 percent are multidirectional, and none are tested cobbles. This is the only core assemblage in which cherts are somewhat overrepresented in comparison to debitage distributions (Table 124).

Townsend Area A has the second smallest mean percentage of remaining cortex and the third smallest mean core size, while Townsend Area C reverses this with the third smallest percentage of remaining cortex and the second smallest mean core size. While both of these assemblages are dominated by multidirectional cores (Table 121), tested cobbles make up a much larger percentage of the core population for Area C, which contributes to the larger mean cortical percentage. With tested cobbles eliminated from both assemblages, they have essentially the same mean percentage of remaining

Table 124. Basic core data for each component.

Component	Cores					Debitage	
	Mean Cortex	Mean Volume	No. Cores	Chert	Nonchert	Chert	Nonchert
Townsend Area A	26.9%	34.5 cc	26	76.9%	23.1%	77.6%	22.4%
Townsend Area B	40.0%	24.0 cc	1	100.0%	-	81.2%	18.8%
Townsend Area C	46.3%	26.1 cc	8	75.0%	25.0%	83.7%	16.3%
Townsend West (Area D)	22.0%	21.6 cc	5	60.0%	40.0%	46.9%	53.1%
LA 51095	47.8%	77.1 cc	9	33.3%	66.7%	41.2%	58.8%
LA 117246	40.0%	63.5 cc	2	50.0%	50.0%	55.6%	44.4%
LA 117248	54.4%	75.9 cc	9	22.2%	77.8%	33.3%	66.7%
LA 117255	57.7%	209.9 cc	9	33.3%	66.7%	46.4%	53.6%
LA 117257	60.0%	112.3 cc	3	66.7%	33.3%	95.5%	4.5%

cortex at about 24 percent. Percentages of chert and nonchert cores are close to the distribution of debitage for Townsend Area A, while nonchert cores are slightly overrepresented in Area C.

The four remaining components tend to have higher mean percentages of remaining cortex and larger mean volumes than the assemblages from the Townsend site. Mean percentages of remaining cortex are generally higher, and mean core size is much larger for these components. The LA 51095 assemblage is dominated by multidirectional cores (77.8 percent), but none of the cores in this assemblage were reduced to the point that no cortex remains, and in seven of nine cases at least 40 percent of the surface is still covered by cortex. In part, the much larger mean size of these cores over those from the Townsend components is because they are dominated by noncherts. Indeed, chert cores are underrepresented in this assemblage when compared to the distribution of debitage in Table 124.

LA 117248 demonstrates trends similar to those seen for LA 51095, though multidirectional cores are not quite as dominant (44.4 percent), and there is a higher percentage of tested cobbles (33.3 percent versus 22.2 percent for LA 51095). Again, none of the cores from LA 117248 had all of their cortical surface removed, and in seven of nine cases at least 40 percent remains. When material percentages are compared for cores and debitage, cherts are underrepresented in the core assemblage.

There is a small increase in mean percentage of remaining cortical coverage for LA 117255 over the two preceding assemblages, but a very large increase in mean core size. This may be because this is the only core assemblage dominated by tested cobbles (77.8 percent). Again, in seven of nine cases at least 40 percent or more of the cortical surface remains. Three of the four smallest cores in this assemblage are chert, and two of them are tested cobbles. The third tested cobble is rhyolite, while the fourth smallest specimen is a chert multidirectional core. Though we have been unable to demonstrate it, this may be evidence that chert cores tended to start off as smaller nodules, on average, than other materials. Once again, when core and debitage assemblages are compared, cherts seem underrepresented in the core assemblage.

Core data for LA 117257 may be somewhat skewed by small sample size, but they have some comparability to that from other assemblages. These cores have the highest mean percentage of remaining cortical surface, and very large mean size. The mean size of cores in this assemblage is reduced somewhat by the presence of a bipolar core. With that specimen eliminated from consideration, the mean core size is increased to 161.3 cc. While this is still smaller than the mean for LA 117255, the difference is not quite as large. All cores in this assemblage have at least half or more of their cortical surface remaining. The largest and smallest cores from this component are chert, indicating that some chert cores could be quite sizeable (266 cc in this case). Once again, when core and debitage assemblages are compared, cherts are underrepresented in the core assemblage. This assemblage contained the highest percentage of chert debitage of all components.

Summary and discussion of core data. To summarize the results of this part of the analysis, more than 87 percent of the core assemblage consists of tested cobbles and multidirectional cores. Of all cores recovered from these components, these types demonstrate the least amount and the largest amount of reduction, respectively, a rather strange distribution. As we would expect, tested cobbles tend to be the largest core type, and multidirectional cores are much smaller. Bidirectional and bipolar cores are the smallest types represented in this assemblage. This is to be expected for the bipolar type since, as noted earlier, generally only nodules too small for freehand reduction are smashed in this way. All four of these cores are chert, and the higher quality and flakeability of this material probably allowed reduction of much smaller pieces than would be possible or desirable for coarser-grained materials. Mean core size tends to decrease as the number of platforms increases, though the multidirectional and bidirectional types are switched in the order. This suggests that the bidirectional cores started life as smaller nodules than those that were reduced from multiple platforms, and that smaller size may simply have limited the number of platforms that could be used to efficiently strike flakes.

Our analysis showed that material type was a controlling factor in both core size and amount of reduction accomplished. Cherts were the highest-quality materials reduced in these assemblages, and chert cores tend to be smaller and have less cortical surface remaining than cores of other, lower-quality materials.

The examination of cortex type on cores was rather confusing and unsatisfactory. Most nodules seem to have been obtained from gravel beds along local streams. However, we were unable to accurately define cortex type for a large percentage of the core population. Nonwaterworn cortex was noted in a few cases, but there may be problems with some of those identifications. Only two cores appear to have been imported from a distant region, and both are Edwards Plateau chert from Townsend Area A. Somewhat against expectations, both of these cores have remnant cortical surfaces (40 and 70 percent), and they are bidirectional and multidirectional types. Otherwise, the core population represents materials that are generally available locally, though probably with variable levels of abundance.

Where individual assemblages are concerned, the higher the mean for remaining cortical coverage, the more likely it is that early-stage core reduction is represented. It is no coincidence that the assemblage with the lowest mean percentage of remaining cortical coverage also has the smallest mean core size and contains no tested cobbles. That component is Area D at Townsend West, the only assemblage containing more than two cores that has no tested cobbles.

Overall, the four components from the Townsend site have the smallest mean core sizes and smallest mean percentages of remaining cortex. These components represent the most intense occupations among the sites examined by this study. This suggests that the longer (or more often) a component was occupied, the greater the chance that cores were intensively reduced. This is partly supported by the presence of cores lacking any cortex in three of the Townsend assemblages: Areas A (30.8 percent of the core assemblage), C (12.5 percent), and D (20.0 percent). All cores recovered from other sites still had portions of their cortical surfaces remaining. Three of the four cases where cherts make up two-thirds or more of a core assemblage are Townsend site components and have the smallest mean core sizes and lowest percentages of remaining cortex. This suggests that material type may also factor into the equation, since chert is the highest quality material available locally, and chert cores were generally more heavily reduced than cores of other materials. Thus, intensity of occupation (or reoccupation) coupled with heavy reduction of high-quality material resulted in smaller cores with less remnant cortex.

The presence of tested cobbles in nearly every assemblage that contains more than two cores indicates that at least some material acquisition and preliminary core reduction occurred in at least six components. In only one case, LA 117255, do tested cobbles form a majority of the core assemblage. However, it is difficult to ascribe meaning to this without taking other data into account. Tested cobbles represent very early-stage cores that were not considered suitable for further reduction. Thus, they are rejects from the chipped stone reduction trajectory. When they are present on a site it probably means that suitable materials were available close enough nearby that transport of potentially unsuitable nodules was not a highly expensive task in terms of time and energy output.

Except for LA 117257, multidirectional cores dominate. This is indicative of fairly intense reduction and suggests that when suitable nodules were found the chance that they would be reduced until exhausted was pretty high. Unidirectional cores represent a fairly early stage in the reduction sequence, and are second only to tested cobbles in mean size. In most instances this type of core probably represents the next step after a cobble was tested and found to be suitable for reduction. Bipolar cores are rare but also represent an early stage in the core reduction sequence.

Bidirectional cores are also rare and very small in these assemblages. While the size of these cores suggests that they represent a late stage in the reduction sequence, this is contradicted by the amount of cortex remaining on their exterior surfaces: 40 percent in both cases. This suggests that these specimens actually represent an early stage in the core reduction sequence, and that beginning nodule size was rather small. One of the bidirectional cores was smaller than all of the tested cobbles and unidirectional cores, and larger than 13 (29.6 percent) of the multidirectional cores; 12 of the latter retained only 10 percent or less of their cortical surfaces. The second and larger bidirectional core was larger than only three (15.6 percent) of the tested cobbles, was smaller than all but one of the unidirectional cores, and was larger than 19 (43.2 percent) of the multidirectional cores; 14 of the latter retained only 20 percent or less of their cortical surfaces. What this seems to suggest is that this type of core should fit into the reduction sequence with the multidirectional variety, representing relatively small nodules that were best reduced from two opposing platforms.

This discussion allows us to divide the core assemblages into early and late stages of reduction. The former is characterized by fairly high percentages of remnant cortical surface and large size, with few flake removals visible or only a single platform. The latter are characterized by comparatively smaller percentages of remnant cortical surface, smaller size, and multiple striking platforms. Core assemblages are divided using these criteria in Table 125. Early-stage reduction dominates three core assemblages and is evenly split with late-stage reduction in one. Late-stage core reduction appears to dominate the remaining core assemblages, though in one case (Townsend Area C), early-stage core reduction is also fairly high. However, these conclusions are only meaningful when corroborated by debitage information.

Table 125. Cores by reduction stages for all assemblages; percentages.

Component	Early Stage	Late Stage
Townsend Area A	15.4	84.6
Townsend Area B	-	100.0
Townsend Area C	37.5	62.5
Townsend West (Area D)	20.0	80.0
LA 51095	22.2	77.8
LA 117246	50.0	50.0
LA 117248	55.6	44.4
LA 117255	77.8	22.2
LA 117257	100.0	-

Informal Tool Use

Informal tools are debitage or cores that display evidence of cultural edge damage but lack signs of purposeful modification of shape or edge angle. Very conservative standards were applied when defining edge damage as evidence of use because trampling and mechanical transport often cause damage 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.

Because stringent standards were applied, we are fairly certain that the tools identified by this analysis indeed served as such. Unfortunately, these criteria probably only allowed identification of a small percentage of the debitage and cores used as informal tools in these components. 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-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 occurs only when hard materials are contacted.

Scarring also varies with the type of material used as a tool. Fragile materials like obsidian scar more easily than tough materials like 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, a much higher percentage of cherts and obsidians are expected to evidence use as informal tools.

These experiments indicate that consistent scarring that would be defined as cultural wear by our analysis will probably not be present unless fairly hard materials were encountered. Thus, flakes used to cut meat or vegetal materials undoubtedly were not identified. Wear patterns may also not be identifiable on coarse-grained materials, especially rocks like rhyolite and quartzite, even if they were extensively used.

Low-powered magnification (under 100x) was used to examine debitage edges in this analysis. As Andrefsky (1998:7) notes, studies have shown that low-powered microscopic analysis can be an accurate technique, but it cannot determine the types of materials debitage tools were used on. Though high-powered

Table 126. Basic informal tool assemblage information for each component.

Component	Cherts		Basalt Debitage	Limestone Debitage	Percentage of Debitage and Core Assemblage
	Debitage	Cores			
Townsend Area A	21	4	-	-	1.2
Townsend Area B	10	-	1	1	1.4
Townsend Area C	1	-	-	-	0.5
Townsend West (Area D)	5	-	-	-	1.2
LA 117255	3	-	-	-	3.8
LA 117257	1	-	-	-	1.4

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 do not have the resources to conduct high-powered microscopic analysis. We can identify debitage that were definitely used as tools, but we cannot determine the materials they were used against in other than very general terms.

Like the methods used to discriminate between core and biface flakes, we can only identify definite examples of informal tools. Specimens with inconsistent edge damage or polish that is not visible under low-powered magnification were not identified. Only a percentage, and probably a small one, of the informally used debitage was identified by this analysis. This study can provide further information on the range of tasks accomplished at a site, but in no way does it identify all of the informal tools in an assemblage or the full range of tasks in which they were used. Thus, like other analyses discussed in this chapter, this study is indicative rather than definitive—it provides some idea of the range of informal tools, but does not identify all such examples. The artifacts in the informal tool assemblage represent a biased sample of the most obvious examples.

Basic informal tool information is presented in Table 126. Informal tools were identified in six components, with the exceptions of LA 51095, LA 117246, LA 117248, and LA 117250. Except for LA 117248, these are the smallest components in our sample. However, the caveats presented in the introduction to this section must be kept in mind: absence of identified informal tools in no way demonstrates that they were not used, it only means that the assemblage contains no obvious informal tools.

As expected, chert is the most common material on which informal tool use was identified, and it comprises 95.7 percent of this small assemblage. Basalt and limestone are represented by single artifacts, each comprising 2.1 percent of the assemblage. While over half (53.2 percent) of the informal tools were recovered from Area A on Townsend, that component also contains 54.1 percent of the total debitage and core assemblage and thus should include half or more of the informal tools. Most of the informal tools are core flakes (n=34; 72.3 percent), though angular debris (n=2; 4.3 percent), biface flakes (n=7; 14.9 percent), and cores (n=4; 8.5 percent) are also represented.

Scarring on utilized edges varies with the way tools were used, the material they were used against, and the type of material from which they were made. In experiments by Vaughan (1985:20), cutting caused bidirectional scarring in 65 percent of his cases, and unidirectional scarring on 17 percent. Scraping or whittling produced bidirectional scars on 46 percent of his cases, and unidirectional scarring on 54 percent. Thus, it is difficult to assign a specific function to either of these patterns since there is a significant overlap in the type of wear pattern produced.

Material texture was important in selecting informal tools. Tasks like cutting and scraping require materials with sharp edges, and glassy and fine-grained materials usually produce the sharpest edges. In contrast, these textures are rarely suitable for pounding or chopping. Glassy and fine-grained materials tend to splinter and fragment when used in such tasks, while coarse-grained materials are tougher and more resistant to fracture damage (Cotterell and Kamminga 1990:129). Thus, edges on coarse-grained materials will last longer and splinter less rapidly or often when used for pounding and chopping. Materials also have different compressive strengths. Compressive strength is high for basalt, quartzite, and chert, while that of obsidian is very low because it lacks a crystalline structure (Hughs

1998:372). Material type is another important consideration because of variation in toughness, or resistance to fracture. Materials like andesite, basalt, tuff, rhyolite, and dacite are much tougher than chert and obsidian (Cotterell and Kamminga 1990:129). We expect that chert, obsidian, and fine-grained basalt or rhyolite were used for cutting or scraping, while quartzites and coarse-grained volcanics were more suited to pounding or chopping.

Edge angle was another important factor in selecting informal tools for specific purposes. Most of the edges used in Schutt's (1980) experiments that measured over 40 degrees were found to be poor for cutting. Thus, we assume that edge angles smaller than 40 degrees were best for cutting, while those larger than 40 degrees were better for scraping.

With the preceding discussion in mind, the types of materials that show evidence of informal tool use are not indicative of chopping or pounding activities. All identified informal tools are fine-grained in texture and best suited for cutting or scraping. This is also consistent with the materials represented: chert has high compressive strength, but is not tough. Basalt is a tougher material but was not heavily used for informal tools. Thus, sharpness of cutting edge, which tends to accompany finer grain size, seems to have been a prerequisite to selection for informal tool use.

There are a total of 62 utilized edges among the 47 informal tools. Both pieces of utilized angular debris had a single utilized edge apiece. Among the core flakes, 27 exhibit a single utilized edge, four have two utilized edges, two have three utilized edges, and one has four utilized edges. Six biface flakes have one utilized edge each, and one has two utilized edges. Two cores have a single utilized edge apiece, one has two, and one has three. A slight majority of debitage edges have angles measuring 40 degrees or smaller (29; 52.7 percent), while the rest are larger than 40 degrees (26; 47.3 percent). All seven utilized core edges have angles greater than 40 degrees. Five pieces of debitage with multiple utilized edges have edge angles that fall into both categories, two have edge angles greater than 40 degrees, and only one has multiple edges with angles measuring 40 degrees or less. These distributions suggest that debitage were used in almost equal proportions for cutting and scraping, while cores were only used for the latter.

Unidirectional wear patterns occur on 49 debitage edges; edge angles averaged 44.4 degrees and ranged from 20 to 92 degrees. Bidirectional wear patterns occur on only five debitage edges, and the average edge angle was almost identical to that of the unidirectional pattern at 44.8 degrees, with a range between 37 and 61 degrees. A single battered edge was recorded on a piece of angular debris, and its edge angle is 57 degrees.

It is difficult to suggest more specific functions based on these data. There is a nearly even split between edges with angles smaller than 40 degrees and those that are larger, yet unidirectional wear dominates both patterns. Logically, one would assume that unidirectional wear should dominate when informal tools were used for scraping, and bidirectional wear should occur most commonly with a cutting motion. Experimental data suggest that these statements are generally true, but as Vaughan's (1985) experiments showed, there can be considerable overlap. About 47 percent of the edges exhibiting unidirectional wear have angles greater than 40 degrees, and 80 percent of those with bidirectional wear have angles larger than 40 degrees. Thus, we really cannot ascribe specific functions to these tools, other than suggesting that they are indicative of activities involving the cutting or scraping of relatively hard materials.

All seven edges on the utilized cores exhibit unidirectional wear, and none measure less than 40 degrees. Indeed, the average edge angle for these tools is 66.3 degrees, with a range between 43 and 92 degrees. In this case, the range of edge angles and wear patterns match our expectations for scraping use, though this is tentative. The only debitage tool for which a more definite function can be suggested is the piece of angular debris with a battered edge. Edge damage was probably intentional in this case, dulling it to produce a backed blade and preventing users from cutting themselves. The actual locus of use was on the edge opposite the dulled edge, which showed no signs of use.

All four utilized cores came from Area A at Townsend and were probably used in tasks involving the scraping of relatively hard materials. In general, these cores were quite small—averaging less than a quarter of the mean size for all cores in this component. All are multidirectional, and three have 20 percent or less of their cortical surface remaining. These specimens were probably unsuitable for further flaking and, rather than being immediately discarded, were used for a different purpose. All we can say about the other informal tools recovered from this component is that they were probably used for cutting or scraping relatively hard materials. Similar tasks are suggested for informal tools in the other five components that yielded them.

Discussion and Conclusions: What Do All of These Data Tell Us about Site Occupations?

Several basic questions can now be addressed with the data that have thus far been generated and discussed. Additional information on formal tools can be brought in from the previous section to provide as complete a picture of these components as it is possible to develop from the chipped stone assemblages. The topics that are of greatest interest here include component dates and functions, changes in chipped stone technology through time, and variability in patterns of mobility.

Component dating. Good dates are available for five of the 10 components in this study. Tentative dates might be suggested for others based on similarities in debitage assemblage characteristics, but great care must be exerted when doing so. This is because debitage assemblage characteristics tell us quite a bit about reduction technology and strategy, but are not directly indicative of date. Thus, we must ascertain whether reduction strategy and technology can be used as temporal indicators in this region.

Three of the firmly dated components were occupied during the Late Archaic period (Areas C and D from Townsend, and LA 117255) as indicated by radiocarbon dates and projectile point typology. The two remaining components were occupied during the early Ceramic (Townsend Area A) and late Ceramic (Townsend Area B) periods, as indicated by radiocarbon dates and pottery typology. While two sherds indicative of late Ceramic period use were also recovered from LA 117250, their association with the chipped stone artifacts from that site is suspect. LA 117250 only yielded four artifacts (two sherds and two chipped stone), so in any case they can provide little relevant temporal or functional information. LA 117246 suffers from a similar lack of data, yielding only 11 pieces of chipped stone and no temporally diagnostic artifacts or samples. Thus, LA 117246 and LA 117250 are considered no further in this discussion. This leaves three components with no firm temporal grounding: LA 51095, LA 117248, and LA 117257.

Three groups of sites were consistently isolated during this analysis. The first group contains two Archaic components: Area C from Townsend and LA 117255. While the third Archaic component (Area D at Townsend West) sometimes fit with these others, it did not do so consistently. The second group contains the two Ceramic period components, Areas A and B from Townsend. The third group has no temporal base and contains LA 51095 and LA 117248. The last component—LA 117257—often fit with both the Archaic and Ceramic period assemblages. We must determine whether the third group represents a temporal or functional category, and where LA 117257 actually fits.

Certain temporal trends in material selection parameters were visible and represent variation between Archaic and Ceramic period assemblages. Cherts were more heavily used in Ceramic period components, while other sedimentary, igneous, and metamorphic materials were more common in Archaic assemblages. Considerably more use of exotic materials occurred in the Archaic assemblages, with a large drop-off by the Ceramic period. An increase in percentages of fine-grained materials through time was noted, with Archaic assemblages containing the smallest percentages. Similar tendencies were seen when materials were grouped by grain size and durability. In part, this probably reflects a greater degree of mobility during the Archaic period, permitting access to a larger variety of material sources. However, there may also be some functional aspects to these trends, with different ranges of activities occurring on Archaic components than on those from the Ceramic period. Unfortunately, no good evidence for this type of functional variation could be found in these assemblages.

Both LA 51095 and LA 117248 follow the Archaic pattern of material type distribution, containing the two smallest percentages of chert. On the other hand, LA 117257 follows the Ceramic period pattern, containing a very high percentage of cherts—in fact, the highest in our sample. When exotic material content is considered, both the LA 117248 and LA 117257 assemblages contain fairly high percentages, while the percentage for LA 51095 is much lower, but still quite a bit higher than the Ceramic period assemblages. Material texture data tend to follow material selection parameters to a certain point, but are not directly comparable. Comparing texture distributions for these assemblages from Table 104 to the means for dated components in Table 105 shows that LA 51095 and LA 117248 contain very low percentages of fine-grained materials, a possible Archaic tendency. The percentage of fine-grained materials for LA 117257 falls between means for the Archaic and Ceramic periods, and is thus an inconclusive indicator. However, material selection parameters are also associated with component function, and so are far from definitive as temporal indicators.

A number of reduction strategy indicators were defined in our model of efficient-versus-expedient reduction. While strategy is not directly indicative of temporal orientation, certain fairly consistent changes occur as dependence on farming grows. Most of these changes are related to reduction in the scale of residential mobility. Archaic hunter-gatherers tend to move base camps on a fairly regular basis as they exploit seasonally available faunal and floral resources within the territory they occupy. Ceramic period populations have a greater dependence on agricultural produce and, while residential movement continued to occur, it was scaled differently.

The Mesilla phase (early Ceramic period) of the southern Jornada Mogollon is an interesting comparison. Characteristics of the settlement pattern for this period have been modeled by Hard (1983:41-51) and Whalen (1994a, 1994b), and summarized by Moore (1996). The Mesilla-phase population is believed to have remained fairly mobile, with a settlement system resembling that of the Archaic. Subsistence was based on hunting and gathering, supplemented by some farming. The strategy of resource exploitation seems to have shifted back and forth between foraging and collecting, depending on season.

Moore (1996:85-86) suggests that, while the Mesilla phase population maintained a relatively high degree of residential mobility, it was structured differently from that of the Archaic. Farming produced surplus that could be stored, allowing the population to remain in cold-season camps far longer than if living on an unsupplemented hunting-gathering diet. Much of the population spread across the landscape during the summer, occupying small foraging camps (Hard 1983) that were probably very much like those of the Archaic. Though the level of residential mobility remained fairly high, especially when compared to the Pueblos of the northern Southwest, a focus on expedient rather than efficient reduction technology suggests that there was a reduction in residential mobility between the Archaic and Ceramic periods in the southern Jornada Mogollon area (Moore 1996:86).

Most of the structures excavated in the Ceramic period components are ephemeral, lack formal interior thermal features, and probably had fairly flimsy superstructures. This fits the pattern for warm season use (Moore 1996:73-74), as well as Hard's (1983:41-51) model of summer foraging camps. If this area is comparable to the southern Jornada Mogollon in more than simply the types of pottery used, there should have been an accompanying change in chipped stone reduction strategy, from one based on efficient reduction and material use to one based on expedient reduction. Thus, we should see evidence of general base camp activities, with less focus on efficient reduction than in the Archaic assemblages.

Large numbers of noncortical interior flakes removed as large bifaces are shaped in an efficient reduction strategy. This is not necessarily the case in an expedient strategy, so assemblages reflecting efficient reduction should contain higher percentages of noncortical flakes. A large percentage of biface flakes in an assemblage indicates that formal tool manufacture was important. When those flakes are long and there is other evidence indicating that large bifaces were made there, an efficient reduction strategy is suggested. In association with these attributes, the presence of a large percentage of modified platforms supports the idea that formal tool manufacture was an important activity, and tends to be indicative of efficient reduction.

Other indicators of reduction strategy include the ratio between flakes and angular debris. A high flake-to-angular debris ratio is indicative of efficient reduction, while a low ratio occurs in an expedient strategy. Flake breakage is also generally more common in assemblages dominated by efficient reduction, because biface flakes tend to be thinner than core flakes and are thus more susceptible to breakage through secondary compression. Experiments suggest that core reduction causes a high percentage of snap fractures, while biface reduction creates a high percentage of manufacturing breaks.

Since most tool manufacture is accomplished using soft hammer percussors and pressure flaking, a high percentage of lipped platforms suggests a focus on tool manufacture rather than core reduction. Finally, ratios of flakes to cores and bifaces may also be indicative of reduction strategy, high ratios in both cases being an indicator of careful, efficient reduction.

This array of reduction strategy indicators can be used to assess the eight components that contain large enough assemblages for comparison and help determine whether or not a change in reduction strategy accompanied the temporal shift from the Late Archaic to the Ceramic period, as occurs in the southern Jornada Mogollon region. Table 127 summarizes data for the reduction strategy indicators, and most are assessed in Table 128. However, several points should be clarified before proceeding with discussion of these tables. First, sites exhibiting a single reduction strategy are probably rare and specialized in function. Both strategies were used by Archaic and Ceramic period peoples, but they were applied differently depending on the availability of local materials, the types of activities occurring at a site, and the level of residential mobility.

The types of materials that were available locally often affected how they were used by Archaic hunter-gatherers. Analysis of the Archaic biface workshop at LA 65006 near San Ildefonso (Moore n.d.b) showed that local materials were mostly worked expediently, while obsidian imported from over 20 km away was flaked into large bifaces. Though several local materials could have been used quite effectively for the manufacture of large general-purpose bifaces, obsidian was available with a bit more work and was apparently considered much better for this type of use. Thus, local materials were used expediently, and nonlocal materials were manufactured into efficient tools. Expedient rather than efficient reduction can also occur when materials occur in small nodules. Recycling of materials left at earlier sites can become an important strategy for material acquisition in areas where suitable materials are scarce (Camilli 1988). This strategy will also result in mostly expedient reduction.

Table 127. Array of reduction strategy indicators for each component containing more than 11 artifacts.

Reduction Indicator	Townsend Area A	Townsend Area B	Townsend Area C	Townsend West (Area D)	LA 51095	LA 117248	LA 117255	LA 117257
Noncortical debitage percentage	85.9	86.0	89.2	77.7	48.6	16.5	65.5	82.0
Percentage of biface flakes	8.3	11.0	8.2	3.0	0.0	0.0	9.9	15.2
Percentage of long biface flakes	29.1	19.4	76.5	75.0	-	-	100.0	90.0
Percentage of modified platforms	13.0	12.6	15.2	5.2	0.0	0.0	21.2	20.7
Flakes to angular debris ratio	7.9:1	9.99:1	8.46:1	4.87:1	2.64:1	3.27:1	4.46:1	12.2:1
Percentage of broken flakes	70.6	75.6	79.6	68.2	64.9	63.5	69.0	83.6
Percentage of manufacturing breaks	41.2	32.9	41.2	41.0	41.7	31.3	42.5	42.0
Percentage of lipped platforms	15.6	11.8	24.1	11.3	6.9	6.2	30.8	18.5
Core flakes to cores ratio	35.9:1	50.9:1	12.3:1	36.0:1	2.7:1	5.8:1	3.6:1	10.3:1
Biface flakes to bifaces ratio	5.7:1	8.6:1	4.3:1	4.0:1	-	-	7.0:1	10.0:1
Percentage of large bifaces	35.0	24.2	75.0	33.3	-	-	100.0	100.0
Percentage of large bifaces corrected	27.2	15.2	-	-	-	-	-	-

Efficient reduction continued to be used well into the Ceramic period elsewhere in the Southwest. However, it was no longer the focus of chipped stone reduction, and evidence for this strategy tends to decrease as the scale of residential mobility decreases. This was seen in an examination of sites from the Highland Mogollon region (Moore 1999b). Large general-purpose biface manufacture and use continued into the Ceramic period in that area, but a significant decrease from Archaic production levels was visible in the data. These tools may actually have been used in more specialized ways. Large general-purpose bifaces in less residentially mobile assemblages may have been used in activities where weight and conservation of material remained important, including logistical forays and hunting. Evidence of efficient reduction in sites occupied by these groups should mostly occur at long-term residential sites. Since those sites would have had a greater occupational longevity, and most reduction performed there would have been expedient, evidence of efficient reduction would have been less common to begin with than in Archaic assemblages and would have been further diluted by the stress on core-flake reduction.

Thus, evidence of both types of strategy will usually occur in a single assemblage. However, evidence of the manufacture and use of large general-purpose bifaces tends to be much more common in sites occupied by residentially mobile peoples, while expedient reduction is much more common when residential mobility is reduced. Thus, certain indicators may suggest biface reduction, while other indicators in the same assemblage may be suggestive of core reduction.

Another major difference is in the types of bifaces that were manufactured and used. Archaic bifaces seem to have begun life as large general-purpose tools that could also be used as cores or as blanks for replacing broken tools. Even projectile points were essentially general-purpose tools, since they could be used as knives as well as weapon tips. Less mobile peoples usu-

Table 128. Reduction strategy assignments for array of indicators.

Reduction Indicator	Townsend Area A	Townsend Area B	Townsend Area C	Townsend West (Area D)	LA 51095	LA 117248	LA 117255	LA 117257
Noncortical debitage percentage	B	B	B	C	C	C	C	B
Percentage of biface flakes	C	B	C	C	C	C	C	B
Percentage of modified platforms	C	C	C	C	C	C	B	B
Flakes to angular debris ratio	B	B	B	C	C	C	C	B
Percentage of broken flakes	B	B	B	C	C	C	C	B
Percentage of manufacturing breaks	C	C	C	C	C	C	C	C
Percentage of lipped platforms	C	C	B	C	C	C	B	B
Core flakes to cores ratio	B	B	C	B	C	C	C	C

C=core reduction, B=biface reduction.

ally focused on small specialized bifaces, though some used large general-purpose bifaces. Thus, heavy dependence on small specialized bifaces appears to have accompanied increased subsistence reliance on farming.

Turning to Table 128, which summarizes reduction strategy assignments for most of the indicators in Table 127, clear patterns occur in five cases. Predominance of core reduction is suggested for Townsend West Area D, LA 51095, LA 117248, and LA 117255. Predominance of biface reduction is indicated in only one case—LA 117257. Biface reduction appears to have been important in Areas A, B, and C from Townsend, but it was not dominant, and core reduction appears to have been at least equally important.

Though we expected to see significant variation between the Late Archaic and Ceramic period assemblages, this was not the case. Biface reduction remained an important aspect of the reduction strategy through these periods. The only assemblage dominated by biface reduction indicators is from the undated LA 117257. No evidence of biface reduction was found for two components: LA 51095 and LA 117248. In most cases, we would assume that these assemblages reflect a late occupation by sedentary farmers. However, in this case there may not be any temporal significance to these attributes.

But are there visible differences between the Archaic and Ceramic period assemblages that would suggest some variation in reduction strategy through time? Returning to Table 127, significant differences in types of bifaces used can be seen. As discussed earlier, several bifaces in the assemblages from Areas A and B at Townsend seem to have been scavenged from earlier sites for reuse, either partly reworked or smashed to produce usable debitage. In both cases, all of the obviously salvaged tools were large bifaces and can be eliminated to correct the percentage of large bifaces from these components. Flakes struck from large bifaces dominate the biface flake assemblages from all three Late Archaic components and represent much smaller percentages for the Ceramic period components. This tendency is mostly replicated in percentages of large bifaces per assemblage. Two of three Archaic assemblages contain mostly large bifaces, while small bifaces dominate the Ceramic period assemblages. Thus, while bifaces continued to be very important parts of the tool kit through the time periods represented in these assemblages, there was a shift from the manufacture and use of large bifaces during the Late Archaic to an emphasis on small specialized bifaces in the Ceramic periods.

The only assemblage in which a clear majority of reduction strategy indicators suggest emphasis on biface manufacture is from the undated component at LA 117257. Use of large bifaces also dominated in this assemblage, and this tentatively suggests an Archaic association. Comparison of the LA 117257 assemblage and those from the Archaic and Ceramic periods have been conducted throughout this chapter, with mixed results. However, usually when LA 117257 was found to be statistically similar to both Archaic and Ceramic period assemblages, there was a higher degree of similarity to the former. These similarities, a lack of pottery, and evidence of an emphasis on large biface use suggest that LA 117257 was occupied during the Archaic period.

Tentative dates cannot be similarly assigned to LA 51095 and LA 117248. These components are simply different from the others. Of the eight assemblages considered here, LA 51095 and LA 117248 both contain large percentages of primary flakes, no modified platforms, and no evidence of biface manufacture or use. Very few lipped platforms were found in these assemblages, suggesting that hard hammer reduction was dominant, and perhaps the only technique used. Along with LA 117255, these components had small core flake-to-core ratios. Cores from these sites tend to be fairly large, with quite a bit of cortex remaining. Only the cores from LA 117255 and LA 117257 had larger mean sizes and cortical coverage. Early-stage reduction dominated the cores from LA 117248, LA 117255, and LA 117257, while only a moderate number of early-stage cores were identified in the LA 51095 assemblage. These characteristics suggest that LA 51095 and LA 117248 were mostly used as loci for initial core reduction. While the core assemblages from LA 117255 and LA 117257 reflect a similar function, other types of data indicate that the suite of activities performed at those locales was more complex.

LA 51095 and LA 117248 are both located fairly near Fivemile Draw, where raw lithic materials could be collected. Though the remains of thermal features were noted at both, no materials suitable for dating were recovered. Neither site was fully investigated, in both cases extending outside project limits. While these sites were usually isolated as a separate population in most of the statistical analyses conducted in this discussion, no temporal association can be suggested, as was done for LA 117257. Instead, the close resemblance of these sites to one another is based on a functional similarity. Debitage and core assemblage data suggest that the occupants of these sites focused on the acquisition and preliminary reduction of lithic raw materials. It is assumed that most of the cores considered suitable for further reduction were transported away.

Cores with no corresponding core flakes occur in four components: LA 51095, LA 117248, LA 117255, and LA 117257. These are also the components with the largest cores that have the most remaining cortex. In all four cases, it is likely that cores lacking corresponding flakes were discarded because more suitable materials were available, and so they were replaced. While this tells us little about site date, it does tell us quite a bit about how materials were used and discarded.

Component functions. Table 129 lists probable activities reflected in the chipped stone assemblages containing more than 11 artifacts. This table combines much of the activity-related information generated during the discussion of formal tools as well as data provided by this section. Attributes derived from the former discussion are shown as present or absent, while those from this section are assessed by strength of data.

Not surprisingly, the two largest assemblages (Areas A and B from Townsend) also contain evidence for the widest range of activities. Some level of material acquisition and core preparation or preliminary core reduction occurred in every assemblage. Whether this evidence was limited in scope or is good does not necessarily reflect how much early-stage core reduction occurred; rather, it is more indicative of how prevalent this activity was. Limited material acquisition/early-stage core reduction was performed in three components, while it was much more important in five cases.

Direct evidence of biface manufacture was recovered from only three components, which are the only assemblages that contain formal tools that were broken during manufacture and discarded. In two cases (Areas A and B from Townsend), there is good evidence of both large and small biface manufacture. Limited evidence for large biface manufacture was found in the third assemblage (LA 117255). We inferred that large bifaces were used as sources for debitage that could serve as informal tools in four cases. While this may also have been the case for Areas A and B from Townsend, we cannot discriminate between biface flakes used as informal tools and those representing unused manufacturing debris at this level of analysis. Thus, it is difficult to infer both activities.

Each assemblage contains evidence of the reduction of cores that were not recovered during our study, suggesting that they were subsequently transported away. Whether this means from site to site or simply to another part of a site is uncertain in most cases. These cores may have been carried off by the occupants of these sites, their absence could be indicative of material recycling by later peoples, or both processes could have been operative. Certainly there was evidence of the recycling of formal tools in three components, spanning the Late Archaic through late Ceramic periods. It would not take much of a stretch of the imagination to assume that this process was operative with usable cores as well.

In only four cases was there evidence of discard of

Table 129. Activities reflected by the chipped stone assemblages from all components containing more than 11 artifacts.

	Townsend Area				LA			
	A	B	C	West (D)	51095	117248	117255	117257
Early-stage core reduction	L	L	G	L	G	G	G	G
Large biface manufacture	G	G	-	-	-	-	L	-
Use of large bifaces as cores	-	-	I	I	-	-	I	I
Small biface manufacture	G	G	-	-	-	-	-	-
Cores transported in and discarded	-	-	-	-	G	G	G	G
Cores reduced in situ and transported away	G	G	G	G	G	G	G	G
Use of exotic materials	L	L	G	L	L	G	G	G
Formal tool recycling (reworked or smashed)	L	L	L	-	-	-	-	-
Informal tool use	L	L	L	L	-	-	L	L
Cutting/chopping wood, bone, or antler	X	X	-	-	-	-	-	-
Refurbishing projectile shafts	X	X	X	-	-	-	-	-
Processing carcasses	X	X	-	-	-	-	-	-
General hunting tasks	X	X	-	X	-	-	-	X
Perforating hard or semihard materials	X	X	-	-	-	-	-	-
General cutting tasks	X	-	-	-	-	-	-	-
Hide, wood, bone, or antler working	X	X	-	-	-	X	X	-

L=limited evidence, G=good evidence, I=inferred, X=present.

cores that lack potentially associated flakes. These cases may be examples of the transport of cores from site to site, and their subsequent replacement when better materials became available. This is essentially curated behavior—preparation of cores in anticipation of need. This behavior may have accompanied the use of large general-purpose bifaces, which is also evidence of curation. If so, we may have evidence of uneven distribution of lithic raw materials of the requisite size and quality across the landscape, leading to transport of bulky cores.

Exotic materials were recovered from every assemblage but were common (over 5 percent) in only four. As discussed earlier, use of exotic materials seems to decrease greatly between the Late Archaic and early Ceramic periods, suggesting that ties with distant groups became more limited as the scale of mobility decreased.

Evidence of informal tool use was found in six assemblages. While this lack in two assemblages may not be highly meaningful considering the limitations of our edge-wear analysis, it is interesting to note that these assemblages also tended to be grouped together during most analyses, forming a population defined by function rather than temporal similarity. Overall, these two assemblages also contain evidence of the least number of activities performed.

Other types of activities in Table 129 are summarized from the discussion of formal tools in the preceding chapter. Most evidence of these activities occurs in only two components: Areas A and B from Townsend. Otherwise, we have evidence of few tasks involving formal tools for any other component. This is probably related to assemblage size, which in turn is related to intensity of occupation. Areas A and B from Townsend contain the largest chipped stone assemblages. They also contain multiple pit structures, which are probably evidence of repeated uses as well as fairly protracted use. This increases the chance that a wide range of activities will be performed in a specific location, and it also increases the chance that evidence of such tasks will be left behind.

Thus, the chipped stone assemblages provide a microcosm of activities that may have been performed in these components. We can speculate on what activities we have evidence of, but we cannot categorically state that other activities did or did not occur. The variety of materials, tools, and activities from Areas A and B from Townsend suggests that they represent the locations of foraging camps used during the early and late Ceramic periods, respectively. Four components—Areas C and D from Townsend, LA 117255, and LA 117257—may reflect a similar function during the Late Archaic period, though with smaller assemblages, the range of activities reflected in each is more limited.

LA 51095 and LA 117248 cannot be dated and probably reflect different functions than the other assemblages. The parts of these sites that were investigated mostly reflect raw material acquisition and initial core reduction. However, the presence of exotic materials in both assemblages and evidence of the working of hard or semihard materials at LA 117248 suggest that these sites were not simply quarry locations. Indeed, the presence of thermal features at both sites is probably indicative of occupation over a period of at least several days. While some raw materials were available on or near LA 117248, LA 51095 was situated in an area lacking suitable raw materials. All materials reduced on LA 51095 and probably at least some of those used at LA 117248 had to be acquired from between 0.5 and 1.5 km away. LA 51095 and LA 117248 appear to represent short-term camps, probably occupied by foraging groups, with material acquisition undoubtedly embedded in other tasks of which no evidence was found in the chipped stone assemblages.

Conclusions

Eight of the ten components investigated by this study yielded assemblages of chipped stone artifacts that were large enough for us to compare and contrast. Assemblages from the Late Archaic through the late Ceramic period are represented, and they suggest that certain trends occurred through time. Residential mobility seems to have decreased between the Late Archaic and early Ceramic periods. This is evidenced by a change in the reduction strategy employed from one focused on the manufacture of large bifaces for use as cores, general-purpose tools, and blanks, to one that was more focused on core-flake reduction and the manufacture of small specialized bifacial tools. While large general-purpose bifaces did not disappear from the tool kit, they seem to have greatly decreased in importance. This reduction in mobility is also visible in the amount of exotic materials that were used, and Ceramic period assemblages contain much smaller percentages of nonlocal materials than Archaic assemblages.

Good dates were available for five components, and comparison of assemblage characteristics suggested a date for a sixth. These components probably reflect use as foraging camps, though the two Ceramic period components contain evidence of more intensive and repeated uses. Only LA 51095 and LA 117248 remain undated, and they seem to differ in function from the rest. While use as short-term foraging camps can be inferred for these components by their locations relative to raw material sources, for the most part they seem to have served as loci for the initial reduction of cores, most of which seem to have been transported elsewhere.

CHAPTER 16

GROUND STONE

BY JESSE MURRELL

All but one piece of the ground stone recovered during the Salt Creek project came from the Townsend site. Of the 33 ground stone artifacts recovered, 21 are fragmentary and whole manos, four are fragmentary and whole metates, two are grinding slabs, one is a polished cobble, and five are indeterminate fragments manufactured from a variety of materials. The piece from LA 117250 is an indeterminate fragment.

All ground stone was inspected with the aid of a binocular microscope set at 10 to 30 power, with the exception of the whole metate, which was inspected with a standard magnifying lens. This ground stone analysis was performed according to the guidelines established in *Standardized Ground Stone Artifact Analysis: A Manual for the Office of Archaeological Studies* (OAS 1994b).

TOWNSEND

Material

Sandstone, the most frequent ground stone material type (Table 130), is found in its primary geologic context in Quaternary deposits that frequently outcrop in the Pecos River Basin (Oakes 1986:3). Limestone is available in its primary geologic context in the exposures of the San Andres Formation west of the project area (Wiseman 2002). The igneous material, the quartzites, and probably the two previously mentioned materials also occur in secondary geologic context as waterworn cobbles in the Pecos River gravels and in the gravels of its tributary streams, including Salt Creek. The primary geologic context of the igneous material is probably in the Sierra Blanca (Wiseman 2002). Quartzites are available in secondary geologic context in gravel terraces in the Pecos Valley (Oakes 1986:3). Cobbles of quartzite and igneous material are also available in a conglomerate located on-site (Lancaster 1986:70). Thus, all ground stone materials are locally available.

Functional Types

Manos. Five whole one-hand manos were recovered (Fig. 102). Provenience information and dimensional data for all ground stone items can be found in Table 131. Each mano is of a different material, including a

Table 130. Townsend ground stone function by material type.

Material	Indeterminate Fragment	Polished Cobble	Mano Fragment	One-Hand Mano	Metate Fragment	Basin Metate	Grinding Slab	Row Total
Igneous, granitic	- -	- -	6 37.5%	1 20.0%	- -	- -	- -	7 21.2%
Limestone	- -	1 100.0%	- -	1 20.0%	- -	- -	- -	2 6.1%
Sandstone	4 80.0%	- -	5 31.3%	1 20.0%	3 100.0%	1 100.0%	2 100.0%	16 48.5%
Metaquartzite	- -	- -	- -	1 20.0%	- -	- -	- -	1 3.0%
Orthoquartzite	1 20.0%	- -	5 31.3%	1 20.0%	- -	- -	- -	7 21.2%
Row total	5 15.2%	1 3.0%	16 48.5%	5 15.2%	3 9.1%	1 3.0%	2 6.1%	33 100.0%

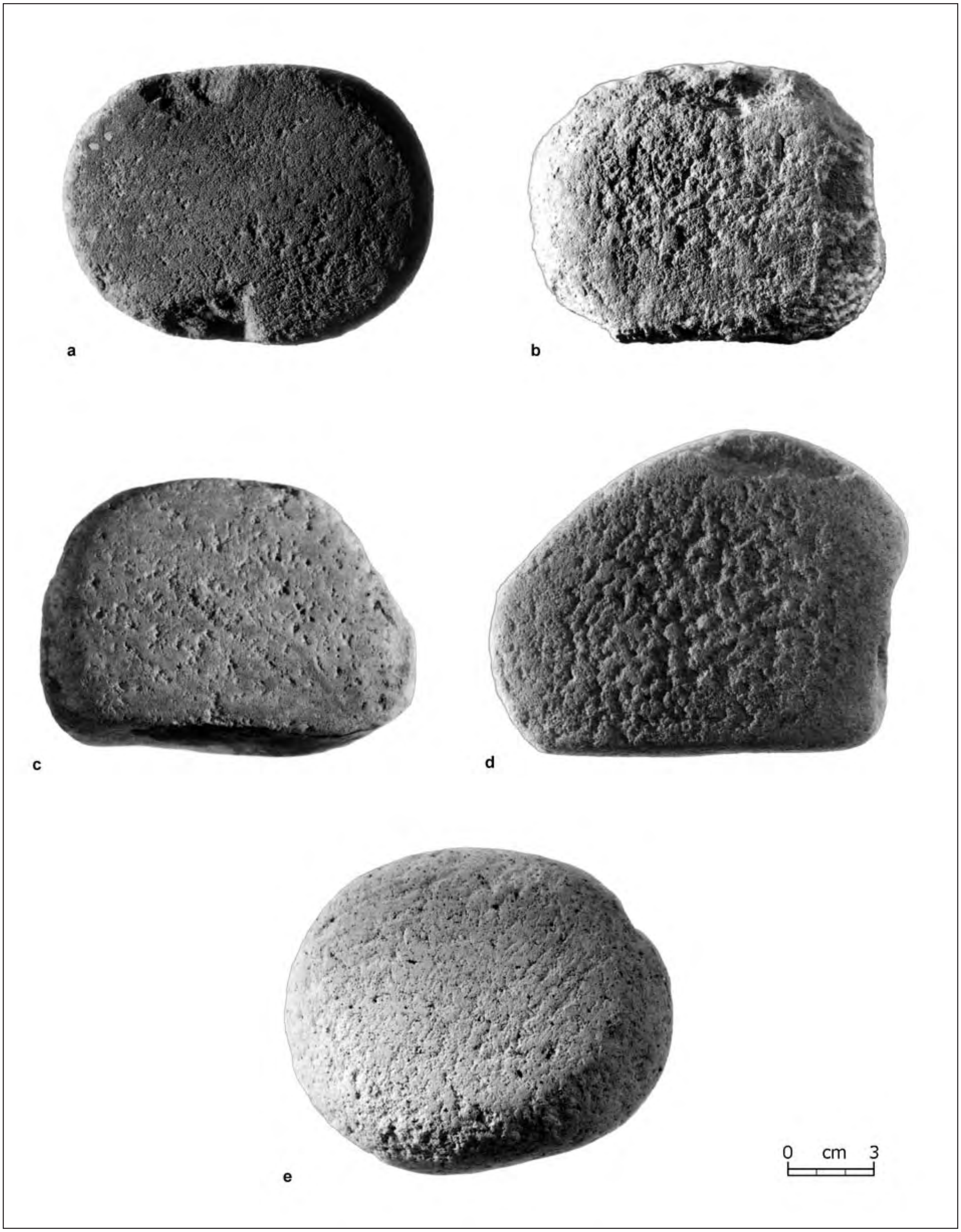

Figure 102. Complete manos from the Townsend site.

Table 131. Provenience and dimensions for Townsend ground stone.

	Field Specimen No.	Area	Grid Unit or Structure	Level	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Indeterminate fragments	1424	A	233N 107E	Surface	4.8	4.1	1.7	28.6
	2058	A	232N 96E	1	4.6	3.2	1.5	24.6
	2066	A	231N 98E	2	9	8.7	3.4	297.3
	2528	A	Str. 2, NE 1/4	3	9	7.2	3.6	355.9
	14	D	EU 3	12	7.1	5	3.5	54.3
	17	D	EU 3	13	4.3	2.9	1.9	25.6
Mano fragments	1051	A	271N 100E	Surface	5	4.9	3.1	108.2
	1189	A	249N 90E	Surface	8.7	5.3	5.7	327.6
	1334	A	233N 107E	Surface	5.6	4.6	3.7	130.1
	1774	B	109N 103E	Surface	3.5	3.4	3.1	53.4
	1876	B	83N 97E	Surface	9.4	8.3	4	407.5
	2005	A	231N 92E	2	6.9	5.5	5.5	229.3
	2059	A	232N 96E	2	9.3	7	5.4	575.5
	2074	A	238N 105E	1	7.6	5.4	3.9	200.8
	2130	A	231N 106E	2	6.5	7.1	6	384.2
	2255	B	110N 101E	2	4.9	4.4	3.9	97.2
	2258	B	110N 102E	2	5	3.4	1.5	34.8
	2334	B	Structure 1	6	6.5	4.8	3.9	130.5
	2508	A	Structure 2	1	7.2	8.5	5.5	130.5
	2518	A	Str. 2, NE 1/4	3	6.9	5.2	2.2	109.6
	2519	A	Str. 2, NW 1/4	3	9.2	10	8.5	1173.6
	2581	C	Feature 40	-	13.3	10.4	4.2	808.6
One-hand manos (whole)	A-2059	A	232N 96E	2	14.2	10.5	5.9	987.8
	B-2118	A	233N 105E	1	13.6	10.5	4.6	1107.2
	C-2181	A	229N 106E	1	13.5	9.6	7.3	1429.5
	D-2578	B	114N 104E	1	12.8	10.5	5	999.9
	E-46-1	D	EU 7	9	12.5	10.6	5.6	1040.8
Metate fragments	2521-2	A	Str. 2, SW 1/4	3	19.8	17.5	6.4	2600
	2521-1	A	Str. 2, SW 1/4	3	26.1	18.8	6.1	3700
	2597-1	A	Structure 7	1	26.8	14.6	6.9	3900
Metate (whole)	46-2	D	EU 7	9	46.3	32	11.4	198000
Grinding slabs	2591-4	A	252N 92E	1	25.3	14	6.7	3750
	2597-2	A	252N 91E	1	31.7	17.3	4.3	2450
Polished cobble	2528	A	Str. 2, NE 1/4	3	9	7.2	3.6	355.9

thin slab of limestone (Mano B) and flattened cobbles of metaquartzite (Mano C), sandstone (Mano A), orthoquartzite (Mano D), and a granitic igneous material (Mano E), which has a fine-grained, leucocratic ground mass enclosing feldspar and a dark hornblende-like mineral. All have a fine-grained texture except Mano D, which is medium-grained on an American/Canadian stratigraphic card.

Production input, or the extent to which the raw material is modified during artifact manufacture, is measured by estimating the percentage of the artifact's total surface area that was initially shaped. Shaping does not include wear modification (OAS 1994b). Two manos were mostly modified, meaning 50 to 99 percent of the artifact's surface was shaped. One of these manos (Mano A) was shaped by pecking, and the other (Mano B) by a combination of flaking and pecking. Two were slightly modified (1 to 50 percent of the artifact's surface was shaped)—one (Mano D) by pecking and the other (Mano C) by grinding and pecking. Mano E is unmodified or was utilized in its natural or raw form. All mano cross-section forms are biconvex, and plan outline forms vary from oval (Manos A and E) to subrectangular (Mano B) to irregular (Manos C and D). Mano E has two opposing use surfaces, while the others have a single use surface. All use-surfaces are slightly convex. On all use-surfaces the primary wear is grinding. With the exception of Mano E, all show secondary wear in the form of pecking, which may have roughened or sharpened the grinding surface. None are altered by heat, drilling, incising, grooving, or notching.

Sixteen mano end, edge, medial, and corner fragments were recovered. The majority (n=7, 45 percent) are end fragments. With the exception of two medium-grained orthoquartzite fragments, all were manufactured from fine-grained materials. In most cases, the fragmentary nature of these manos precludes determinations of preform morphology, production input, mano cross-section form, and plan view outline form. Shaping by pecking is apparent on one mano corner fragment. Seven fragments are heat fractured and/or reddened. Nine fragments exhibit a single slightly convex use-surface, three exhibit a single plano use-surface, and three exhibit two opposing slightly convex use-surfaces. The above-mentioned corner fragment has a slightly convex use-surface and shows evidence of use as a hammerstone along an adjacent edge. Grinding is the primary wear evident on all fragments. Two specimens exhibit sleek striations, which, following Zier's (1981:xvi) definition, are "very fine striations having a smooth regular margins, formed through plastic deformation or displacement of surface material, and occurring typically on hydrolyzed surfaces in the presence of silica." Secondary wear in the form of pecking is evident on four fragments. One fragment (FS 2581) has an adhering red ocher (hematite) pigment residue. Two orthoquartzite mano fragments (FS 2005 and FS 2059) from the same mano can be refitted.

Metates. One whole metate with two use-surfaces was recovered from excavations at Townsend West. The metate (FS 46-1) was associated with Mano E. Use-Surface 1 has a grinding surface area that is a relatively deep, ovoid basin measuring 962.1 square centimeters. Use-Surface 2 has a grinding surface area that can be described as an elongate shallow basin measuring 704.5 square centimeters. This mostly modified metate was shaped by flaking and pecking a thick slab of fine-grained sandstone (Fig. 103). Both use-surfaces show primary grinding wear and discontinuous, randomly oriented, furrow striations. Furrow striations are defined by Zier as "a scratch or narrow channel formed by the removal of material by pushing, pulling, or microfracturing, and characterized by torn, broken, or shattered margins" (1981:14). Secondary pecking wear, which may have functioned to sharpen the grinding surface, is obvious on both use-surfaces. Red pigment residue adheres to Use-Surface 1. Basin metates are part of a generalized grinding tool kit that can be used to process a variety of materials, including small amounts of corn, whereas a trough metate reflects a greater emphasis on corn grinding (Lancaster 1983:35-36).

One metate edge fragment (FS 2597-1) was manufactured by flaking and pecking a fine-grained sandstone. It is not obviously heat fractured. There is an irregular fractured margin but no sooting or reddening. Grinding and pecking are present on the two opposing use-surfaces. One surface is concave, and the other is only slightly concave. These attributes point to similarities between this and the previously described whole basin metate.

An end fragment (FS 2521-1) which refits with an edge fragment (FS 2521-2) is from a metate recovered from the floor of Structure 2. The metate was originally shaped by flaking and pecking a slab of fine-grained sandstone. It does not appear to be heat fractured. Grinding wear and pecking to sharpen are present on the single concave use-surface. Despite the fragmentary nature of this artifact, it is estimated to be a basin metate.

Miscellaneous ground stone. Two whole grinding slabs were manufactured from a fine- and a medium-grained sandstone by flaking and pecking. One (FS 2597-2) is slightly modified, and the other (FS 2591-4) is mostly modified (Fig. 104). Both have ground plano use-surfaces and an irregular oval plan view outline form that tapers toward one end. They are estimated to be a more portable form of the lower grinding element, which may have functioned with a mano exhibiting a plano use-surface.

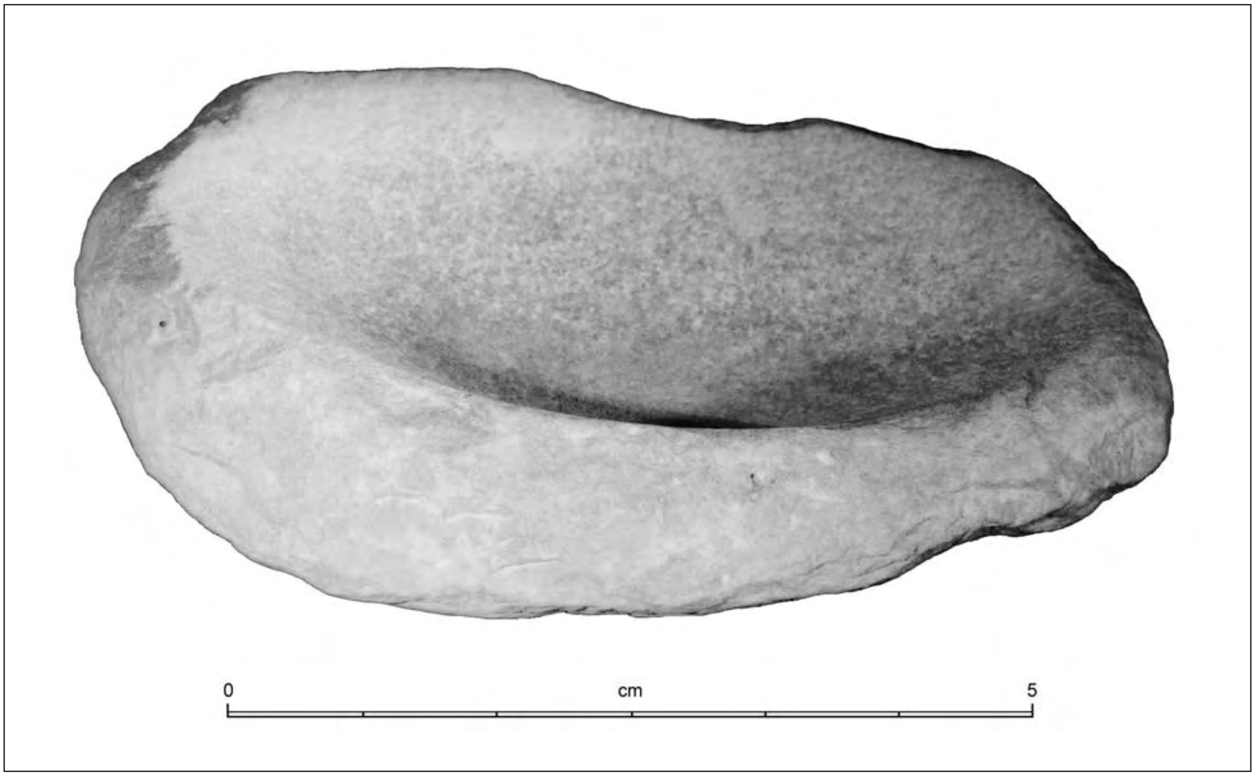

Figure 103. Metate recovered from Townsend West.

An unmodified, oval, flattened cobble of limestone (FS 2528) recovered from the hearth in Structure 2 is considered a polished cobble because of the presence of polish, which could be caused by abrasion or deposition (Zier 1981:14). Randomly oriented, discontinuous sleek striations overlie the polish on this artifact's convex use-surface. The artifact is partially sooted but not heat fractured. Due to the lack of plaster in floor, wall, or feature preparation in Structure 2, it is unlikely that this artifact functioned as a polishing stone. It is possible that this polished cobble represents a hide-processing tool. Similar use-wear patterns were observed on a handstone used to rub the inside of a deer hide in a six-hour experiment conducted by Adams (1989). She observed a sheen or polish, which she contends is a tribochemical deposit, as well as an occasional striation, possibly caused by a grain dislodged from the handstone or introduced from the environment, because there is nothing in the hide hard enough to cause abrasive wear (Adams 1989:269-270).

The remaining five pieces of ground stone are too fragmentary to determine function. Four are sandstone, and the other (FS 14) is orthoquartzite and has red pigment adhesions. All have plano to slightly concave use-surfaces. Two show evidence of secondary pecking on the ground surface. One appears to be heat fractured.

Ground Stone Recovered during Previous Excavations at Townsend West

Seventeen ground stone artifacts were recovered during excavations at Townsend West in 1982. These include five whole one-hand manos manufactured from sandstone, andesite-like material, and metaquartzite. Four of the five have striations that are oriented parallel to their short axis, reflecting a reciprocal motion on the lower grinding element. The remaining mano has inconsistently oriented striations, which may reflect use in a rotary motion. One (SS-580) has an adhering red pigment residue. All other ground stone, with the exception of a possible polishing stone, is fragmentary. These fragmentary artifacts include four manos, three of limestone and one of sandstone, one limestone metate, and seven miscellaneous ground stones (Lancaster 1986:70-71).

Degree of Agricultural Dependency

Several researchers have sought to relate ground stone tool morphology to the users' degree of agricultural dependency (Diehl 1996; Hard 1990; Lancaster 1983; Mauldin 1991, 1993). All agree that grinding efficiency is related to grinding-surface area. As grinding surfaces

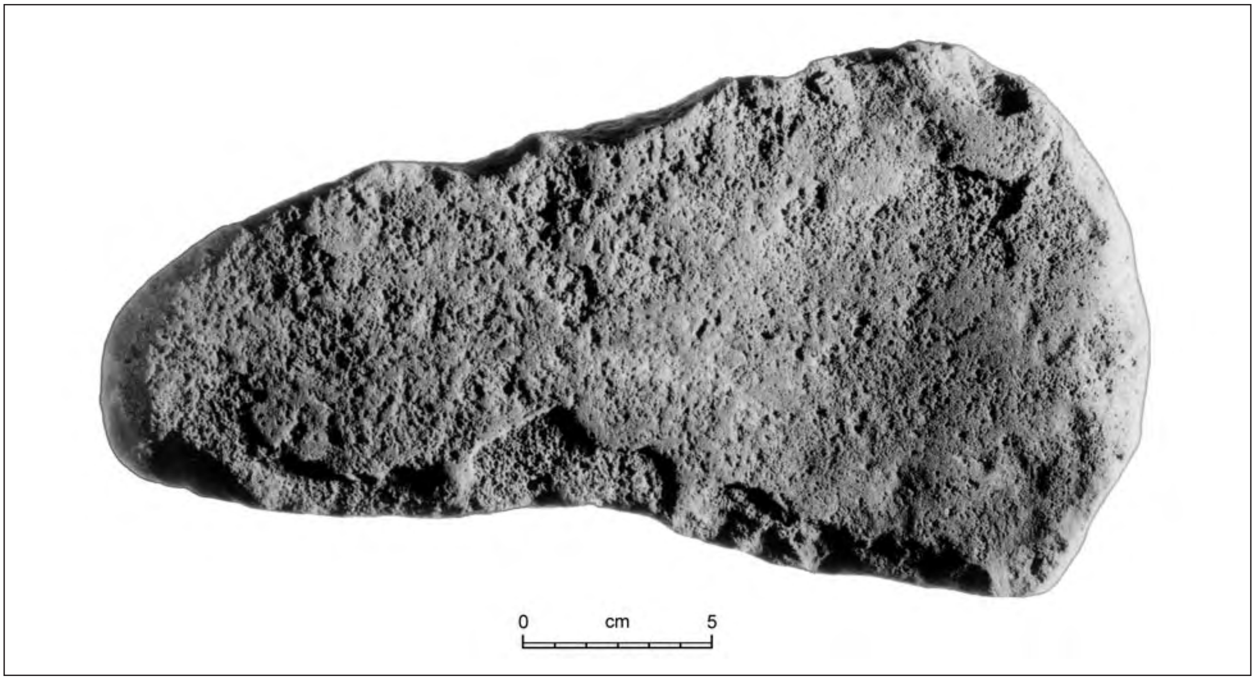

Figure 104. Grinding slab from Structure 7 at Townsend East.

become larger, they become more efficient. That is, more grain, in this case maize, can be processed in less time (Adams 1993:333). Recent ethnographic studies by Mauldin (1993) in a Bolivian village support the correlation between grinding area and efficiency. This correlation is also supported by Hard's (1990) comparison of ethnographically known southwestern groups. In response to increasing agricultural dependency, which would mean increased time allotted to maize grinding, prehistoric groups would have readily adopted new technology geared toward larger, more efficient, time-saving ground stone tools (Diehl 1996:107).

With the recovery of five whole manos and dimensional data for five additional manos from Townsend West, the mean mano grinding area can be compared to the results of research by Hard (1990) and Mauldin (1993). This can aid in evaluating the relative agricultural dependency of the prehistoric occupants of the Townsend site.

Hard (1990:138-139) uses mano length as a proxy measurement for grinding area, arguing that maximum hand-grip size acts as a constraint on mano width. He calculates mean mano lengths for specimens from 19 groups whose agricultural dependencies are reported in Murdock's *Ethnographic Atlas*. His analysis shows a positive correlation between mean mano length and the group's agricultural dependence. He uses this information to infer the degree of agricultural dependence in eight archaeologically known regions and to support the idea that agricultural intensification plays a role in the pithouse to pueblo transition. He then presents these estimates for future comparisons: a mean mano length of less than 11 cm corresponds with none to a low degree of agricultural dependence (agricultural products constituting 0 to 15 percent of the diet); 11 to 15 cm with none to moderate (0 to 45 percent); 15 to 20 cm with moderate to high (35 to 75 percent); and greater than 20 cm with high dependence (more than 65 percent) (Hard 1990).

In his analysis, Mauldin (1993) uses 1,084 manos from pithouse and Pueblo period sites in the Pinelawn region of western New Mexico. He computes mean mano areas and contrasts these for 12 sites at the component level. The area of rectangular manos was calculated by multiplying length by width and for round, oval, and oblong manos by averaging the sum of the length and the width for an approximate diameter and then using the formula for the area of a circle (Mauldin 1991:61-63, 1993:325). He arrives at an evaluation of agricultural intensity primarily using mean mano grinding surface area, but this is coupled with variation in the frequency of manos with multiple use-surfaces and with variation in metate form.

Not all manos are used in agricultural production, and, ideally, those that are not should be eliminated when attempting to evaluate agricultural dependence using mean mano grinding areas (Diehl 1996; Hard 1990; Mauldin 1991, 1993). One-hand manos first appeared in the Archaic, when the subsistence base was

Table 132. Summary of mano length and grinding area for the Townsend site.

Townsend East, Areas A and B							
Mano/FS	A-2059	B-2118	C-2181	D-2578	Mean	SD	Range
Length (cm)	14.2	13.6	13.5	12.8	13.5	0.6	1.4
Area (sq. cm)	119.8	114.0	104.8	106.6	111.3	6.9	15
Townsend West (Area D) and 1987 Excavations							
FS	SS-580	SS-582	14-63	E-46	Mean	SD	Range
Length (cm)	12.8	12.4	12.7	12.5	12.6	0.2	0.4
Area (sq. cm)	104.8	92.5	84.9	104.8	96.8	9.8	19.9
Total site					Mean	SD	Range
Length (cm)					13.1	0.6	1.8
Area (sq. cm)					104	11.1	34.9

more diversified, and there was little if any dependence on agriculture (Lancaster 1983:17). One-hand manos are a generalized grinding tool serving multiple functions, including processing agricultural and wild food resources, hides, pigments, and pottery clays (Adams 1989; Diehl 1996; Hard 1990; Lancaster 1983; Mauldin 1993). Two-hand manos are primarily used for processing agricultural grains (Lancaster 1983:17; Mauldin 1993:21).

Researchers have employed different criteria for defining mano types. Based on a cluster analysis of a scattergram plot of the lengths and widths of whole manos from the Mimbres Valley, Lancaster (1983:18-20) proposes that one-hand manos are less than or equal to 13.2 cm in length and less than or equal to 11.5 cm in width, while two-hand manos are larger. Diehl (1996:109) observes a bimodal distribution in the grinding area measurements of 1,007 manos from upland Mogollon pithouse period sites. There is not a complete break, but there is an overlap at 128 square centimeters. He proposes that one-hand manos have a grinding area of less than 128 square centimeters, and that two-hand manos have a larger grinding area. Mauldin (1991:63, 1993: 23) also observed a bimodal distribution in a histogram of grinding area measurements for 1,300 manos from the upland Mogollon pithouse and Pueblo periods. This pattern suggests a break at approximately 75 square centimeters. This measurement became his separation point between manos probably involved in food processing and those more likely involved in other activities. Mauldin (1991:63; 1993:324) and Diehl (1996:109) exclude the smaller manos that fall under their respective discriminating measurements from their studies, arguing that the larger manos are more likely involved in processing agricultural grains. Due to inconsistencies in discriminating between one-hand and two-hand manos in published descriptions, the lack of a detailed analysis of individual tools, and the possibility that some one-hand manos were used in the processing of agricultural grains, Hard (1990:139) does not exclude one-hand types. He further states that including them would lower mean mano area and appropriately indicate less agricultural dependence.

All manos recovered from the Townsend site, including those from both 1982 and 1997 excavations, were classified as one-hand types (Lancaster 1986:70-71). Most are from early Ceramic period deposits, with a possibility that some are from the Late Archaic component and others are from the late Ceramic component. Computation of mano grinding area and the criteria for the exclusion of manos from further study follow Mauldin (1991, 1993) as outlined above. This allows for the inclusion of some one-hand manos but most likely excludes those not used in food processing. SS-586 is an ovoid, quartzite, one-hand mano recovered during 1982 excavations that measures 9.6 by 7.2 by 4.0 cm (Lancaster 1986:71). Its surface area of 55.4 square centimeters falls significantly below the 75 square centimeter cutoff, excluding it from this evaluation. This mano most likely functioned in a capacity other than food processing. Diehl's (1996) grinding area criteria would exclude all manos with the possible exception of K-15. Recovered during the 1982 excavations, K-15 is problematic and is excluded from this evaluation because

Lancaster (1986:73) states, "only approximately one-third of the grinding surface of the largest mano (K-15) exhibits any evidence of grinding wear." Measurements of the grinding area are not tabulated, but total measurements are present, so only a very loose approximation of grinding area could be calculated. Lancaster's criteria (1983) would change the designations of four of the five one-hand manos from Townsend East to two-hand types, but these changes would not affect this evaluation. A total of eight manos, including all those recovered during the 1997 excavation, are used to evaluate the prehistoric occupants' degree of agricultural dependency.

Mean mano length and grinding surface area were calculated (Table 132). The manos were broken into two subsamples based on spatial components, Townsend East and Townsend West. Two t-tests were performed, one for equality of mean area, the other for equality of mean length. The mean area difference of 14.6 square centimeters between Townsend East and Townsend West manos is fairly significant (t=2.425, DF=6, p=0.052) but fails to reject the null hypothesis at the 95 percent confidence level. The mean length difference of 0.925 cm between Townsend East and Townsend West manos is more significant (t=3.073, DF=6, p=0.022) and rejects the null hypothesis. In these tests, the null hypothesis holds that the observed differences are due to the vagaries of sampling. Tentatively, the greater mean mano grinding area for Townsend East suggests these tools are more efficient than those from Townsend West.

In comparison to Hard's (1990:148) results, both components (12.6 and 13.5 cm) show none to a moderate degree of dependence on agriculture, with agricultural products comprising from none to 45 percent of the diet. Both components are most comparable to samples from two other desert Mogollon regions. The inhabitants of the San Simon region (A.D. 500 to 600) used manos with a mean length of 13.2 cm (n=156). It appears that this group, along with the occupants of the Townsend site, was slightly more reliant on agricultural products than the Jornada Mogollon in the El Paso region. In the El Paso region, specimens dating between A.D. 300 and 1100 have a mean mano length of 11.4 cm (n=166), while those dating from A.D. 1100 to 1200 have a mean mano length of 11.3 cm (n=18). This indicates that the group relied almost totally on hunting and gathering (Hard 1990:143).

Mean mano grinding areas from the Townsend site manos are much lower than the lowest mean mano grinding areas from the upland Mogollon mano assemblages studied by Mauldin (1993:325). The Three Pines site of the early Pueblo period (A.D. 950-1100) has the lowest mean. Mauldin argues that this statistic, 136.2 square centimeters, reflects a low relative degree of agricultural intensity. In comparison, the occupants of the Townsend site, with a mean area of 104 square centimeters, must have been much less reliant on agriculture. Mauldin's (1993) study of manos from the SU site, which have a mean mano grinding area of 148.5 square centimeters, indicates a higher degree of agricultural intensity than that shown by the Townsend site mano data. Based on these differences, it appears that a subsistence strategy geared more toward hunting and gathering supplemented by agriculture was practiced at the Townsend site, in contrast to the largely agricultural and sedentary upland Mogollon.

Roswell Area Comparisons

The Townsend site mano data is compared to whole mano assemblages from two sites near Roswell, New Mexico, to provide an intraregional perspective on ground stone tool morphology and its relation to the users' relative degree of agricultural dependency. Comparisons are made to both late pithouse period and Pueblo period mano assemblages. Unfortunately, the Pueblo period mano metric data is limited to a single mano. All inferences made regarding this sample are extremely tenuous.

The Fox Place is a pithouse village located along the Rio Hondo. The village was occupied during the late 1200s and the early 1300s (Wiseman 2002). Recent excavations at the Fox Place by OAS recovered 10 manos that are equally divided between one-hand and two-hand types. One-hand manos have a mean length of 11.4 cm, and two-hand manos have a mean length of 19.1 cm (Wiseman 2002). Together these manos have a mean length of 15.3 cm. Mean mano length can be used as a proxy for mean mano grinding area (Hard 1990:138-139). According to Hard (1990), a mean mano length of 15.3 cm reflects a moderate to high degree of agricultural dependence, with agricultural products constituting 35 to 75 percent of the diet. This statistic more accurately reflects the low end of these ranges, but it still reflects a significantly greater reliance on agriculture than that shown by the Townsend site mano data.

The tentatively designated Lincoln phase site of Bloom Mound is approximately 14 miles west to southwest of Roswell along the Rio Hondo. The Texas Technological College excavated a small portion of the adobe surface pueblo in 1954. Kelley (1984:464) reports the recovery of a mano measuring 18.6 cm long. Metric attributes for an additional 10 manos were not tabulated. For the Lincoln phase, Kelley postulates a subsistence based on corn agriculture and supplemented by hunting and gathering (Kelley 1984:54). The large proxy mano grinding area and the presence of corn throughout the pueblo attest to this. Comparing the Townsend mano data with the above-mentioned mano reinforces the idea that the occupants of the Townsend site were far from being highly reliant on corn agriculture. These comparisons point to an increasing reliance on agriculture and a concomitant increase in mano grinding efficiency throughout the Roswell area.

Conclusions

The occupants of the Townsend site may have practiced limited agriculture, as indicated by the recovery of corn and by some of the ground stone artifacts, namely the larger manos and the metate. The mano data suggest that there was a slight to moderate dependence on agriculture, which probably supplemented a subsistence geared more toward hunting and gathering. The manos and metate reflect a generalized or multipurpose grinding tool kit, sometimes used to process small amounts of agricultural products.

LA 117250

One fragment of ground stone was recovered from LA 117250. This fine-grained sandstone fragment is internal, meaning that none of the original margins are present. It measures 4.3 by 3.5 by 1.5 cm and weighs 24.0 g. Its fragmentary nature and plano use-surface preclude determinations of preform morphology, production input, plan view outline form, and function. Grinding wear is apparent in the faceting of individual sand grains, but no striations were apparent with the aid of a binocular microscope (30 power). The fragment also lacks evidence of thermal alteration and adhesions.

CHAPTER 17

MINERALS, WORKED SHELL, AND ORNAMENTS

MINERALS

Few objects classifiable as minerals were found (Table 133). While some have signs of wear, only the small cylinder fragment exhibits definite signs of modification. All were recovered from Area A, and two are from the same large pit, Feature 2 (Fig. 105). This feature also contained a tested cobble, two cores, a biface, and a midstage biface, and predominantly El Paso Brown Ware ceramics. Such a concentration of objects in a pit just to the north of Structure 3 could indicate a cache of material or could reflect the trashy fill found in this rodent-disturbed pit of unknown function.

WORKED SHELL AND ORNAMENTS

A total of 19 pieces of worked shells or ornaments of other materials were recovered (Table 134). Most are shell, but five are probably of travertine, one is of an undetermined stone, and the other is a soft carbonate rock or mineral. Small disc beads are the most common form. Five are made of travertine, one of freshwater mussel (Fig. 106). A singular short tubular bead resembling one reported by Wiseman (1996:63b) from a quarry site to the east and slightly south of Townsend is the only marine shell (Fig. 107). It resembles an *Olivella* shell but is much larger and has both ends and the surface extensively ground. Two pieces of shell are convex and roughly round with holes at the center (Fig. 108). One other small piece of freshwater mussel has drill holes started on both surfaces, but it was never completed (Fig. 109). The triangular and circular forms could represent unfinished objects that lack only drill holes (Fig. 110). At least five other pieces have ground edges, some resembling fragments of shell objects, and others are on pieces near the edge of the bivalve (Fig. 111), so that if perforated, they would have asymmetrical and unusual shapes.

The stone objects are all unusual. A tear-drop pendant has a heavily patinated look, so that the material could not be determined without damaging the object. It is completely modified, with a line incised on one side (Fig. 112). Similarly, a piece decorated with a hatched design on both surfaces is a soft cream-colored material with a high carbonate content (Fig. 113).

All but two of the ornaments came from Area A of Townsend East. Two larger disc beads or pendants and a fragment of a shell object were recovered from Structure 3, and the incised piece and a small piece of freshwater mussel shell with a ground edge from Structure 7. Otherwise, most were found in the areas where hand excavations were concentrated, mostly the area around and between Structures 2 and 5. The partially drilled and unfinished pieces indicate that shell ornaments were manufactured at this site, especially in the vicinity of these two structures.

Table 133. Minerals recovered from the Townsend site.

FS	Provenience	Material	Dimensions (cm)	Description
2047	Area A Feature 2, Level 2	unknown red-brown petrified wood or sedimentary rock	4.5 x 1.7 x 1.1	material resembles petrified wood but has inclusions of red and yellow hematite and long cylinders of a metal-like material; ground flat on one side and at tip
2047	Area A Feature 2	hematitic sandstone concretion	2.2 diameter	small round ball, no evidence of grinding
2075	Area A 239N 104E Level 1	magnesium? nodule	1.7x 1.2 x 1.1	small nodule, figure-8 shape, slight polish in some areas, probably wear
2470	Area A 234N 107E Level 2	sedimentary?	1.3 x .6	small cylinder, both ends broken; highly polished surface with transverse striations, as if rolled to polish
2477	Area A 236N 108E	quartz crystals	1.2 x 1.2 x .9	small cluster of quartz crystals joined at the base with tips blunted

Table 134. Worked shell and ornaments recovered from the Townsend site.

FS	Provenience	Material	Dimensions (mm)	Description
1	site surface	stone, cream to gray color; heavily patinated	24.8 x 17.7 x 4.3	tear-drop shaped, completely modified with an incised line on one side; drilled from one side but hole enlarged or worn on the other
109	Townsend West Pit, EU 13, Level 1	freshwater mussel	6.6 diameter 0.7 thick 2.6 hole	flat round bead; some angularity to edges; hole off center and probably drilled from both sides; edges ground
1297	Area A 235N 108 E surface	marine shell	8.5 diameter 6.5 length 4.3 interior dia.	*Olivella*-like shell but larger; ends cut off and completely modified; similar to those pictured in Wiseman (1996b:63, Fig. 27c)
2092	Area A 231N 101E Level 1	probably Pecos pearly mussel	27.2 x 23.1 x 2.1	triangular with rounded corners; edges lightly ground
2095	Area A 231N 102E Level 1	freshwater mussel	12.1 dia. 1.7 to 3.6 thick	round disc that has exfoliated into layers; could all be the same disc or possibly two discs; edges ground
2158	Area A 230N 104E Level 3	travertine?	A: 5.0 x 1.3, hole 1.7 dia. B: 5.1 x 0.9, hole 1.5 dia.	small disc beads; well shaped
2161	Area A 230N 105E Level 3	travertine?	4.6 x 1.0 hole 1.8 dia.	small disc bead; well shaped
2172	Area A 233N 106E Level 1	Pecos pearly mussel, R valve edge	38.1 x 9.9 x 5.8	edge piece with ground margin and one end; roughly ovoid
2181	Area A 229N 106E Level 1	freshwater mussel	5.5 x 5.5 x 0.8	roughly square piece with unfinished edges, but drill holes started on both sides
2203	Area B 125N 102 E Level 2	freshwater mussel	14.7 x 7.5 x 1.2	fragment of a shell object well worked on two long curved sides with breaks on both ends
2514	Area A 235N 100E Level 1	freshwater mussel	16.2 x 8.0 x 0.9	fragment of a shell object with a rounded corner that is well worked
2534	Area A 244N 93E Level 1	travertine?	4.3 x 1.7	small disc bead; well shaped
2545	Area A Structure 3 NW ¼, Level 1	cf. Pecos pearly mussel	23.1 x 13.0 x 2.8	edge fragment; broken edge ground and smooth; roughly triangular, but curved cross section
2551	Area A Structure 3 SE ¼, Level 1	freshwater mussel	21.2 x 19.0 x 0.8 hole 1.3 diameter	roughly round; not well shaped; edges lightly ground
			20.9 x 17.7 x 0.7 hole 2.6 x 1.4	incomplete; roughly round; not well shaped; edges lightly ground
2593	Area A Structure 7 SE¼, Level 1	soft white carbonate	11.7 x 7.6 x 3.4	irregular shaped fragment of an incised object; hatchured design both sides
2598	Area A Structure 7 SW ¼, Level 3	freshwater mussel	6.6 x 4.8 x 0.9	small rectangular piece with one ground edge
2619	Area A Structure 4 Level 4	travertine?	4.5 x 1.4 hole 1.7 dia.	small disc bead; well shaped

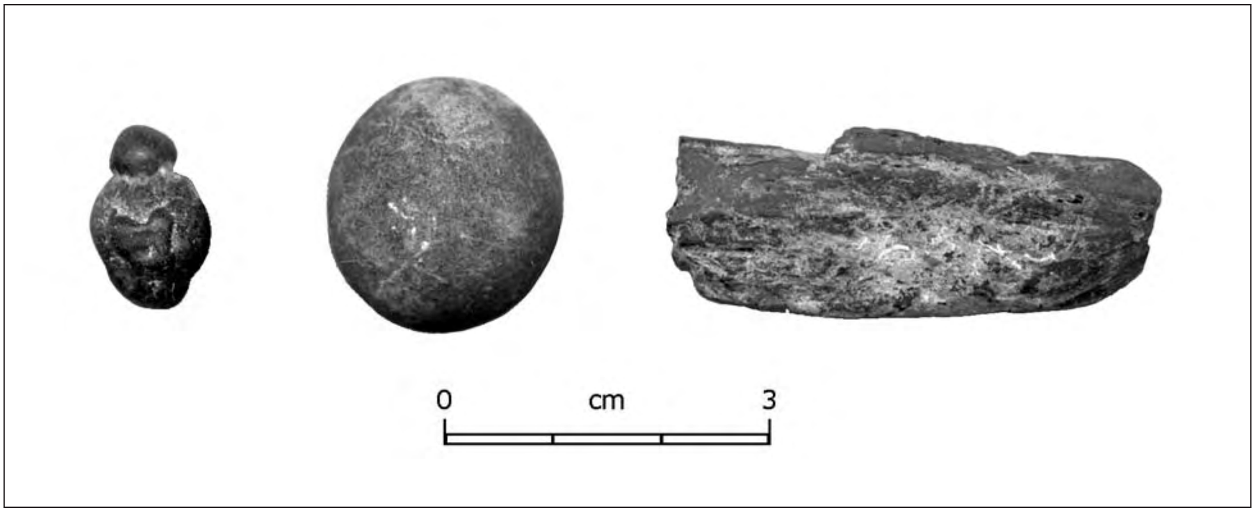

Figure 105. Minerals found in Feature 2, Area A, Townsend East.

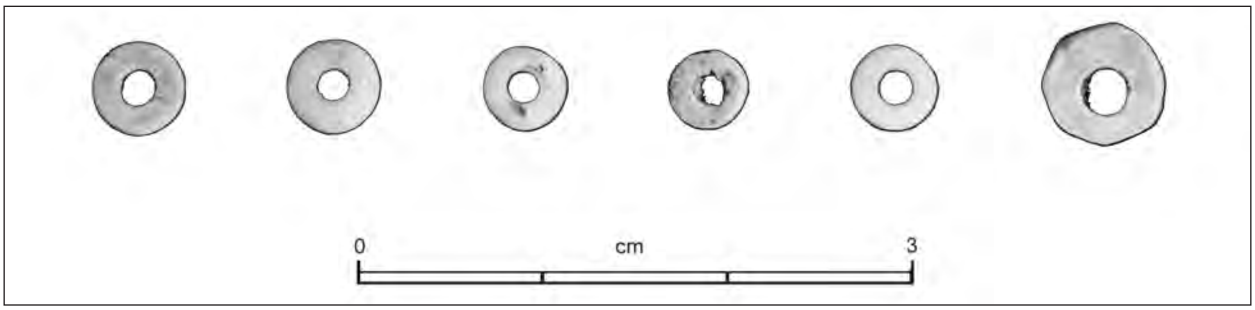

Figure 106. Shell and stone beads from the Townsend site (shell is on far right).

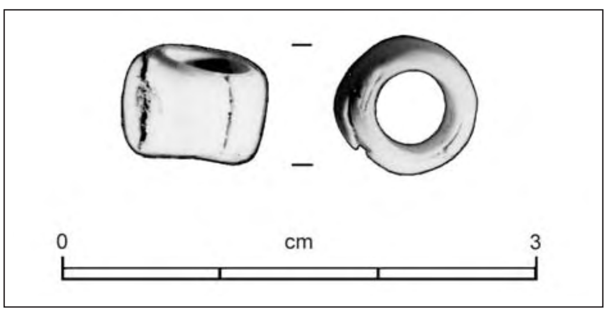

Figure 107. Tubular marine shell bead from Townsend East.

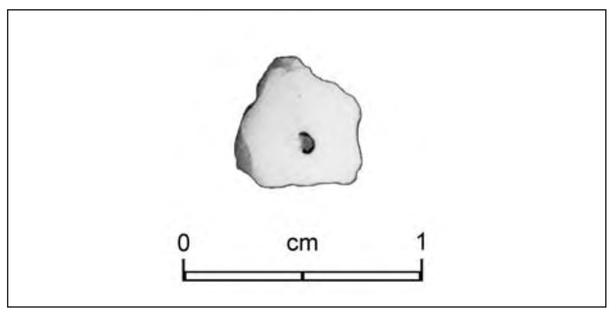

Figure 109. Shell with partial drill hole from Townsend East.

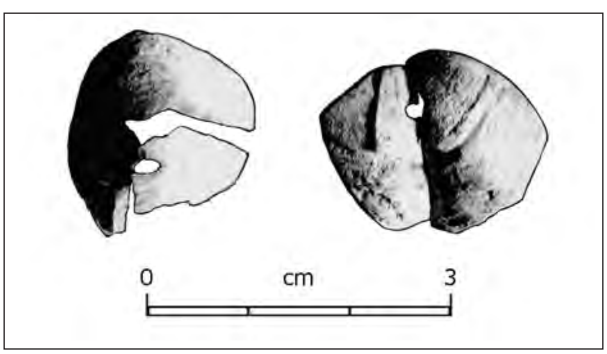

Figure 108. Worked shell beads or pendants from Townsend East.

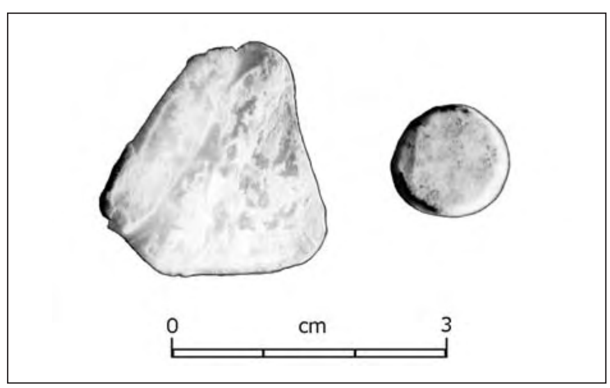

Figure 110. Worked shell from Townsend East.

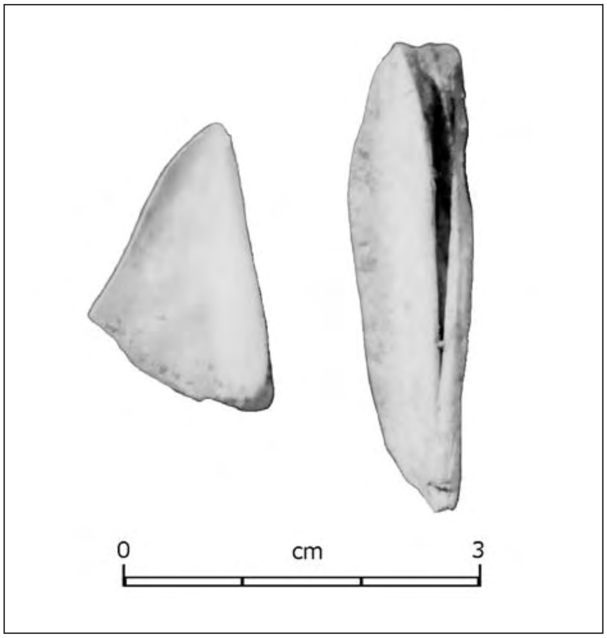

Figure 111. Shell pieces with worked edges from Townsend East.

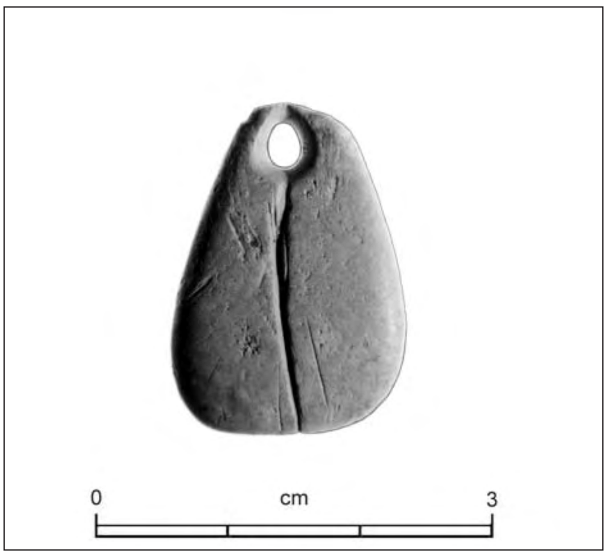

Figure 112. Stone pendant from Townsend East.

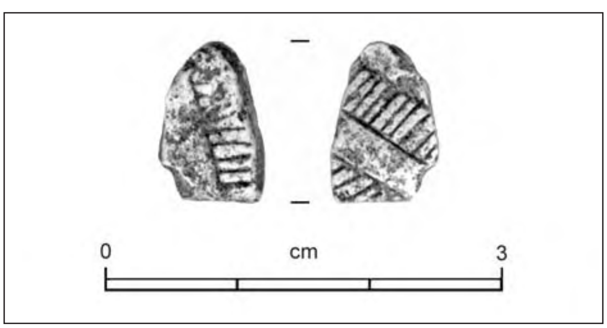

Figure 113. Rock with hachure from Townsend East (two views).

CHAPTER 18

FAUNA

Almost all of the fauna recovered by the project (n=1,686) is from the Townsend site. The exceptions are two pieces from LA 117255, both from jackrabbits, and probably modern. The Townsend East and Townsend West samples are quite different. Much of the bone recovered from the Townsend West Bison Area is bison and could represent a natural kill and dispersal rather than procurement and discard by humans. The few pieces recovered from the Pit are more comparable to the Townsend East assemblage, but also include a number of intrusive burrowers.

The Townsend East assemblage is the most diverse and informative. Unfortunately, poor preservation of bone is a definite factor. Much of the bone is pitted or eroded by soil conditions (87.5 percent), while nearly half (44.7 percent) of the sample was probably preserved by burning. A significant portion of the bone was recovered in flotation samples (18.8 percent).

Much of the provenience-based information is included in the site description portion of this report. This chapter focuses on how these data contribute to our knowledge of subsistence practices in the Roswell area during the Late Archaic and Ceramic periods.

METHODOLOGY

Specimens were identified using the Office of Archaeological Studies comparative collection, supplemented by those at the Museum of Southwest Biology, Fish and Herpetology Divisions. Recording followed the established OAS computer-coded format, which identifies the animal and body part represented, how and if the animal and part was processed for consumption or other use, and how taphonomic and environmental conditions have affected the specimen. These variables are briefly described below.

Field specimen (FS) numbers are the primary link to more detailed proveniences within the site. Each line is also assigned a lot number, which identifies a specimen or group of specimens that fit the description recorded in that line. The count specifies how many specimens are described by that data line. Taxonomic identifications are as specific as possible. When an identification is less than certain, this is indicated in the certainty variable. Specimens that cannot be identified to species, family, or order are assigned to a range of indeterminate categories based on the size of the animal and whether it is a mammal, bird, other animal, or cannot be determined. Unidentifiable fragments often constitute the bulk of a faunal assemblage. By identifying these as precisely as possible, the information can supplement that provided by the identified taxa.

Each bone (specimen) is counted only once, even when broken into a number of pieces by the archaeologist. If the break occurred prior to excavation, the pieces are counted separately and their articulation noted in a variable that identifies conjoinable pieces, parts that were articulated when found, or pieces that appear to be from the same individual.

The skeletal element (e.g., cranium, mandible, humerus) is identified then described by side, age, and the portion recovered. Side is recorded for the element itself or the portion recovered when it is axial, such as the left transverse process of a lumbar vertebra. Age is recorded at a general level: fetal or neonate, immature, young adult (near or full size with unfused epiphysis or young bone), and mature. The criterion used for assigning an age is also recorded. This is generally based on size, epiphysis closure, or texture of the bone. The portion of the skeletal element represented by a particular specimen is recorded in detail to determine how many individuals are present.

Completeness records how much of that skeletal element is represented by a specimen. It is used in conjunction with the portion represented to determine the number of individuals present. It also provides information on whether a species is intrusive, and on processing, environmental deterioration, animal activity, and thermal fragmentation.

A series of variables addresses taphonomy; that is, the study of preservation processes and how these affect the information obtained by identifying some of the nonhuman processes that affect the condition or frequencies found in an assemblage (Lyman 1994:1). Environmental alteration includes degrees of pitting or corrosion from soil conditions, sun bleaching from extended exposure, checking or exfoliation from exposure, root etching from the acids excreted by roots, and polish or rounding from sediment movement. Animal alteration is recorded by source or probable source and where it occurs. Choices include carnivore gnawing and/or punctures, scatological or probable scat, rodent gnawing, and agent uncertain.

Burning can occur as part of the cooking process, part of the disposal process, when bone is used as fuel, or after burial. The color, location, and presence of crackling or exfoliation are recorded. Burn color is a measure of burn intensity. A light tan color or scorch is superficial burning, while charred or blackened bone becomes black as the collagen is carbonized, and when the carbon is oxidized, it becomes white or calcined (Lyman 1994:385, 388). Burns can be graded over a specimen, reflecting the thickness of the flesh protecting portions of the bone. Bones that are light on the exterior and black at the core reflect burns that occur when the bone is dry. Graded burns can indicate a cooking process, generally roasting. Completely charred or calcined bone does not result from cooking. Uniform degrees of burning are possible only after the flesh has been removed and generally indicate a disposal practice (Lyman 1994:387). Potential boiling or cooking brown are recorded as brown and rounded, brown with no rounding, rounding only, or waxy.

Evidence of processing or butchering is recorded as the orientation of cuts, grooves, chops, abrasions, saws, scrapes, peels, and intentional breaks. The location of the butchering is also recorded. A conservative approach was taken in recording marks and fractures that could be indicative of processing animals for food, tools, or hides since many natural processes result in similar marks and fractures. A modification variable distinguishes manufacturing debris and tool forms from potential use-wear and pigment stains.

Taxa Recovered

The project recovered a fair number of taxa (Table 135). All but the Plains pocket gopher are found at Townsend East. For the most part, no one species has a very large sample, and when body parts are considered, relatively few animals are indicated.

The number and proportion of unidentified taxa varies by site, area, and how much of the bone was recovered in flotation samples (Table 136). Almost a quarter (23.7 percent) of the unidentified small-mammal bones and substantial proportions of the small-to-medium-mammal (15.8 percent), medium-to-large-mammal (19.8 percent), and even large-mammal (7.9 percent) came from Townsend East flotation samples. Because of the nature of the Townsend West excavation sample, very few flotation samples were taken, so bone recovered from flotation comprises much less of that faunal assemblage.

As for taxa distributions, Townsend East Area A has the largest proportion of small forms, while at the other extreme, the Bison Area is dominated by large and very large forms. Poorer preservation in the Townsend West Pit is demonstrated by the abundance of artiodactyl bone, all of which are small pieces of tooth enamel. Much more of the Townsend East sample is burned, regardless of the size of the animal, suggesting that very different processes are responsible for these deposits compared to those from Townsend West.

Rodents

Bones from a variety of rodents were recovered. None occur with any great frequency, and many probably are the remains of post-occupational burrowers. A few are burned and could have been eaten and the bones thrown into a fire.

Two species of pocket gopher were found. Both inhabit the Roswell area. The Plains pocket gopher (*Geomys bursarius*) is most common in soft alluvial soils of arroyo bottoms and floodplains, while harder, shallower soils are more often occupied by the yellow-faced pocket gopher (*Pappogeomys castanops*) (Findley et al. 1975:152-154). Both types of soil are found in and around the Townsend site. Burrow-dwelling rodents, pocket gophers feed on roots, collect succulent foods near the entrances to their burrows, and occasionally eat woody vegetation under snow (Chase et al. 1982:246-247). One of the yellow-faced pocket gopher bones is calcined, and only one is nearly complete. This suggests that at least some of these bones are food debris.

Two species of kangaroo rat were also found. The smaller Ord's kangaroo rat (*Dipodomys ordii*) is commonly found in the Roswell area, especially in areas of friable soil, preferably windblown sand or alluvial soil along or in arroyos (Findley et al. 1975:174). The banner-tailed kangaroo rat (*Dipodomys spectabilis*) inhabits grasslands, with a preference for heavier soils that will support deep and complex burrow systems. This species has been reported within a few miles of the Townsend site (Findley et al. 1975:180-182). The few kangaroo rat bones recovered are generally fragmentary (75.0 percent), and one is partially burned. Graded burning on a bone from the larger form of kangaroo rat could suggest this species was used for food, or it could have accidentally burned.

Common in the Roswell area, the Northern grasshopper mouse (*Onychomys leucogaster*) inhabits sandy grasslands and mesquite stands and preys on

Table 135. Taxa recovered from the Townsend site.

Taxon	Common Name/Size	Townsend West Bison Area	Townsend West Pit	Townsend East
Unknown small	small mammal, herp, or bird			16 (1.0%)
Small mammal/medium to large bird	up to jackrabbit size		2 (1.3%)	7 (0.4%)
Small mammal	rodent to jackrabbit		35 (23.0%)	843 (50.1%)
Small to medium mammal	rodent to coyote			39 (2.3%)
Medium to large mammal	coyote to artiodactyl	5 (1.5%)	11 (7.2%)	86 (5.1%)
Large mammal	artiodactyl or larger	67 (19.8%)	5 (3.3%)	77 (4.6%)
Very large mammal	elk or bison	155 (45.7%)		
Small squirrel	chipmunk or ground squirrel			1 (0.1%)
Cynomys ludovicianus	black-tailed prairie dog		3 (2.0%)	50 (3.0%)
Pappogeomys castanops	yellow-faced pocket gopher			4 (0.2%)
Geomys bursarius	plains pocket gopher		3 (2.0%)	
Dipodomys ordii	Ord's kangaroo rat		1 (0.7%)	2 (0.1%)
Dipodomys spectabilis	banner-tailed kangaroo rat			2 (0.1%)
Onychomys leucogaster	northern grasshopper mouse			1 (0.1%)
Neotoma sp.	woodrats			1 (0.1%)
Small rodent	smaller than woodrat		1 (0.7%)	5 (0.3%)
Medium to large rodent	woodrat or larger			58 (3.4%)
Sylvilagus audubonii	desert cottontail		41 (27.0%)	161 (9.6%)
Lepus californicus	black-tailed jackrabbit		9 (5.9%)	64 (3.8%)
Canis sp.	fox, dog or coyote			1 (0.1%)
Taxidea taxus	badger			1 (0.1%)
Artiodactyla	artiodactyls		40 (26.3%)	17 (1.0%)
Medium artiodactyl	deer or pronghorn size		1 (0.7%)	7 (0.4%)
cf. *Cervus elaphus*	elk			1 (0.1%)
Odocoileus sp.	deer			2 (0.1%)
Bos bison	bison	112 (33.0%)		2 (0.1%)
Bos	cow or bison			2 (0.1%)
Large bird	large duck, turkey, or hawk size			1 (0.1%)
Medium to large bird	crow or larger			2 (0.1%)
Egg shell				12 (0.7%)
Testudinata	turtles and tortoises			7 (0.4%)
Terrapene ornata	ornate box turtle			5 (0.3%)
Trionyx sp.	soft-shell turtles			1 (0.1%)
Cnemidiphorus sp.	whip-tailed lizards			1 (0.1%)
Ophidia	snakes			6 (0.4%)
Colubridae	nonvenomous snakes			1 (0.1%)
Osteichthyes	fish			8 (0.5%
Crytonaias tampicoensis	Pecos pearly mussel			2 (0.1%)
Pelecypoda	freshwater mussels			188 (11.2%)
Totals		339 (100.0%)	152 (100.0%)	1684 (100.0%)

Table 136. Summary of unidentified taxa from the Townsend site.

Taxon	Area A	Area B	Area C	Bison Area	The Pit
Sample size	1316	363	5	339	152
Small unknown	9 0 .7%	7 1.9%	- -	- -	- -
Small mammal/large bird	7 0.5%	- -	- -	- -	2 1.3%
Small mammal	742 56.4%	99 27.3%	2 40.0%	- -	35 23.0%
Small-medium mammal	35 2.6%	4 1.1%	- -	- -	- -
Medium-large mammal	54 4.1%	32 8.8%	- -	5 1.5%	11 7.2%
Large mammal	39 3.0%	38 10.5%	- -	67 19.8%	5 3.3%
Very large mammal	- -	- -	- -	155 45.7%	- -
Artiodactyl	14 1.1%	2 0.6%	1 20.0%	- -	40 26.3%
% small forms burned	61.9%	32.7%	100.0 %	0.0%	5.4%
% large forms burned	48.6%	37.5%	0.0%	0.0%	1.8%
% from flotation	17.9%	21.5%	60.0%	0.0%	3.9%

insects and small vertebrates such as lizards and mice (Findley et al. 1975:227). A single mandible is all that represents this species. It is nearly complete and unburned, suggesting it is a postoccupational addition to the site assemblage.

Only one woodrat (*Neotoma* sp.) element was found. The Southern Plains woodrat (*Neotoma micropus*) and white-throated woodrat (*Neotoma albigula*) are found in the Roswell area. Both inhabit grasslands, and the two can co-occur (Findley et al. 1975:238-242). The specimen, a partial mandible, is unburned and from the upper fill of a grid excavation. It could represent a post-occupational addition to the site or a human discard.

A few small-rodent bones that could not be further identified were recovered (n=5 from Townsend East and n=1 from Townsend West), mainly in flotation samples (n=4). Three of those from Townsend East are heavily burned or calcined, suggesting that small rodents were used as food. Medium-to-large-rodent bones are more common (n=58) and found in all three areas of Townsend East. Again, a large proportion (70.7 percent) were found in flotation samples. Many are burned (65.5 percent), possibly enhancing preservation, and consistently enough to suggest that larger rodents regularly contributed to the food supply. Bones from immature and juvenile rodents are present (2.5 and 6.8 percent) among parts that are largely long-bone (67.2 percent) and flat-bone (12.1 percent) fragments.

Squirrels

A single unburned humerus fragment from a small squirrel was recovered from Townsend East. Several small squirrels inhabit the general area and could be represented. These include the thirteen-lined ground squirrel (*Spermophilus tridecemilineatus*), the Mexican ground squirrel (*Spermophilus mexicanus*), and spotted ground squirrels (*Spermophilus spilosoma*). The first is found in short grass plains, the Mexican ground squirrel inhabits grasslands with mesquite, cactus, or shrubs, and the spotted ground squirrel is found in grassland and desert environs (Findley et al. 1975:18-121).

The black-tailed prairie dog (*Cynomys ludovicianus*) is one of the more common species found in the Townsend East assemblage (n=50, 7 from flotation samples). A grassland species, these prairie dogs live in large colonies. In the southern part of the state they become fat in the fall and remain active during the winter (Findley et al. 1975:130-132).

Both immature and juvenile prairie dogs are represented in the Townsend East assemblage. If utilized by humans, these indicate a presence at the site during the warm season, probably May or June for the immature and slightly later for the juvenile individuals (Bailey 1971:124). Burning is fairly common (22.0 percent) and is mostly heavy burns (14.0 percent). Complete or mostly complete bones (> 75 percent complete) are also fairly common (30.0 percent). Cranial parts are frequent (30.0 percent) with fewer front limbs (24.0 percent) and hind limbs (22.0 percent). Three prairie dog bones were found at Townsend West. None are burned, one is complete, and all are from mature individuals. Parts are from front and hind limbs.

Rabbits

Desert cottontails (*Sylvilagus audubonii*) are the only cottontail rabbit found in the project area (Findley et al. 1975:89). Some of the specimens recovered from Structure 5 are smaller than desert cottontails in the comparative collection, about two-thirds the size. This could suggest that a different species or stressed individuals or populations are represented.

Cottontail rabbits are the most common species identified for Townsend East (n=161, 12 from flotation samples) and the Townsend West Pit (n=41, 1 from a flotation sample). In the Townsend East sample, most pieces are fragmentary (70.2 percent comprise less than 25 percent of the element), with a considerable number that are burned (32.9 percent), mainly heavy (18.0 percent) or calcined (11.8 percent) burns. Immature and juvenile elements are present (2.5 and 6.8 percent) and indicate some warm-season deposition. Body parts break down into cranial (34.8 percent), front limbs (20.5 percent), and hind limbs (26.7 percent).

The Townsend West cottontail bones are less often burned (only 4.9 percent), and not as many are fragmentary (61.0 percent comprise less than 25 percent of the element). Parts are cranial (26.8 percent), front limb (21.9 percent), and hind limb (31.7 percent).

The black-tailed jackrabbit (*Lepus californicus*) is the only jackrabbit inhabiting Chaves County (Findley et al. 1975:94). Much less numerous than cottontails in both assemblages (n=64 for Townsend East, n=9 for the Townsend West Pit), they are still the second most common species found in both assemblages. For Townsend East, burning is even more frequent than for cottontails (42.2 percent), predominately heavy burns (15.6 percent) and calcined (10.9 percent). A good number of bones are complete or nearly so (17.2 percent), but these are mostly small foot bones, which are less likely to break than larger bones. Body parts are largely hind limb (45.3 percent), followed by cranial (21.9 percent) and front limb (17.2 percent).

The Townsend West jackrabbit is burned much less often (22.2 percent), almost always heavy burns. All nine pieces are very fragmentary, one is from a juvenile, and parts are scattered throughout the body.

Carnivores

Single bones from a canid and a badger were found in flotation samples. The canid part, the distal end of claw, could be coyote (*Canis latrans*) or dog (*Canis familiaris*). The badger (*Taxidea taxus*) part is a complete first phalanx from a young badger. Neither is burned. Coyotes and badgers were once ubiquitous and most common in grasslands (Findley et al. 1975:281, 308).

Artiodactyls

Specimens that could only be identified as artiodactyl, with no indication of size (17 from Townsend East and 40 from Townsend West), are all small pieces of tooth enamel that could come from animals from pronghorn to bison in size. Some tooth root fragments look more like bison but are too fragmentary for positive identification. Some of those from Townsend East are burned (14.3 percent).

Only two of the medium-sized artiodactyl specimens (a tooth and a large piece of a rib) could be identified as deer (*Odocoileus* sp.) and none as pronghorn (*Antilocapra americana*). Mule deer (*Odocoileus hemionus*) are more widespread in the area than white-tailed deer (*Odocoileus virginianus*), which are reported for the sandhills east of Roswell (Findley et al. 1975:328-332). Pronghorn prefer open grasslands (Findley et al. 1975:333-334) and are commonly seen in the area today. The few medium-sized artiodactyl bones found, seven from Townsend East and one from the Townsend West Pit, are fragments of teeth, ribs, an ulna, and a calcined metapodial.

The Sacramento Mountains west of Roswell are suitable range for elk (*Cervus elaphus*) (Findley et al. 1975:327). The single specimen recovered, a piece of an acetabulum, is more consistent with elk than bison. If it is elk, it indicates that at least some of the groups using the Townsend site traveled between there and the Sacramento Mountains.

Bison (*Bos bison*) were once common on the eastern plains of New Mexico (Findley et. al. 1975:333-334) and are often found in prehistoric assemblages from the area. If the distribution in the Salt Creek area follows that documented in the southern plains region, then bison were not abundant until after 2050 B.C. to A.D. 500, after which they were absent or rare until between A.D. 1000 and 1800 (Dillehay 1974:180; Hofman et al. 1989:163-165).

Both bison and large-bovid (*Bos*) parts were found at Townsend East and the Townsend West Bison Area. While none of the Townsend West Pit bones could be positively identified as bison, tooth roots left at the level of artiodactyl are very similar to those of bison and could very well be from this species. Table 36 gives the body part distribution for the bison and probable bison from the Bison Area. These appear to be natural deaths, based on the lack of artifacts and unambiguous evidence of processing, as well as the orientation of the bones in the deposits. Since the bones were found in the Lower Terrace, which postdates the Intermediate Terrace, where the Pit is located, these could date to period when bison were more common, between A.D. 1000 and 1800. The bison bones from Townsend East are from the same structure, which dates to around A.D. 1050, and include a femoral head and a complete first phalanx. Neither is burned or has evidence of processing. The large-bovid specimens are two tooth fragments from the upper fill of Feature 2. This close to the surface, they could be cow.

Birds

No bird bone was recovered from Townsend West. Those from Townsend East, a long-bone fragment from a large bird and a vertebra and sternum fragment from medium to large forms, could not be identified beyond the size of the bird. The large-bird bone is burned. Twelve pieces of egg shell were also found.

Turtles

Much of the turtle bone are pieces of carapace (n=7) that could not be identified any further. Four pieces are burned, one lightly, one heavily, and two calcined.

Ornate box turtles (*Terrapene ornata*) are common in the southeastern part of the state. A relatively small terrestrial species, ornate box turtles occupy a wide range of habitats. They are most abundant in grassland areas where soils allow burrowing. Foraging in the morning and late afternoon, box turtles retreat into their burrows at midday and at night. Hibernation lasts from October or November to March or April (Degenhardt et al. 1996:104-107). Found only at Townsend East, the box turtle remains (n=5) are marginal pieces of carapace and a vertebra. None are burned.

The single piece of possible softshell turtle (*Trionyx spiniferus*) is unburned and resembles a carapace marginal as pictured in Olsen (1968:25). Spiny softshell turtles are found in the Pecos River and occasionally in temporary ponds near rivers, rarely far from permanent water. They prefer shallow water with beaches or where streams enter and are highly aquatic, spending little time on land. Hibernation periods resemble those of other turtles, about October to March or April (Degenhardt et al. 1996:121-124).

Snakes and Lizards

Most of the snake bones are vertebrae that are too damaged to distinguish venomous from nonvenomous snakes. None of the snake bones (vertebrae and a rib) are burned, and most are relatively complete. Given the lack of burning and relative completeness, these snakes are probably relatively recent additions to the site assemblage rather than human prey.

Although many live and some hibernating whiptail lizards (*Cnemidophorus* sp.) were observed at the site, only one bone, a complete femur from a juvenile lizard, was found. Less pitted than most bone, it is most likely a recent addition to the site area. Several species of whiptail live in the Roswell area (Deganhardt 1996:205-231). This one agreed well with the western whiptail (*Cnemidophorus tigris*) but could be another species.

Fish

All but one of the fish bones from Townsend East came from the same structure and could represent as many as three fish. Except for one possible cranial fragment, the specimens are small cervical or trunk vertebrae. None are burned. While various catfish species could be ruled out, none were identifiable to species. The vertebrae agreed well with those from a largemouth bass (*Micropterus salmoides*) but were also similar to a gray redhorse (*Moxostoma congestum*) so have been left at the general level of fish.

Averaging 120 to 700 mm in length, the largemouth bass occupies a wide range of habitats, preferring quiet and warm rivers, lakes, and ponds with low turbidity and beds of aquatic plants. It is native to the Pecos River (Sublette et al. 1990:317-318) and was trapped in Salt Creek near Roswell by W. J. Koster and C. Metzler in June of 1947 (Museum of Southwest Biology records).

Gray redhorses do not get quite as large, up to 514 mm in length. Their preference is for clear to moderately turbid, warm, sluggish, low-gradient streams. It formerly occupied the Pecos River upstream to about Roswell but is diminishing in the Pecos River drainage (Sublette et al. 1990:223-225).

With the exception of the largemouth bass, species collected for the Museum of Southwest Biology from "Salt Creek near Roswell" are all small forms such as the gizzard shard, mosquito fish, red shiner, sand shiner, and green sunfish. Given the relative lack of fish in the Townsend site assemblages, it is most likely that even prehistorically, Salt Creek was perennial and did not support large numbers of the fish most useful for human consumption, especially as far west as the Townsend site. The near absence of fish in this assemblage could reflect the distance to where fish were found or the food preferences of the fairly mobile groups who utilized the Townsend site.

Freshwater Mussels

Two pieces of freshwater mussel shell were identified as the Pecos pearly mussel (*Cyrtonaias tampiocoensis*). A third piece, part of a hinge, was recovered from an Area A extramural grid. It was placed with the ornaments and not analyzed as fauna, as were several pieces of worked shell (see Table 134). This species lives in the lower reaches of the Pecos River in quiet or fast-running water of lakes, rivers, and small streams in soft mud, mud-sand, mud-gravel, and large pebble substrates (Metcalf 1982:50; Murry 1985:A-25).

Mussel shell makes up 11.3 percent of the site assemblage. A fair number either have a ground edge or are shaped into beads or other ornaments, making them more difficult to interpret. If they were transported from the Pecos River (about 13.5 km to the east), then some to most of the shell fragments recovered at the site could be by-products of ornament manufacture. If mussels could be procured nearby, they may be food refuse. Their ubiquity certainly suggests a good deal of use, yet freshwater mussel shells preserve much better than bone, making their role less certain, especially given the time span represented at this site. The near absence of other species indicating that Salt Creek was a perennial stream further suggests these shell fragments were brought to the site.

Townsend East

The Townsend East sample is largely discussed in terms of the three spatial areas defined earlier in this report (Table 137). Area C, clearly Late Archaic, represents a distinct spatial and temporal unit. Initially, Areas A and B were arbitrarily divided at the 200N line. For the fauna, Structure 4, which dates to the late Ceramic period, has been included in Area B to provide a better chronological division. Area B is largely late Ceramic. Area A probably has some Archaic combined with mostly early Ceramic deposits but could also have some late Ceramic deposits, even when Structure 4 is excluded. Dart points suggesting earlier dates were found in or around Structures 3 and 5. Extensive rodent burrowing and churning of the Area A soil has mixed the deposits from the different periods. Still, the three areas can serve as rough proxies for the three time periods: Area A for the early Ceramic period, Area B for the late Ceramic period, and Area C for the Late Archaic period. Unfortunately, Area C has a very small sample (n=5), while Area A produced the bulk of the Townsend East sample (n=1,316).

A smaller percent of the Area A sample was recovered in flotation samples (Table 138), so the prevalence of small forms in that sample is not strictly a function of sample composition. Preservation is probably better in Area B, where 45.7 percent of the bone has no environmental alteration (Table 139), compared to Area A at 39.4 percent. The actual difference is probably much greater, because Area A has more heavily burned and calcined bone, which is less likely to be affected by soil conditions (Table 140).

The biggest difference in the Area A and Area B samples is in the proportions of large and small animals (Table 136). Over half (56.4 percent) of the Area A sample is identifiable only as small mammal, while Area B has less than half that proportion. Area B has more larger forms. Medium-to-large and large mammals comprise 19.3 percent, compared to only 7.1 percent of the Area A sample, and it has all of the elk and bison. Area B also has the only two carnivore bones, yet the sample size is much smaller. Freshwater mussels make up a much larger proportion of the Area B sample (22.0 percent compared to 8.3 percent), yet only 1 of the 13 ornaments or pieces with ground edges is from Area B. The abundance and proportion of ground shell (11.0 percent of Area A and 1.2 percent of Area B) may indicate some change in how mussels were used. Early on, freshwater mussels may have been used not only for food but also as a raw material that was processed at the site. The presence of a single shell ornament in Area B is poor evidence of the use of shell as a raw material during the later period.

Contrary to expectations that the number of species represented should increase with the sample size, Area A, with over four times the sample size, has about the same number of species represented (at least 15) as Area B (at least 14). Relatively few animals are represented in either area when all area bone is treated as a sample for calculating the MNI (Table 141). Again, small forms comprise most of the MNIs for Area A (25 of 247, or 92.6 percent) and fewer of those for Area B (13 of 18, or 72.2 percent). When combined with smaller proportions of medium-to-large and large-mammal bones in the Area A sample, this strongly suggests a different emphasis in exploitation of body sizes during the early and late Ceramic periods.

More of the Area A bone is highly fragmented (Table 142). Complete or nearly complete bones are relatively rare in both Area A and Area B, but rarer in Area A. Some of the fragmentation was undoubtedly caused by burning (Table 143). The proportion of heavily burned bone in Area A is over twice that of Area B. Since burning renders bone more friable (e.g., Stiner et al. 1995), it probably contributed significantly to the amount of fragmented bone in both areas (Table 140). An alternate or contributing factor could be the amount of processing that took place. Heavily processed bone has been interpreted as an indication of dietary stress and an attempt to extract the maximum amount of nutrients from animals (e.g., Oliver 1993:211-212).

Actual evidence of processing is rare in the Townsend fauna, in large part because of the amount of burning and fragmentation, plus poor preservation. Only ten instances of processing were observed: one impact fracture and nine spiral breaks. The impact break is on a medium artiodactyl long bone, and all the spiral breaks are on unidentifiable small-mammal long bones. All but one are from Area A: two from the first level, three from the third level of extramural grids, and four from the fill of Structure 5. The impact break is from the fill of Structure 1 in Area B.

Townsend West

Townsend West produced two distinct and very different assemblages. One consists mainly of bison and large- to very-large-mammal bone eroding out of the creek bank.

Table 137. Townsend East taxa by area (Structure 4 included with Area B).

Taxon	Area A		Area B		Area C		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Unknown small	9	0.7%	7	1.9%	-	-	16	1.0%
Small mammal/medium to large bird	7	0.5%	-	-	-	-	7	0.4%
Small mammal	742	56.4%	99	27.3%	2	40.0%	843	50.1%
Small to medium mammal	35	2.6%	4	1.1%	-	-	39	2.3%
Medium to large mammal	54	4.1%	32	8.8%	-	-	86	5.1%
Large mammal	39	3.0%	38	10.5%	-	-	77	4.6%
Small squirrel	-	-	1	0.3%	-	-	1	0.1%
Prairie dog	33	2.5%	17	4.7%	-	-	50	3.0%
Yellow-faced pocket gopher	4	0.3%	-	-	-	-	4	0.2%
Ord’s kangaroo rat	-	-	2	0.6%	-	-	2	0.1%
Banner-tailed kangaroo rat	2	0.2%	-	-	-	-	2	0.1%
Grasshopper mouse	-	-	1	0.3%	-	-	1	0.1%
Woodrat	1	0.1%	-	-	-	-	1	0.1%
Small rodent	5	0.4%	-	-	-	-	5	0.3%
Medium to large rodent	43	3.3%	14	3.9%	1	-	58	3.4%
Cottontail	129	9.8%	32	8.8%	-	-	161	9.6%
Jackrabbit	47	3.6%	17	4.7%	-	-	64	3.8%
Canid	-	-	1	0.3%	-	-	1	0.1%
Badger	-	-	1	0.3%	-	-	1	0.1%
Artiodactyl	14	1.1%	2	0.6%	1	20.0%	17	1.0%
Medium artiodactyl	4	0.3%	3	0.8%	-	-	7	0.4%
cf. Elk	-	-	1	0.3%	-	-	1	0.1%
Deer	1	0.1%	1	0.3%	-	-	2	0.1%
Bison	-	-	2	0.6%	-	-	2	0.1%
Bos/Bison	2	0.2%	-	-	-	-	2	0.1%
Large bird	1	0.1%	-	-	-	-	1	0.1%
Medium to large bird	2	0.2%	-	-	-	-	2	0.1%
Egg shell	10	0.8%	2	0.6%	-	-	12	0.7%
Turtles	7	0.5%	-	-	-	-	7	0.4%
Ornate box turtle	5	0.4%	-	-	-	-	5	0.3%
Softshell turtle	1	0.1%	-	-	-	-	1	0.1%
Whip-tailed lizard	1	0.1%	-	-	-	-	1	0.1%
Snakes	1	0.1%	5	1.4%	-	-	6	0.4%
Nonvenomous snakes	1	0.1%	-	-	-		1	0.1%
Fish	7	0.5%	1	0.3%	-	-	8	0.5%
Pecos pearly mussel	2	0.2%	-	-	-	-	2	0.1%
Freshwater mussel	107	8.1%	80	22.0%	1	20.0%	188	11.2%
Total	1316	78.1%	363	21.6%	5	0.3%	1684	100.0%

The other is at the edge of a large camp where excavations of hearths in 1982 produced radiocarbon dates ranging from the Late Archaic (490 to 250 B.C.) to the early Ceramic period (A.D. 460 to 600 and 660 to 820) (Maxwell 1986:22). Geomorphological evaluations suggest that the campsite area on the intermediate terrace is older than deposits forming the lower terrace, where much of the bison was found (Maxwell 1986:18).

Table 138. Townsend East, proportion of bone recovered from flotation by area.

Taxon	Area A	Area B	Area C	Total
Unknown small	4 4.4%	4 57.1%	- -	8 50.0%
Small mammal/ large bird	1 14.3%	- -	- -	1 14.3%
Small mammal	167 22.5%	31 31.3%	2 100.0%	200 23.7%
Small-medium mammal	5 14.7%	1 25.0%	- -	6 15.4%
Medium-large mammal	4 7.4%	13 40.6%	- -	17 19.8%
Large mammal	3 7.7%	3 7.9%	- -	6 7.8%
Prairie dog	4 12.1%	3 17.6%	- -	7 14.0%
Small rodent	4 80.0%	- -	- -	4 80.0%
Medium-large rodent	30 69.8%	10 71.4%	1 100.0%	41 70.7%
Cottontail	10 7.8%	5 15.6%	- -	15 9.3%
Jackrabbit	3 6.4%	1 5.9%	- -	4 6.3%
Canid	- -	1 100.0%	- -	1 100.0%
Badger	- -	1 100.0%	- -	1 100.0%
Deer	1 100.0%	- -	- -	1 50.0%
Snakes	- -	5 100.0%	- -	5 83.3%
Total	236 17.9%	78 21.5%	3 60.0%	317 18.8%

Bison Area

Six excavation units contained bone (Table 144), almost all of which could be bison. The range of parts is restricted but widespread, from head to rear foot. No more than one or two animals are indicated by the element or age distribution. Pieces of humerus and scapula were found in EU 1 and EU 12, but with no duplication of portions.

All of the bone is fragmentary or represents less than half of the element (Table 144), with no evidence of breakage or processing that can be attributed to humans. None of the bones from this area are burned, and almost all are heavily pitted from soil conditions or checked from exposure (Table 144). This, combined with depositional factors (orientation of pieces) in what are essentially alluvial deposits lacking charcoal, provides no unambiguous evidence that these bones were deposited by humans.

These findings contrast somewhat with the conclusions regarding the 1982 testing project at this site, which also recovered considerable amounts of bison bone. Bison (n=37) and very-large-mammal bone (n=580) were found in eight test trenches, a backhoe trench, in the creek cut bank and bottom, and on the surface. Most came from tests of the lower terrace, either the banks or the base of the creek channel; however, those from the backhoe trench and one test trench were in the intermediate terrace. In at least two instances, Test Trenches I and R, bison was associated with cultural material. Test Trench I in the creek bottom produced 11 pieces identifiable as bison and 240 very-large-mammal bones as well as a projectile point 10 cm from bison cranial fragments. Test Trench R in the intermediate terrace

Table 139. Townsend East, summary of environmental alteration by area.

Alteration	Area A	Area B	Area C	Total
None	518 39.4%	166 45.7%	4 80.0%	688 40.9%
Pitting	765 58.1%	180 49.6%	1 20.0%	946 56.2%
Sun bleached	2 0.2%	- -	- -	2 0.1%
Checked/exfoliated	15 1.1%	12 3.3%	- -	27 1.6%
Root etched	16 1.2%	5 1.4%	- -	21 1.2%
Total	1316 100.0%	363 100.0%	5 100.0%	1684 100.0%

Table 140. Summary of significance tests for burning verses completeness and environmental alteration.

Area	Unburned > 25%	Unburned < 25%	Burned > 25%	Burned < 25%	Pearson Chi-square	Significance
Townsend East	113	899	30	641	23.262	0
Area A	67	651	30	567	8.848	0.003
Area B	46	246	0	71	12.808	0
Area	**Unburned Unaltered**	**Unburned Altered**	**Burned Unaltered**	**Burned Altered**	**Pearson Chi-square**	**Significance**
Townsend East	302	711	386	285	128.296	0
Area A	178	541	340	257	141.644	0
Area B	123	169	43	28	7.825	0.005

Burned does not include scorched bone. Altered includes any kind of alteration.

Table 141. Townsend East MNIs.

Taxon	Minimum MNI	Area MNI			
		Area A	Area B	Area C	Total
Small squirrel	1	-	1	-	1
Prairie dog	5	4	3	-	7
Yellow-faced pocket gopher	2	2	-	-	2
Ord's kangaroo rat	1	-	1	-	1
Banner-tailed kangaroo rat	1	1	-	-	1
Grasshopper mouse	1	-	1	-	1
Woodrats	1	1	-	-	1
Small rodent	-	1	-	-	1
Medium-large rodent	-	-	1	1	2
Cottontail	5	5	3	-	8
Jackrabbit	3	3	1	-	4
Canid	1	-	1	-	1
Badger	1	-	1	-	1
Artiodactyl	-	-	-	1	1
Medium artiodactyl	-	1	-	-	1
Elk	1	-	1	-	1
Deer	1	-	1	-	1
Bison	1	-	1	-	1
Bos/bison	-	1	-	-	1
Medium to large bird	-	1	-	-	1
Box turtle	2	2	-	-	2
Softshell turtle	1	1	-	-	1
Lizards	1	1	-	-	1
Snakes	-	-	1	-	1
Nonvenomous snakes	1	1	-	-	1
Fish	2	2	1	-	3
Totals	32	27	18	2	47

contained small fragments of very-large-mammal bones, many from a refilled erosional channel. However, 51 pieces of tooth enamel were associated with a hearth. Seven other test pits found bison or very-large-mammal without unequivocal evidence that humans were responsible for their deposition (Maxwell 1986:74-80). While there is no question that humans living in this area exploited bison, bison could also have utilized this particular section of Salt Creek and died naturally.

The Pit

Excavations in predominantly eolian deposits at the edge of a more heavily utilized area produced a relatively small collection of bone (n=152) and no freshwater mussel shell, except for a small disc bead made from mussel shell in the first level of fill. Bone was most numerous in the middle elevations of fill, between 1.00 and 1.40 m below the surface (Table 37). Very little

Table 142. Townsend East, summary of completeness by area.

Completeness	Area A	Area B	Area C	Total
>75%	44 3.3%	20 5.5%	- -	64 3.8%
25-75%	53 5.0%	26 7.2%	- -	79 4.7%
<25%	1218 92.6%	317 87.3%	5 100.0%	1540 91.5%
Total	1315 100.0%	363 100.0%	5 100.0%	1684 100.0%

Table 143. Townsend East, burning by area.

Taxon	Area A			Area B			Area C	
	Unburned	Light/Dry	Other	Unburned	Light/Dry	Other	Unburned	Other
Unknown small	9 (100.0%)	-	-	7 (100.0%)	-	-	-	-
Small mammal/large bird	2 (28.6%)	-	5 (71.4%)	-	-	-	-	-
Small mammal	284 (38.3%)	85 (11.4%)	373 (50.3%)	65 (65.7%)	3 (3.0%)	31 (31.3%)	-	2 (100.0%)
Small-medium mammal	7 (20.0%)	8 (22.9%)	20 (57.1%)	2 (50.0%)	-	2 (50.0%)	-	-
Medium-large mammal	24 (44.4%)	11 (20.4%)	19 (35.2%)	9 (28.1%)	1 (3.1%)	22 (68.7%)	-	-
Large mammal	19 (48.7%)	5 (12.8%)	15 (38.5%)	34 (89.5%)	-	4 (10.5%)	-	-
Small squirrel	-	-	-	1 (100.0%)	-	-	-	-
Prairie dog	24 (72.7%)	1 (3.0%)	8 (24.2%)	15 (88.2%)	-	2 (11.8%)	-	-
Yellow-faced pocket gopher	3 (75.0%)	-	1 (25.0%)	-	-		-	-
Ord's kangaroo rat	-	-	-	2 (100.0%)	-	-	-	-
Banner-tailed kangaroo rat	1 (50.0%)	1 (50.0%)	-	-	-	-	-	-
Grasshopper mouse	-	-	-	1 (100.0%)	-	-	-	-
Woodrats	1 (100.0%)	-	-	-	-	-	-	-
Small rodent	2 (40.0%)	-	3 (60.0%)	-	-	-	-	-
Medium-large rodent	7 (16.3%)	3 (7.0%)	33 (76.7%)	13 (92.9%)	-	1 (7.1%)	-	1 (100.0%)
Cottontail	83 (64.3%)	-	46 (35.7%)	25 (78.1%)	1 (3.1%)	6 (18.7%)	-	-
Jackrabbit	23 (48.9%)	4 (8.6%)	20 (42.5%)	14 (82.4%)	1 (5.9%)	2 (11.8%)	-	-
Canid	-	-	-	1 (100.0%)	-	-	-	-
Badger	-	-		1 (100.0%)	-	-	-	-
Artiodactyl	12 (85.7%)	-	2 (14.3%)	2 (100.0%)	-	-	1 (100.0%)	-
Medium artiodactyl	4 (100.0%)	-	-	2 (66.7%)	-	1 (33.3%)	-	-
Elk	-	-	-	1 (100.0%)	-	-	-	-
Deer	-	-	1 (100.0%)	1 (100.0%)	-	-	-	-
Bison	-	-	-	2 (100.0%)	-	-	-	-
Bos/bison	2 (100.0%)	-	-	-	-	-	-	-
Large bird	-	-	1 (100.0%)	-	-	-	-	-
Medium to large bird	2 (100.0%)	-	-	-	-	-	-	-
Turtles	3 (42.9%)	1 (14.3%)	3 (42.9%)	-	-	-	-	-
Box turtle	5 (100.0%)	-	-	-	-	-	-	-
Softshell turtle	1 (100.0%)	-	-	-	-	-	-	-
Lizards	1 (100.0%)	-	-	-	-	-	-	-
Snakes	1 (100.0%)	-	-	5 (100.0%)	-	-	-	-
Nonvenomous snakes	1 (100.0%)	-	-	-	-	-	-	-
Fish	7 (100.0%)	-	-	1 (100.0%)	-	-	-	1 (100.0%)
Totals	643 (48.9%)	120 (9.1%)	553 (42.0%)	286 (78.8%)	6 (1.6%)	71 (19.6%)	2 (40.0%)	3 (60.0%)

Table 144. Summary of Townsend West Bison Area fauna.

	Medium-Large Mammal	Large Mammal	Very Large Mammal	Bison	Total
			EU Distribution		
EU 1	- -	- -	35 25.2%	104 74.8%	139 100.0%
EU 11	- -	3 3.4%	81 93.1%	3 3.4%	87 100.0%
EU 12	2 11.8%	7 41.2%	5 29.4%	3 17.6%	17 100.0%
EU 13	1 3.6%	10 35.7%	16 57.1%	1 3.6%	28 100.0%
EU 21	- -	32 62.7%	18 35.3%	1 2.0%	51 100.0%
EU 22	2 11.8%	15 88.2%	- -	- -	17 100.0%
			Environmental Alteration		
Pitting/ corrosion	4 80.0%	62 92.5%	155 100.0%	99 88.4%	320 94.4%
Checking/ exfoliation	- -	- -	- -	13 11.6%	13 3.8%
Polish/ rounding	1 20.0%	5 7.5%	- -	- -	6 1.8%
			Completeness		
25-50%	- -	- -	- -	12 10.7%	12 3.5%
<25%	5 100.0%	67 100.0%	155 100.0%	100 89.3%	327 96.5%

Table 145. Townsend West Pit, number of individuals (MNI) represented.

Taxon	Count	Minimum	Maximum			
			0-100	100-140	140+	Total
Prairie dog	3	1	1	1	-	2
Small rodent	1	0	1	-	-	1
Plains pocket gopher	3	1	-	1	-	1
Ord's kangaroo rat	1	1	-	-	1	1
Cottontail	41	2	1	2	1	4
Jackrabbit	9	1	1	2	-	3
Medium artiodactyl	1	1	-	1	-	1
Artiodactyl	1	1	1	-	1	2

Minimum treats the assemblage as one sample.
Maximum divides the assemblage into three samples by elevation.

bone is burned (n=5) with proportionately more burned bone in the lowest fill (21.4 percent). Much of the bone is fragmentary, yet some of this results from poor preservation where soil conditions have dissolved large parts of many smaller bones.

Environmental alteration is largely pitting or corrosion caused by properties of the soil (Table 37). Proportions of corroded bone decrease with depth, as does the degree of alteration. This suggests that the corrosion is a long-term process, with some protection afforded by deep burial.

The most common taxa in this small assemblage are unidentifiable small mammal (n=35), cottontail (n=41), and artiodactyl (n=40). Small-mammal remains increase proportionately with depth, cottontail rabbits are most numerous in the middle section, and the artiodactyls are more abundant in the highest and lowest elevations (Table 37). Some of the cottontail rabbit bones could be from burrow deaths. Eight elements (mandibles, vertebrae, and front and hind limb parts) from EU 3, Level 12 (1.20-1.30 m), appear to be from the same rabbit.

Few animals are represented in this fairly small assemblage (Table 145), and the majority could represent burrow deaths or naturally deposited bone. Only seven pieces of bone have signs of burning, a large mammal and cottontail have graded light to heavy burns, a jackrabbit bone is dry burned, and two small-mammal bones, a cottontail bone, and a jackrabbit bone are heavily burned.

When compared to the counts from the 1982 excavations (Table 146), there are considerable differences and similarities. Many of the differences are largely methodological, that is, the result of how taxonomic units are defined. When viewed at a very gross level based primarily on body size, they are more comparable: small mammal (29 and 22 percent), large mammal (37 and 41 percent), and rabbit (33 and 33 percent). There are also less obvious differences. The Pit rabbit is largely cottontail (41 cottontail and 9 jackrabbit), while the 1982 sample has more jackrabbit (13 cottontail and 21 jackrabbit) bone. Similarly, the large-mammal taxon in the 1982 excavation counts includes animals from deer to bison in size and consists mainly of long-bone fragments, while the artiodactyl bone from the Pit is mainly tooth enamel with the possible artiodactyl long-bone fragments left in the large-mammal category. The situation is further confused by the analysis and reporting of the 1982 sample. Bison and probable bison/very large-mammal remains were analyzed and reported separately, regardless of provenience. A total of 234 pieces of tooth enamel were analyzed with the bison and very-large-mammal assemblage (Maxwell 1986:76).

Probably the most significant difference between this and the 1982 assemblage is in the rabbit species. Yet even this could easily be a function of field methods (screening), the nature of the samples (one area with no associated ceramics versus many test areas dating from the Archaic well into the Ceramic period), and numerous other factors.

LA 117255

Only two pieces of bone were recovered from LA 117255. Both are from the upper level of grids (359N 99E and 466N 2E), both are jackrabbit, and both are sun bleached and checked. The first is the proximal end of a right first rib from a mature rabbit. The other is a right proximal radius from an immature rabbit. Given the depth, sun bleaching, and checking, these two specimens probably postdate the prehistoric occupation of this site.

Discussion

Examining the Townsend site faunal data from a chronological perspective (Table 147) show several trends. Placing the main proveniences in approximate order from earliest to later and emphasizing those with larger samples (shaded columns), in this case over a hundred specimens, provides a general picture of the changes that occurred from the Late Archaic (West Pit) to the early Ceramic (Structures 2 and 5) and late Ceramic (Structures 1 and 4) periods.

The presence of rodents varies through time with no clear patterns. If the postoccupational burrowers could be separated from those used and left by humans, some patterns might emerge. Regardless, the rodent contribution was fairly low and does not appear to be solely a function of the amount of flotation bone in a particular assemblage. Birds, turtles, and fish are found in few of the assemblages, only the two largest samples. In the Structure 5 assemblage, these are accompanied by very high proportions of small mammals and very few artiodactyl bones.

Small-mammal proportions increase from the Late Archaic to the early Ceramic assemblages then decrease in the late Ceramic assemblages. The proportion of large mammals begins fairly high, drops dramatically in the early Ceramic period, and rises considerably in the late Ceramic assemblages. Coincidentally, the lagomorph index, which compares the relative numbers of cottontails and jackrabbits, shows cottontails are the more abundant rabbit for all but the Structure 2 assemblage, which has a very small number of rabbit bones (n=9). This index starts high, indicating proportionately more cottontails, and gradually decreases but remains high over time. The artiodactyl index, which assesses the relative contributions of artiodactyls and rabbits, is high, indicating more artiodactyls in the Late Archaic and one of the late Ceramic period assemblages, and very low in the two early Ceramic period assemblages. The same patterns are evident when all of the Area A sample is compared to that from Area B. Lagomorph indices fall from 0.73 for Area A to 0.65 for Area B, while the artiodactyl indices rise from 0.25 to 0.51.

Plotting the lagomorph against the artiodactyl indices for some of the Townsend structures, Area A and B in general, and samples and those from other sites in the region (Fig. 114) highlights some of the similarities and differences between the assemblages. Like the Archaic samples, Structure 4, Bloom Mound (Driver 1985:46), and Henderson (Speth 2000:92), all have relatively high artiodactyl indices, but both Bloom Mound (A.D. 1200-1450) and Henderson (A.D. 1275-1300) date much later, to the Lincoln phase. Structure 1 is

Table 146. Townsend West Pit counts compared to 1982 excavation counts.

Taxon	Pit	1982 Sample
Small mammal	37 24%	45 21%
Medium-large and large mammal	15 10%	80 37%
Bird	0	2 1%
Cottontail	41 27%	28 13%
Jackrabbit	9 6%	46 21%
Rodents	8 5%	1 1%
Canids	0	2 1%
Artiodactyls	41 27%	4 2%
Unknown	0	9 4%
Totals	152 100%	217 100%
% burned	4.6%	6.9%

Adapted from Rayl (1982:81).

Table 147. Summary of Townsend faunal data in approximate chronological order (earliest to latest).

	Late Archaic		Early Ceramic					Late Ceramic	
	Area C	West Pit	St. 6	St. 3	St. 7	St. 2	St. 5	St. 4	St. 1
Sample size	5	152	2	40	55	110	595	141	115
% from flotation	60.0	3.9	50.0	47.5	27.3	40.9	10.2	29.1	23.5
% rodents	20.0	4.6	-	-	1.8	12.7	2.7	2.1	13.0
% small mammals	40.0	59.2	50.0	55.0	72.7	72.7	84.0	49.6	57.4
% large mammals	20.0	37.5	-	20.0	16.4	4.5	5.2	39.7	14.8
% bird, turtle, fish	-	-	-	-	1.8	-	3.7	-	.9
% mussel	20.0	-	50.0	20.0	5.5	6.4	1.0	-	9.6
No. of species	2-3	7	2	4	6	6	13	9	10
Lagomorph index	-	0.82	-	0.67	-	0.44	0.77	0.70	0.66
Artiodactyl index	-	0.53	-	0.62	-	0.18	0.09	0.62	0.34
% burned	60.0	4.6	50.0	50.0	45.4	80.0	32.1	21.3	16.5
% <25% complete	100.0	86.2	100.0	95.0	98.2	90.9	88.4	80.9	85.2
% with environmental alteration	100.0	90.8	100.0	42.5		38.2	76.1	82.3	53.9
% immature	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	3.8

Lagomorph index = cottontail ÷ (cottontail + jackrabbit).
Artiodactyl index = artiodactyl (large mammal + artiodactyl + identified species) ÷ (cottontail + jackrabbit + artiodactyl).

remarkably similar to the Fox Place (Akins 2002), dating to the late A.D. 1200s and early 1300s, while Structure 5 is fairly unique. When all of Area A is considered, the point is close to that of the Fox Place. The lagomorph indices reflect a consistent (0.63 to 0.83) preference or use of the more common species on an area-wide basis, regardless of time.

Mussel shell is absent from the Late Archaic and Structure 4 samples, most abundant in the Structure 1 and 2 assemblages, and rare in the Structure 5 assemblage. Given the near absence of species that would inhabit a permanent water source (muskrat, beaver, raccoon, aquatic turtles, fish, and water fowl), as well as geological and hydrological assessments of Salt Creek, it seems unlikely that the mussels were procured from Salt Creek. Rather, mussels and other river-dependent species may have been transported to the site as a food or, in the case of the freshwater mussels, a raw material resource.

Aside from the species content, the proportion of burned bone from the Townsend East structures decreases over time (Table 146), with very little found in the Late Archaic Townsend West assemblage. This could be an indication that poorer preservation removed more of the unburned bone from the older samples, or could indicate a greater degree of processing, or could reflect longer periods spent at the site. The proportion of environmentally altered bone is lowest in the assemblages that have the most burning, and in fact there is a significant correlation between the two (Table 140). For Townsend East as a whole, only 29.8 percent of the unburned bone is also unaltered, compared to 57.5 percent of the burned bone. When looked at by component, the proportion of unburned bone that is unaltered increases dramatically from the Area A to the Area B assemblages (28.8 and 42.1 percent) and somewhat for burned bone (56.9 and 60.0 percent). This is a good indication that deposit age contributes to the amount of environmental alteration for bone in general, but especially for unburned bone.

Like the environmental alteration, the amount of very fragmentary bone is highly correlated with the burning. Broken down into burned and unburned or lightly burned bone, burned bone is almost always very

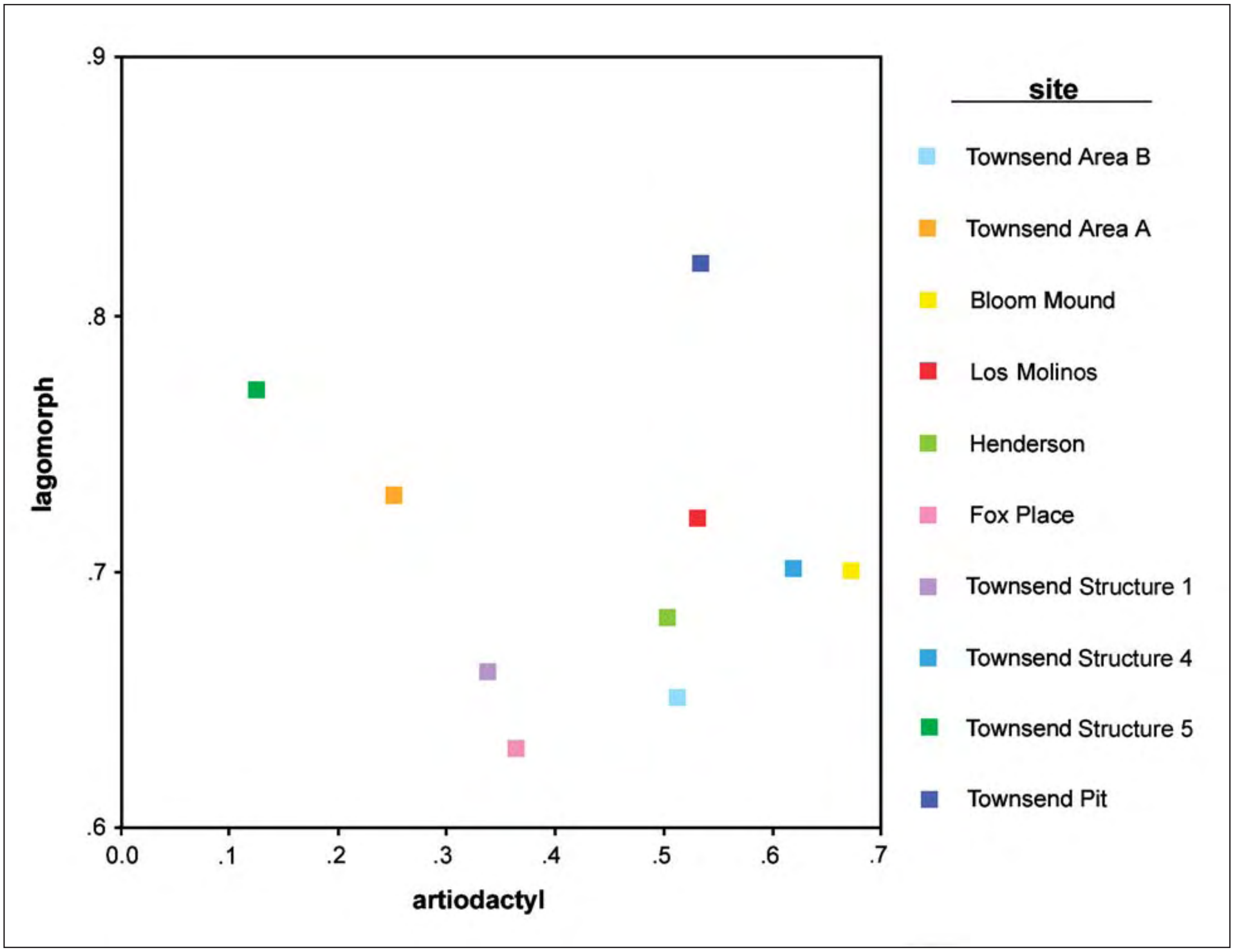

Figure 114. Comparison of lagomorph and artiodactyl indices for Roswell area sites.

fragmentary (95.5 percent), and unburned bone is less so (88.8 percent). This remains true regardless of the age of the deposit.

The proportion of immature bone ranges from none to only 3.8 percent. When combined with species that hibernate or become less active in winter, these provide some evidence of warm-weather use of the site area. Structure 1 has the highest proportion, along with a small number of species indicative of warm weather, while Structures 4 and 5 have low proportions. Structure 5 also has turtle and fish. Structures lacking bones from immature mammals generally have small samples, or the proportion of highly fragmented and unidentifiable pieces are high. Overall, these can be seen as indicating warm-weather occupation at some point during the early and late Ceramic periods. No immature bone was identified in the two Archaic samples, but severe environmental alteration would have obscured most evidence of unfused epiphyses and the porosity characteristic of young bone. In addition, most bone is highly fragmented.

All in all, the Townsend site faunal data seem to indicate a more balanced use of large and small forms during the Late Archaic, with a fairly equal representation of large and small mammals, and with cottontails by far the more frequently used of the rabbits. In the next series of samples, dating about 300 years later, small-mammal bones are far more numerous than those from artiodactyls. Good proportions of rodents, bird, turtles, fish, and mussels also point to a generally broad-spectrum use of animal species, but one that concentrates on small mammals. This changes completely with the Structure 4 sample, which dates around A.D. 1050. Small-mammal bones are considerably less frequent, while artiodactyl remains become more frequent and more diverse. The final sample from Structure 1 is not much later than that from Structure 4, about A.D. 1100, and still has a reduced proportion of small mammals, but less artiodactyl and a good proportion of mussel.

Structure 1 contained corncob fragments, indicating that it (and perhaps Structure 4) was built by groups practicing horticulture or who were in contact with groups that did. Most researchers consider groups living during at this time (Late Mesilla or 8-Mile phases) to be more sedentary, as dictated by the subsistence base, than pre-Ceramic and early Ceramic groups (Mauldin et al. 1998:17). This is also suggested by the burial from the middle fill of Structure 4 with characteristics generally attributed to groups practicing agriculture. This occupation could very well represent a logistic camp occupied by small groups with more permanent settlements located to the south along permanent drainages or the foothills to the west.

Certainly, the faunal assemblage from the earlier components is consistent with that expected for hunters and gatherers foraging from a base camp and moving once resources around the camp became depleted. Camps would be located near water sources, and the length of occupation depended on how long it took the resources to become depleted (Hard n.d.:21-22; Sebastian and Larralde 1989:55-56). Favorable locations would be revisited once the resources were replenished. Use of the most abundant local fauna (cottontails and rodents) as well as some transported fauna (mussels and perhaps some artiodactyls) is indicated, with no clear indication that one particular species was targeted.

The late Ceramic occupation does not reflect the sedentary aspect of this period. Nor are the assemblages from the two late structures consistent with each other. Structure 1, with corn and an abundance of rodents, turtles, fish, carnivores, and mussel shell and only a moderate amount of artiodactyl contrasts with the Structure 4 assemblage. The latter most resembles the Late Archaic assemblage from the Pit in relative proportions of rodents, small-mammal, and large-mammal forms that may reflect a similar mobile strategy. Structure 1, on the other hand, most resembles the indices for the Fox Place (lagomorph index=0.63 and artiodactyl index =0.36) as well as in the diversity of animals exploited.

CHAPTER 19

MACROBOTANICAL REMAINS

BY PAMELA J. McBRIDE AND MOLLIE S. TOLL

The Salt Creek project focused on the Townsend site (LA 34150E), a series of shallow irregular structures and extramural features. On the banks of Salt Creek, archeological features chronicle repeated occupation from Archaic to late Ceramic eras. With increasing distance from the wash, features are fewer, farther between, and chronologically more discrete. In Area A, the closest to Salt Creek, Structures 2, 3, 5, 6, and 7 are probably associated with the early Ceramic period, and Structure 4 with the late Ceramic period. Structure 1 of Area B (south of Area A) was in use during the late Ceramic period. Area C, the farthest away from Salt Creek, lacks ceramics and represents an Archaic occupation of the site. Across the highway, Archaic through late Ceramic deposits are found along with bison bone concentrations at Townsend West (LA 34150W). Throughout the Townsend site, archaeological deposits are riddled with the burrows of small mammals, reptiles, and insects, redistributing and confusing the depositional history of prehistoric events. Excavations at LA 117255, farther from Roswell along Highway 285, produced very few artifacts (all lithic and ground stone) and fewer features. This Late Archaic campsite was dated at around A.D. 320.

The Salt Creek project is squarely in the midst of a broad zone of semidesert grassland on the plains of eastern New Mexico (Brown 1994). Modern vegetation in the project area was surveyed on July 6-7, 1997. We examined the makeup of the plant community and plant occurrence, with focus on those with economic utility. We placed less emphasis on introduced and/or noxious plants; their identity is principally useful for identifying disturbed or contaminated strata. We collected vouchers for confirmation of taxonomic identification, using University of New Mexico Herbarium comparative specimens and plant manuals, and seeds where possible. For all woody taxa, we collected paired wood and vegetative/flowering samples to help identify archaeological charcoal. We noted distribution in two areas: east of the highway at road level, and in the margins and channel of Salt Creek (Table 148).

Several taxa occurred in significantly different growth forms in the two habitats. For instance, soapweed yucca growing at the road level were knee-high basal rosettes, and in the arroyo were waist-high and far

Table 148. Modern vegetation in the Salt Creek Project area.

Plant Type Taxon	Common Name	Occurrence	
		Road Level	Wash
Grasses			
Andropogon cf. *hirtiflorus*	[none]	•	
Aristida sp.	three-awn	•	
Bouteloua curtipendula	sideoats grama	•	•
Chloris virgata	feather fingergrass		•
Elymus canadensis	Canada wild rye		•
Hilaria jamesii	galleta grass	•	
Muhlenbergia cf. *torreyi*	ring-muhly	•	
Panicum obtusum	vine-mesquite grass	•	
Sporobolus cf. *airoides*	alkali sacaton	•	
Sporobolus giganteus	giant dropseed		•
Forbs			
Argemone polyanthemos	white prickly poppy	•	
Cirsium sp.	thistle		•
Convolvulus incanus	dagger bindweed		•
Datura cf. *quercifolia*	oak-leaved jimsonweed		•
Gaura parviflora	small-flowered gaura		•
Grindelia aphanactis	gumweed		•
Hymenopappus flavescens	yellow wooly-white	•	
Kochia sp.	kochia		•
Lepidium montanum	western peppergrass	•	•
Mentzelia cf. *pumila*	stickleaf, blazing star		•
Physalis sp.	groundcherry	•	
Polygonum sp.	knotweed		•
Proboscidea cf. *parviflora*	devil's claw		•
Ratibida tagetes	Mexican hat		•
Salsola kali	Russian thistle	•	•
Solanum eleagnfolium	nightshade	•	
Sphaeralcea cf. *angustifolia*	copper mallow	•	•
Xanthium strumarium	cocklebur		•
Shrubs			
Atriplex canescens	fourwing saltbush		•
Cylindropuntia sp.	cholla	•	
Platyopuntia sp.	prickly pear	•	
Prosopis glandulosa	mesquite	•	
Tamarix pentandra	tamarisk		•
Yucca elata	soapweed yucca	•	•

more robust. Native grasses (sideoats grama) and introduced weeds (Russian thistle, kochia) occurred in far more luxurious growth in the wash. Clearly the wash habitat provided not only a specialized list of plant resources specific to wetter growing conditions, but overall, distinctly greater density, diversity, and vigor.

Methods

The 230 soil samples collected during excavation were processed by the Office of Archaeological Studies using the simplified bucket version of flotation (see Bohrer and Adams 1977). Flotation soil samples ranged in size from 0.25 to 3.80 liters in volume. Each sample was immersed in a bucket of water, and a 30- to 40-second interval was allowed for settling out of heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of chiffon fabric, catching organic materials floating or in suspension. The squares of fabric were lifted out, formed into a bundle, secured with a binder clip, and laid on coarse mesh screen trays to dry.

Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, and 0.5 mm mesh) and then reviewed under a binocular microscope at 7x to 45x. Charred and uncharred reproductive plant parts (seeds and fruits) were identified and counted. Full-sort flotation data were reported in tables as the number of reproductive plant parts per liter of the original soil sample. If five goosefoot seeds were recovered from a two-liter sample, then 2.5 goosefoot seeds were recorded in the table for that sample. Three exceptions to this are FS numbers 2095, 2102, and 2113, where volumes were not recorded prior to flotation, so the actual number of seeds present in each sample was recorded. Nonreproductive plant parts such as pine needles and grass stems were recorded by relative abundance for each liter of soil processed.

To help the reader sort out botanical occurrences of cultural significance from the considerable noise of post-occupational intrusion, data in tables are sorted into categories of cultural (all carbonized remains), possibly cultural (unburned, economically useful taxa), and noncultural (unburned materials, especially of taxa not economically useful, and when found in disturbed contexts together with modern roots, insect parts, scats, or other signs of recent biological activity).

Charcoal from the 4 mm and 2 mm screens of full-sort flotation samples was identified, to a maximum of 10 pieces from each screen size. Charcoal was examined by snapping each piece to expose a fresh transverse section and identified at 45x. Identified charcoal from each taxon was weighed on a top-loading digital balance to the nearest 0.1 g and placed in labeled plastic bags or vials. Low-power, incident-light identification of wood specimens does not often allow species- or even genus-level precision but can provide reliable information for distinguishing broad patterns of utilization of a major resource class.

Results

Townsend West

This area (on the west side of U.S. 285) consisted of a sparse bison bone bed eroding from the bank of Salt Creek and a possible campsite. A series of flotation samples were examined from a profile of the Bison Area and the Pit. Charred goosefoot seeds were recovered in a flotation sample from EU 3, Level 10, of the Pit (Table 149), indicating the possible processing of the seeds for food. A walnut shell fragment was recovered from one macrobotanical sample from EU2, Level 9, of the Pit (Table 150). Walnut trees occur in riparian corridors and may have been present along the section of Salt Creek that is now part of the Bitter Lake National Wildlife Refuge, along the Pecos River, or along the Rio Hondo. Although the nuts of *Juglans microcarpa*, as indicated by the specific name of the tree, are small, they were gathered and eaten, and a brown dye could be made from the hulls. Other floral remains consisted of uncharred noncultural weedy annual and grass seeds as well as dicot leaves and hackberry and jimsonweed seeds. Many of these taxa were documented in the modern vegetation survey conducted at the site (see Table 148).

For the most part, locally abundant wood resources were used for fuel. Wood identified for radiocarbon analysis was primarily saltbush/greasewood (Table 151). Mesquite and cf. alder woods were also present.

Townsend East

Area A. Area A is the northernmost portion of the site, extending from 200N to the bank of Salt Creek. Extramural features and the majority of the six structures in Area A were heavily disturbed by rodents. The overwhelming majority of carbonized floral parts were weedy annual seeds and included seven taxa: flame flower, goosefoot, pigweed, purslane, seepweed, sunflower, and winged pigweed (Tables 152-155, 157-160). The adaptive advantage that weedy annuals have of proliferating in the disturbed ground around habitation sites, agricultural fields, and middens make them a readily available resource, and their seeds have been recov-

Table 149. Townsend West, flotation sample plant remains.

		FS No.	10	46	51	165	167	168	169	170
			Campsite		EU 12 Soil Profile in Bison Bed					
		Context	EU 3 Level 10	EU 7 Level 9						
Cultural	*Annuals*	goosefoot	2.3							
Noncultural	*Annuals*	cheno-am	0.8							
		pigweed								0.5
		povertyweed		0.8						
		purslane						3.5		0.5
	Grasses	dropseed			2.6					
		grass family			0.3					
		panic grass tribe		0.8						
	Other	dicot				+ leaf	+ leaf		+ leaf	?
		globemallow family		0.5						
		monocot		+ stem						
		spurge			0.3					
		jimson weed						1.5		

Table 150. Townsend West, macrobotanical sample plant remains.

		FS No.	8	32	127	196
			The Pit			
		Context	EU 2 Level 9	EU 4 Level 15	EU 17 Level 13	EU 6 Level 18
Cultural	*Perennials*	walnut	1 charred nutshell frag. (0.2 g)			
Noncultural	*Perennials*	hackberry		1 seed frag. (0.03 g)	1 seed frag. (0.02 g)	1 seed frag. (0.03 g)

Table 151. Townsend West, species composition of charcoal for radiocarbon analysis (weight in grams).

FS No.	12	37	93	120	123	176	190	Totals	
Context	EU 3 Level 11 Pit	EU 4 Level 18 Pit	EU 2 Profile Pit	EU 19 Levels 10 and 11 Pit		EU 23 Levels 11 and 12 Pit		Weight	%
Nonconifers: cf. alder	-	-	-	0.2	-	1.3	0.5	2.0	26%
Saltbush/greasewood	3.9	0.3	0.1	-	-	-	-	4.3	55%
Mesquite	0.3	0.1	-	-	1.1	-	-	1.5	19%
Totals	4.2	0.4	0.1	0.2	1.1	1.3	0.5	7.8	100%

Table 152. Townsend East, Area A, extramural features, flotation plant remains.

		FS No.	2038	2027	2118	2110	2150	2162	2164	2166
		Feature	F 2 Circular Pit	F 3 Circular Pit	F 5 Ovoid Pit	F 7 Irregular Pit	F 8 Irregular Stain	F 9 Ovoid Pit	F 10 Small Fire Pit	F 11 Oval Pit
Cultural	*Annuals*	goosefoot		1.3*		0.6*		1.9*	0.4*	
		purslane						0.5*	1.3*	
		seepweed						0.5*		
		sunflower								0.7*
		winged pigweed		0.6*						
	Cultivars	corn		++* c	1.0* k					
	Other	unidentifiable						0.5*	0.4*	
		unknown		1.9* pp	5.0* pp	+* rind		1.9* pp		1.4* pp
Noncultural	*Annuals*	goosefoot					1			
	Grasses	dropseed	1.1	1.3	1	0.6				
	Other	dicot				+ leaf				
		spurge		1.9	2.0			0.5		2.9
		FS No.	2185	2177	2460	2463	2461	2462	2468	2469
		Feature	F 12 Small Fire Pit	F 13 Circular Pit	F 23 Small Fire Pit		F 24 Small Fire Pit	F 25 Small Fire Pit	F 28 Circular Pit	
Cultural	*Annuals*	goosefoot					3.4*	0.3*	0.3*	0.3*
		purslane					0.3*			
		unidentifiable	2.0*							
		unknown	2.5* pp							
	Perennials	mesquite						0.3*		
		prickly pear cactus								0.3*
Noncultural	*Annuals*	goosefoot					0.3			
		pigweed					0.3		0.3	
	Grasses	dropseed			4		0.3		0.3	
		grass family							0.3	
	Other	nightshade family						0.3		
		spurge		0.8		0.5		0.5		
		unknown							0.3 nr	
		FS No.	2530	2559	2564	2565	2566	2567	2604	2606
		Feature	F 49 Circular Pit	F 27 Large Fire Pit	F 45 Large Fire Pit	F 29 Large Pit	F 30 Large Pit	F 31 Small Pit	F 47 Small Fire Pit	F 24 Small Fire Pit
Cultural	*Annuals*	cheno-am		1.0*						
		goosefoot		1.0*	1.0*	0.6*				
		purslane		1.0*						
		seepweed			0.5* 0.5* e	2.5* 0.6*				
	Cultivars	corn	+* c, 0.4* k							
	Other	bulrush			0.5*					
		unidentifiable				1.3*			2.0*	
		unknown							2.5* pp	
		unknown #9188		0.5*						
Noncultural	*Annuals*	pigweed		0.5						
	Grasses	dropseed		0.5						
	Other	caltrop							1	
		spurge		2.4		0.6		1.3	1	0.2

* = charred, + = 1-10/liter, ++ = 11-25/liter, c = cupule, e = embryo, k = kernel, nr = nonreproductive plant part, pp = plant part.

Table 153. Townsend East, Area A, grid samples (stains and other organic levels), flotation plant remains.

		FS No.	2095**	2102	2113**	2119	2123	2125	2236	2237	2238	2239	2240
		Feature	231N 102E Level 1	233N 96E Level 2	232N 104E Level 2	234N 104E Level 1	231N 104E Level 1	231N 104E Level 2	228N 103E	Dark Fill, Test Trench 231N 96-102E			
Cultural	*Annuals*	pigweed							0.4 pc				
		seepweed									0.4*		3.7*
	Other	spurge									0.4*		
		unidentifiable						0.5*					
		unknown			2* pp						0.4* pp		1.9* pp
Noncultural	*Annuals*	goosefoot	1					1	0.4	0.4			
		pigweed								0.4			
		purslane											0.5
	Grasses	brome	1 glume										
		dropseed	2	2	1	2.0			4.6		0.4	1.1	1.4
		panic grass tribe							0.4				
		grass family									+ g		
	Other	caltrop							0.4				4.2
		milkvetch							0.4				
		monocot				+ stem							
		dicot											
		nightshade family	1										0.9
		spurge	7	8	4	7.0	1		3.3	2.3	1.7	2.9	2.3
		tansy mustard							0.4				
		unidentifiable	1	5									
	Perennials	globemallow							0.4				0.5
		juniper						+ twig					
		unknown conifer							+ n				

** flotation volume not recorded, actual number of seeds in sample are reported; * = charred, + = 1-10/liter, pc = partially charred, n = needle, pp = plant part, g = glume.

Table 154. Townsend East, Area A, Structure 2, flotation plant remains.

		FS No.	2509	2518	2523	2525	2529	2532	2533	3007
		Quad/Feature	Str. 2	NE quad	Pit	Posthole	Entryway	Posthole	Posthole	Posthole
		Level/Feature No.	Level 1	Level 2	F 3	F 5	F 10	F 14	F 15	F 7
Cultural	*Annuals*	goosefoot								0.7*
	Other	unidentifiable		0.6*						
		unknown #9188			1.0*					
	Perennials	prickly pear cactus							0.8*	
Noncultural	*Annuals*	goosefoot					0.8			
	Grasses	dropseed					2.5			
		spurge				0.5	9.6	1		
		unidentifiable					0.4			
	Perennials	hackberry	0.7							

* = charred

ered from a wide array of prehistoric assemblages. Documented economic uses of the seeds of weedy annuals like goosefoot abound in the ethnographic literature. Seeds were ground into a meal and eaten as gruel or combined with other food such as corn meal and made into cakes (Castetter 1935:23). The young leaves of goosefoot, purslane, and pigweed were also cooked and eaten like spinach. Corn recovered from extramural features and structures (Tables 152, 154, 155, 157) included occasional kernels (Features 5 and 49), but more often tiny cob fragments (Features 3 and 49, Level 1, in Structure 3; and a burial in Structure 4) or glumes (a cob appendage encircling an individual kernel, as in Level 3 of Structure 3). Corn is not only a nutritious food resource, but also the spent cobs (minus the edible kernels) are a good source of fuel. Cob fragments commonly comprise a significant percentage of archaeobotanical assemblages at sedentary period sites.

Perennial species use was represented by carbonized cactus, juniper, and mesquite seeds as well as walnut shells (Table 156). The fruits of prickly pear and hedgehog cactus were eaten raw, boiled, or dried for storage (Castetter 1935:26, 35-36; Dunmire and Tierney 1995:190-191). They were one of a small number of sweets available prior to the arrival of Europeans. The presence of juniper seeds could relate to use of juniper wood for fuel and/or use of the cones (commonly called berries) for food. Juniper cones are often still attached to branches when the trees are collected for firewood, and the cones and their seeds are subsequently burned along with the wood. However, juniper cones were eaten raw or cooked by several of the Pueblo peoples, used as a seasoning for meat, or ground into a meal (Castetter 1935:31-32). Their strong resinous flavor and low nutritive value probably preclude widespread or general food use. The absence of juniper on the landscape surrounding Townsend today suggests that the wood was collected as driftwood in Salt Creek, and the fleshy cones that were still attached to branches were remains of using the wood for fuel. Mesquite seeds were ground into a flour and made into loaves or made into a meal and eaten as pinole by many different groups in Arizona, New Mexico, and Mexico (Castetter 1935:43-46).

Although many grasses are available in the general area (see Table 148), evidence of their use was limited to a few grass family grains from Structure 5 (Table 158). A particularly diverse array of floral taxa in Structure 3 suggests that it may have been a center of plant processing and preparation activities. Preservation issues are probably not a factor here, because Structure 3 was one of two very shallow structures, badly disturbed by rodents. Despite the fact that Structure 4 was the deepest of all structures excavated and rodent disturbance was minimal at Structure 5, floral remains were sparse in these two structures.

Uncharred floral parts were generally representative of the modern vegetation documented in the vegetation survey and included grasses, a variety of forms,

Table 155. Townsend East, Area A, Structure 3, flotation plant remains.

		FS No.	2546	2547	2548	2549	2550	2553	2558
		Quad/Feature	NW Quad		NE Quad			SE Quad	Hearth
		Level/Feature No.	Level 2	Level 3 Floor Fill	Level 1	Level 2	Level 3 Floor Fill	Level 3 Floor Fill	F 1
Cultural	*Annuals*	cheno-am					0.5*		0.5*
		flameflower				0.5*			
		goosefoot	0.3*			1.0*	1.6*	0.6*	1.5*
		pigweed	0.3*						
		purslane	1.0*	0.7*		1.0*			2.0*
		seepweed	0.3*						
	Cultivars	corn			+* c			+* g	
	Other	unidentifiable			0.3*		0.5*	0.6*	
		unknown #9188	0.3*					0.6*	0.5* 0.5pc
	Perennials	hedgehog cactus				0.5*			
		juniper				0.5*			
Noncultural	*Annuals*	goosefoot	0.5		0.3				
	Grasses	dropseed	0.5						
	Other	groundcherry			0.3				
		spurge	0.3		1.5	2.0	0.5		0.5
		unidentifiable				0.5*			

* = charred, + = 1-10/liter, c = cupule, g = glume, pc = partially charred.

Table 156. Townsend East, Area A, Structure 3, macrobotanical plant remains.

		FS No.	2546	2556
		Context	NW 1/4, Level 2	Fill
Cultural	*Perennials*	juniper		1 charred seed (0.02 g)
		walnut	1 charred nutshell fragment (0.13 g)	

Table 157. Townsend East, Area A, Structure 4, flotation plant remains.

		FS No.	2620	2623	2624
		Context	Fill, Ash Lens	Floor 2 Hearth	Level 3, Burial 1
Cultural	*Annuals*	goosefoot	0.2*	1.1*	
	Cultivars	corn			+* c

* = charred, c = cupule.

Table 158. Townsend East, Area A, Structure 5, flotation plant remains.

		FS No.	2485	2492	2497
		Quad/Feature	NE Quad	SE Quad	SW Quad
		Level	Level 1	Level 2	Level 3
Cultural	*Annuals*	cheno-am		0.7*	
		goosefoot			1.0*
	Grasses	grass family	0.4*	0.7*	
	Perennials	mesquite			0.5*
Noncultural	*Other*	spurge			0.5

* = charred.

and hackberry seeds found in flotation samples, as well as several macrobotanical samples.

Flotation charcoal recovered from Area A extramural features was predominately saltbush/greasewood (Table 161). The remainder of the nonconifer woods consisted of undetermined and mesquite wood. The only coniferous wood in flotation samples recovered from extramural contexts was a trace of juniper in the Feature 10 fire pit. Mesquite and saltbush/greasewood were the dominant wood taxa identified in wood samples examined prior to submission for radiocarbon dating (Table 162). A more diverse array of wood taxa was identified from these samples than from the smaller specimens retrieved from flotation samples.

Flotation samples from structures in Area A lacked charcoal of identifiable size, while the radiocarbon samples from structures and features provided a good overall view of wood use (Tables 163-167). Paralleling the nonwood plant remains in flotation samples, the number of wood taxa identified from Structure 3 was greater than for any other structure. Juniper, pine, cf. alder, saltbush/greasewood, rabbitbrush, cf. cholla, Mormon tea, creosotebush, mesquite, cf. oak, and cf. rose family woods were identified from Structure 3. While these taxa were identified from other contexts, Structure 3 was the only locus where all 11 genera occurred together. These woods represent trees and shrubs not only from the immediate vicinity of the site, but also from the foothills and higher elevations of the Capitan Mountains, approximately 58 km to the west. While forays to the mountains could have been made to collect juniper, pine, oak, and rose family woods, it is more probable that these woods were carried down by Salt Creek from the mountains and gathered as driftwood.

Table 159. Townsend East, Area A, Structure 5, macrobotanical plant remains.

		FS No.	2489
		Context	NW 1/4, Level 3
Cultural	*Perennials*	juniper	3 charred seeds (0.4 g)

Area B. In this central part of Townsend East, wall slump and extensive rodent burrowing made it difficult for excavators to define the single habitation, Structure 1. Although it appeared that three use-episodes were represented, they have not been distinguished in Tables 168-173. As in Area A, weedy annual seeds dominate the floral assemblage from Area B. Annual taxa recovered include goosefoot, pigweed, purslane, and seepweed. Corn was identified in six samples in 126N 105-107E grids from Structure 1, and the only two cobs from the site were recovered from Levels 7 and 8 (Table 171), suggesting the concentration of corn processing activities in this portion of the structure. Both cobs were 12-rowed and lacked kernels. Perennial species use was represented by mesquite and lemonade berry seeds. Lemonade berry fruits were eaten raw, ground into a meal, or soaked in water by several Native American groups (Castetter 1935:49), contributing to their distinctive lemony flavor. The recovery of mesquite pods in macrobotanical samples from extramural Feature 35 and from every lower fill sample of Structure 1 (Tables 169 and 171) indicates that intensive processing of mesquite took place in this part of the site.

Table 160. Townsend East, Area A, Structures 6 and 7, flotation plant remains.

		FS No.	2586	2587	2599	2600	2603
		Feature	Structure 6		Structure 7 SW Quad		
		Context/Feature No.	S 1/2 Floor Fill	N 1/2 Floor Fill	Level 2	Level 3 Floor Fill	Level 4 Floor Contact
Cultural	Annuals	cheno-am		0.4*			
		goosefoot			1.3*	0.5*	0.5*
		unidentifiable			0.9*		
Noncultural	*Grasses*	dropseed		0.4			
		grass family				+ g	
	Other	caltrop			0.4		0.5
		spurge		0.4	8.7	0.5	1.0

* = charred, g = glume.

Table 161. Townsend East, Area A, extramural features, species composition of flotation wood charcoal.

	FS No.	2038	2027	2150	2162	2164	2166	2185
	Feature	Irregular Pit	Circular Pit	Irregular Stain	Oval Pit	Small Fire Pit	Oval Pit	Small Rock-filled Fire Pit
	Feature No.	F 2	F 3	F 8	F 9	F 10	F 11	F 12
Conifers	juniper					1 (<0.1 g)		
Nonconifers	saltbush/greasewood		4 (<0.1 g)	3 (<0.1 g)	20 (0.5 g)	4 (<0.1 g)		1 (<0.1 g)
	mesquite		4 (<0.1 g)	1 (<0.1 g)		2 (<0.1 g)		4 (<0.1 g)
	undetermined nonconifer	7 (<0.1 g)	2 (<0.1 g)	1 (<0.1 g)			9 (<0.1 g)	
	totals	7 (<0.1 g)	10 (<0.1 g)	5 (<0.1 g)	20 (0.5 g)	7 (<0.1 g)	9 (<0.1 g)	5 (<0.1 g)

Table 162. Townsend East, Area A, extramural features, species composition of charcoal for radiocarbon analysis.

	FS No.	2534	2167	2530	2583	Totals	
	Feature	Deflated Large Fire Pit	Oval Pit	Small Circular Pit Just Outside Str. 2	Stain	Weight	%
	Feature No.	F 1	F 11	F 49	F 42		
Conifers	juniper				<0.1	<0.1	<1%
Nonconifers	mesquite		0.1	0.1	<0.1	0.2	10%
	cf. rabbitbrush				<0.1	<0.1	<1%
	saltbush/greasewood	<0.1	0.5	0.1	0.8	1.4	70%
	undetermined nonconifer		0.1	<0.1	0.3	0.4	20%
	totals	<0.1	0.7	0.2	1.1	2.0	100%

Only one flotation sample from Area B had sufficient charcoal for identification purposes (Table 172). Mesquite and saltbush were the only taxa identified. Species identified in radiocarbon samples included juniper, possible alder, creosotebush, mesquite, and saltbush (Table 173). As was the case in Area A, the abundance of saltbush and mesquite charcoal reflects the ready availability of these woods in the vicinity.

Area C. The southern area of the site has been impacted by road construction, a telephone pole, and cable lines. Feature 38 (a small isolated stain) was the only feature with any floral remains (Table 168). Uncharred spurge seeds represent a modern intrusive. Piñon and unidentified conifer were found in the radiocarbon sample from Feature 39, again suggesting the collection of driftwood.

Table 163. Townsend East, Area A, Structure 2, species composition of charcoal for radiocarbon analysis.

	FS No. Level	2517 Level 2	2518 Level 3	2519 Level 3	2520 Level 3	2521 Level 3	2522 Level 2	Totals Weight	 %
Conifers	juniper	<0.1	<0.1	<0.1			0.1	0.1	3%
	undetermined conifer						<0.1	<0.1	<1%
Nonconifers	cf. sagebrush		<0.1					<0.1	<1%
	saltbush/greasewood	0.2	0.2	0.2	<0.1	0.1	0.5	1.2	41%
	mesquite	0.1	0.5	0.3	0.2	0.1	0.3	1.5	52%
	undetermined nonconifer			<0.1		<0.1	0.1	0.1	3%
	totals	0.3	0.7	0.5	0.2	0.2	1.0	2.9	100%

Table 164. Townsend East, Area A, Structure 3, species composition of charcoal for radiocarbon analysis.

	FS No. Level	2545 L 1	2546 L 2	2547 L 3	2548 L 1	2549 L 2	2552 L 2	2553 L 3	2554 L 1	Total Weight	 %
Conifers	juniper			0.1		<0.1				0.1	<1%
	pine			<0.1						<0.1	<1%
Nonconifers	cf. alder						<0.1	<0.1		<0.1	<1%
	saltbush/greasewood	0.1	0.5	0.9	0.2	0.9	1.1	0.8	<0.1	4.5	36%
	cf. rabbitbrush	0.1			0.1		0.1			0.3	2%
	cf. cholla	0.1	<0.1					0.1		0.2	2%
	Mormon tea						<0.1	0.1		0.1	<1%
	cf. creosote bush			0.1						0.1	<1%
	mesquite	0.1	0.3	1.2		1.1	1.3	0.4	<0.1	4.4	35%
	cf. oak			0.1						0.1	<1%
	cf. rose family						<0.1			<0.1	<1%
	undetermined nonconifer	0.6	0.1	0.6	0.4	0.1	0.4	0.6	<0.1	2.8	22%
	total	1.0	0.9	3.0	0.7	2.1	2.9	2.0	<0.1	12.6	100%

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Investigations were conducted east of U.S. 285 (Area A), west of the highway (Area B), and in the narrow strip of intact archeological deposits along the right-of-way fence on the east side of the highway (Area C). The only two features, found in Area A, were excavated and sampled for archaeobotanical remains. Neither yielded any cultural floral material other than wood. Feature 1, a large oval pit with charcoal and burned clay, produced unburned modern specimens of grass family plant parts, plus legume family and spurge seeds (Table 174). A trace of saltbush/greasewood charcoal was observed in the flotation sample. Mesquite and a trace of undeter-

Table 165. Townsend East, Area A, Structure 4, species composition of charcoal for radiocarbon analysis.

	FS No.	2616	2617	2618	2619	2622	Total	
	Level	L 1	L 2	L 3	L 4	Surface 2	Weight	%
Conifers	juniper	<0.1		0.2	0.1		0.3	2%
Nonconifers	cf. alder	<0.1					<0.1	<1%
	saltbush/greasewood	<0.1	0.1	2.0	6.5	0.1	8.7	58%
	cf. rabbitbrush			0.1	0.1		0.2	1%
	cf. cholla				0.3		0.3	2%
	Mormon tea				0.1	<0.1	0.1	<1%
	mesquite	<0.1	<0.1	0.5	1.7	<0.1	2.2	15%
	cf. rose family				<0.1		<0.1	<1%
	undetermined nonconifer	<0.1		1.1	2.1	<0.1	3.2	21%
	total	<0.1	0.1	3.9	10.9	0.1	15.0	100%

Table 166. Townsend East, Area A, Structure 5, species composition of charcoal for radiocarbon analysis.

	FS No.	2485	2486	2489	2490	2493	2494	2497	2498	Total	
	Quadrant	NE 1/4		NW 1/4		SE 1/4		SW 1/4		Weight	%
Conifers	juniper	0.1	0.2	0.2	<0.1	0.2	0.2	0.2	0.3	1.4	5%
Nonconifers	cf. alder	<0.1						0.4		0.4	2%
	saltbush/greasewood	2.1	2.0	2.5	1.4	2.8	1.3	3.3	2.0	17.4	65%
	cf. rabbitbrush	<0.1				<0.1	<0.1	<0.1	0.1	0.1	<1%
	Mormon tea	<0.1							<0.1	<0.1	<1%
	mesquite	0.1	0.4	0.7	0.4	0.6	0.7	1.0	0.6	4.5	17%
	cf. creosote			0.2						0.2	1%
	undetermined nonconifer	0.1	0.2	0.3	0.2	0.8	0.1	0.4	0.5	2.6	10%
	Total	2.4	2.8	3.9	2.0	4.4	2.3	5.3	3.5	26.6	100%

Table 167. Townsend East, Area A, Structures 6 and 7, species composition of charcoal for radiocarbon analysis.

	FS No.	2586	2587	2596	2601	Total	
	Feature	Structure 6		Structure 7		Weight	%
Nonconifers	cf. alder		0.1		<0.1	0.1	3%
	saltbush/greasewood	0.3	0.8	0.7	0.4	2.2	76%
	mesquite	0.1	0.1	0.2	0.2	0.6	21%
	undetermined nonconifer	<0.1		<0.1	<0.1	<0.1	<1%
	total	0.4	1.0	0.9	0.6	2.9	100%

Table 168. Townsend East, Areas B and C, extramural features, flotation plant remains.

		Area	Area B								Area C
		FS No.	2328	2329	2568	2569	2570	2576	2577	2578	2579
		Feature	Large Pit	Fire-cracked Rock Scatter	Large Circular Pit	Small Pit	Small Fire Pit	Small Pit	Large Pit	Small Pit	Stain
		Feature No.	F 15	F 16	F 32	F 34	F 35	F 36	F 46	F 36	F 38
Cultural	*Annuals*	goosefoot	0.6*					1.9*		2.5*	
		purslane						0.3*			
		seepweed					0.8*				
	Grasses	dropseed		3.2							
	Other	monocot		+ nr							
		nightshade family		1.1							
		unidentifiable			0.9*		0.8*				
	Perennials	lemonadeberry					2.4*				
		mesquite					8.0*				
Noncultural	*Other*	spurge	0.6			1.7		0.5	0.9	2.5	0.5 0.5e

* = charred, + = 1-10/liter, e = embryo, nr = nonreproductive plant part.

Table 169. Townsend East, Area B, extramural features and grids, macrobotanical plant remains.

		FS No.	2570	2266	2572	2575
		Context	Feature 35 Small Thermal Pit	110N 106E Level 1	108N 109E Level 2	109N 110E Level 1
Cultural	*Perennials*	mesquite	15 pod fragments (0.24 g)			
Noncultural	*Perennials*	hackberry		1 seed fragment (0.02 g)		1 seed fragment (0.02 g)
		mesquite			1 pod fragment (0.02 g)	

Table 170. Townsend East, Area B, Structure 1, flotation plant remains.

		FS No.	2344	2365	2332	2334	2335	2231	2232	2366
		Grid/Feature	125N 105E	125N 107E	126N 105E			126N 106E		
		Level/Feature No.	Level 4	Level 7	Level 3	Level 5	Level 6	Level 4	Level 5	Level 6
Cultural	*Annuals*	goosefoot	1.1*	1.1*	1.0*	0.7*		1.9*	1.0*	3.2*
		pigweed					0.6*			0.8*
		purslane						0.4*	0.3*	
		seepweed							1.5*	
	Cultivars	corn			+* c		0.6* k		+* c +* g	
	Other	unidentifiable	0.6*			0.4*				
		unknown			0.3* e			0.8* pp	2.3* pp	
	Perennials	mesquite			0.3*					
Noncultural	Grasses	dropseed						0.8		
		grass family								1.6
	Other	monocot							+ stem	
		poppy family								1.2
	Perennials	globemallow						0.4		

		FS No.	2369	2330	2331	2372	2380	2336	2388	2389
		Grid/Feature	126N 107E					Modern Post Hole	Rodent Disturbance	
		Level/Feature No.	Level 9	Level 3	Level 4	Level 8		F 1	F 4	F 5
Cultural	*Annuals*	cheno-am			2.1*					
		goosefoot	0.5*	2.1*	3.4*			2.0*	1.0*	1.0*
		pigweed					0.5*			
		purslane		0.7*						
	Cultivars	corn	+* c			+* c	+* c		+* c	
	Other	unidentifiable				0.6*		0.3*		
		unknown			0.7* pp					1.0* e
		unknown #9177	0.5*							
	Perennials	mesquite	1.0*							1.0*
Noncultural	*Annuals*	goosefoot								
		pigweed								
		purslane						1		
	Grasses	dropseed								
	Other	spurge			0.7			7.3		
	Perennials	hackberry								1.0

* = charred, + = 1-10/liter, c = cupule, e = embryo, g = glume, k = kernel, pp = plant part.

Table 171. Townsend East, Area B, Structure 1, macrobotanical plant remains.

	FS No.	2334	2335	2362	2367	2368	2369
Cultural	Context	Lower Structure Fill					
Cultivars	corn				1 cob (0.3 g)		1 cob (0.6 g)
Perennials	mesquite	1 pod segment* (0.02 g)	1 small seed/ pod fragment* (0.02 g)	1 pod segment* (0.03 g)	5 pod segments* (0.1 g)	8 pod segments* (0.2 g)	2 pod segments* (0.1 g)
Other	unknown					1 plant part* (0.1 g)	

*charred.

mined conifer charcoal were identified in a radiocarbon sample from this feature (Table 175). Feature 2, an ash-filled oval pit, contained uncharred dropseed grass and spurge seeds along with mesquite leaves. Like the unburned plant parts from Feature 1, they represent modern intrusives.

Table 172. Townsend East, Area B, Structure 1, species composition of flotation wood charcoal.

	FS No.	2232
	Feature	Structure 1
	Context	Level 5, 126N 106E
Nonconifers	mesquite	9 (<0.1 g)
	saltbush/greasewood	5 (<0.1 g)
	total	14 (<0.1 g)

LA 117257

LA 117257 may be an Archaic campsite, consisting of a lithic artifact scatter and two fire pits. The lithic analysis suggests the site dates to the Archaic period, but in the absence of datable material, this cannot be confirmed. A single flotation sample was analyzed from Feature 1. No charred or uncharred floral remains were recovered, and charcoal was also absent.

Discussion

Archaic contexts at the Townsend site, limited to Townsend West and Area C of Townsend East, produced little archaeobotanical information. Carbonized goosefoot seeds (in one of the nine flotation samples analyzed) simply document the occurrence here of the most widespread economic plant found in sites of all time periods, site types, and habitats throughout the Southwest. The identification of a walnut hull from the

Table 173. Townsend East, Area B, Structure 1, species composition of charcoal for radiocarbon analysis.

	FS No. Level	2367 L 7	2368 L 8	2369 L 10	2371 L 7	2372 L 8	2379 L 7	2382 L 6	2384 L 9	Totals Weight	 %
Conifers	juniper		0.1		<0.1				0.1	0.2	1%
Nonconifers	cf.alder	<0.1	0.1	0.1		<0.1		<0.1		0.2	1%
	saltbush/greasewood	2.2	1.9	1.8	0.2	0.7	0.1	0.1	1.2	8.2	58%
	cf. creosotebush			0.1					<0.1	0.1	<1%
	mesquite	1.5	0.7	0.5	0.1	0.3		1.0	0.5	4.6	32%
	undetermined nonconifer	0.4	0.1	0.1	0.2	<0.1			0.1	0.9	6%
	Total	4.1	2.9	2.6	0.5	1.0	0.1	1.1	1.9	14.2	100%

Table 174. LA 117255, flotation plant remains.

		FS No.	750 Bag 1	750 Bag 2	752 Bag 1	752 Bag 2
		Feature	Large Fire Pit		Small Fire Pit	
		Feature No.	F 1		F 2	
Noncultural	*Grasses*	dropseed				0.6
		grass family	+ glume	0.6 + stem		
	Other	legume family	0.9			
		spurge	2.7		1.1	
	Perennials	mesquite			+ leaf	

+ = 1-10/liter

Table 175. LA 117255, species composition of charcoal for radiocarbon analysis.

	FS No.	750
	Feature	Large Fire Pit
	Feature No.	1
Nonconifers	mesquite	4.2
	undetermined nonconifer	<0.1
	total	4.2

Pit indicates forays to collect this resource that could have occurred along the Pecos or farther east along Salt Creek, or along the Rio Hondo to the south. Charcoal in Archaic proveniences is focused on the two dominant types (saltbush/greasewood and mesquite) found in later contexts at the Townsend site. Riparian wood (probably alder) is slightly more prominent than later on. Small amounts of piñon and undetermined conifer in the sample from Area C indicate ties to more distant habitats.

During both Ceramic period occupations at the Townsend site, weedy annuals and perennial plants were major components of the archaeobotanical record. Diversity is greater in both wild plant categories during the earlier occupation, but a larger sampling population (over 50 percent more) may be a factor. Corn remains are present in both early and late Ceramic period contexts, but more widespread later on. Use of riparian habitat resources is documented by walnuts, sedge seeds, and cf. alder wood that could have been collected along Salt Creek. The creek also may have been a source of driftwood carried down from the Capitan Mountains to within reach of site occupants to gather for firewood and construction material. Oak, rose family, pine, and juniper specimens are good candidates for transportation as driftwood.

The diversity of available and utilized plant resources is amply demonstrated in the archaeobotanical assemblages from the Townsend site and other sites in the area (Table 176). The adaptive advantage that weedy annuals have of proliferating in the disturbed ground around habitation sites, agricultural fields, and middens make them a readily available resource. Their seeds have been recovered from a wide array of prehistoric assemblages throughout North America, and southeastern New Mexico follows that pattern.

Dependence on perennial plant resources, however, does show some distinctive patterning in southern New Mexico. The prevalence and diversity of perennials (cacti, monocot leaf succulents, and shrub fruits) is noteworthy. Perennial food products with large carbohydrate or oil reserves in fruit or root tissues may offer greater nutritive return for harvesting and processing energy expended. As food resources, perennials also offer greater dependability. Ethnographies, such as Basehart's studies (1973) of the White Mountain Apaches, confirm that these taxa have constituted the botanical focus of local hunter-gatherer economics in the historic period.

The Chihuahuan Desert floristic community of southern New Mexico and the Rio Abajo appears to provide a resource base with some distinctive qualities (Toll 1983). In cooler deserts to the north, many perennial resources are restricted to specialized soil and drainage conditions, which tend to occur in higher elevations toward the upper altitudinal limits of these species. In southern New Mexico, greater profusion of gravelly outwashes and other coarse-textured soils,

Table 176. Salt Creek flotation plant remains in a regional context.

Site	Flotation and Macrobotanical [no. of flotation samples]	Wood
	Archaic Period	
Townsend West A.D. 350-535 open site; 1,097 m Salt Creek	[2] A: Ch P: Jug	saltbush/greasewood 55% cf. alder 26% mesquite 19%
Sunset Archaic (LA 58971) A.D. 1-400 open site; 1,515 m Rio Hondo Toll 1996a	[26] A: Ch, Desc, Port, 9113 P: Pied, Pros, Rhus G: Spor C: Phas, Zea	creosotebush 21% juniper 10% mesquite 9% plus 17 other taxa
Sunset Shelters (LA 71167) Tintop Cave, Levels 8 and 9 shelter; 1,487 m Rio Hondo Toll 1996a	[4] A: Am, Ch, Hel, Nicot, Port P: Echin G: Spor C: Zea	creosotebush 31% juniper 24% mesquite 10% plus 10 other taxa
	Early Ceramic Period	
Beth's Cave (LA 47481) A.D. 624-813 shelter; 1,890 m Rio Bonito Wiseman 1988	[0] A: P: Jug, Pied, Querc, Yucca G: C: Cuc, Phas, Zea	?
Townsend site (LA 34150 East Structures 2, 3, 5-7, extramural features) A.D. 615-980 open site; 1,097 m Salt Creek	[52] A: Ch, Cycl, Euph, Hel, Port, Sua, Tal P: Echin, Jug, Jun, Opun, Pros, Scir G: Gram C: Zea	juniper 4% mesquite 29% saltbush/greasewood 67% plus 9 other taxa
	Late Ceramic Period	
Townsend site (LA 34150 East, Structures 1, 4) A.D. 980-1275 open site; 1,097 m Salt Creek	[23] A: Am, Ch, Port, Sua P: Platy, Pros G: C: Zea	juniper 2% mesquite 28% saltbush/greasewood 70% plus 6 other taxa
King Ranch (LA 26764) A.D. 1150-1250/1300 pithouse village; 1,053 m Rio Pecos south of R.Hondo Toll 1986, Minnis n.d.	[1] A: Plan P: Pros G: C:	mesquite, saltbush present
Bloom Mound A.D. 1200-1450 adobe room block, pitroom; 1,151 m Rio Hondo Kelley 1984	[0] A: P: Celtis G: C: Phas, Zea	?
Sunset Shelters (LA 71167) A.D. 1100?-1250 shelters, cave; 1,487 m Rio Hondo Toll 1996a	[23] A: Ch, Port, Nicot, Sphaer P: Echin, Jug, Opun, Rhus, Vitis, Yucca G: C: Phas, Zea	creosotebush 27% mesquite 20% juniper 17% plus 15 other taxa
Fox Place (LA 68188) A.D. 1200s pithouse village; 1,089 m Rio Hondo in city of Roswell Toll 1993a	[25] A: Am, Ch, Comp, Nicot, Oeno, Poly P: Acer, Art, Yucca G: Gram, Phrag, Spor C: Cuc, Phas, Zea	ash 15% walnut 13% saltbush/greasewood 50% plus 6 other taxa

Table 176 continued.

Site	Flotation and Macrobotanical [no. of flotation samples]	Wood
Abajo de la Cruz (LA10832) A.D. 1150-1350 room block; 1,700 m Rio Tularosa Minnis et al. 1982 Ford 1975	[17] A: Ch, Port (10% of seeds) P: Atrip, Echin, Opun, Pied, Pros, Vitis (62% of seeds) G: C: Cuc, Zea	ash (walnut?) 17% juniper 35% piñon 32% saltbush 11%
Bent (LA 10835) A.D. 800-1000, 1100-1200 fieldhouse, large pits 1,700 m; Rio Tularosa Minnis et al. 1982	[8] A: P: Pros G: Phrag C: Zea	?
Angus North (LA 16297,2315) A.D. 1150-1350 pithouse villages, roomblock; 2,134 m Rio Bonito Struever & Donaldson 1980	[30] A: Am, Ch, Hel, Port P: Echin, Jun, Pied G: Phrag, Spor C: Cuc, Zea	?
Angus (LA 3334) A.D. 1005-1035 pit structure 2,088 m Rio Bonito Toll & McBride 2000	[4] A: Am, Ch, Desc, Ment P: Jun, Pied G: C: Zea	86% coniferous 11% juniper 64% piñon 11% undetermined 14% nonconiferous 3% mountain mahogany 11% oak
Angus (LA 3334) A.D. 1290-1455 roomblock 2,088 m Rio Bonito Toll & McBride 2000	[19] A: Am, Ch, Desc, Port, Sphaer P: Jun, Pied G: Phrag C: Zea	72% coniferous 11% juniper 14% piñon 45% ponderosa 2% undetermined 28% nonconiferous 5% mountain mahogany 7% oak 14% cottonwood/willow 2% other
Block Lookout = Smokey Bear (LA 2112) A.D. 1250/75-1325/50 roomblock/kiva; 1,865 m Capitan Mountains Ford 1976	[0] A: Hel P: Jun, PiPo, Quer G: Phrag, Spor C: Cuc, Zea	?
Robinson Pueblo (LA 46326) A.D. 1150-1400 pueblo Capitan Mountains Adams 1991	[38] A: Am, Ch, Comp, Desc, Hel, Phys, Port P: Atrip, Jug, Jun, Opun, Pied, Yucca G: Phrag C: Cuc, Phas, Zea	?

Annuals: **Am**aranthus, **Ch**enopodium, **Comp**ositae, **Cycl**oloma, **Desc**urainia, **Euph**orbia, **Hel**ianthus, **Ment**zelia, **Nicot**iana, **Phys**alis, **Plan**tago, **Poly**gonum, **Port**ulaca, **Sphaer**alcea, **Sua**eda, **Tal**inum

Perennials: **Acer** negundo, **Art**emisia, **Atrip**lex, **Echin**ocereus, **Jug**lans, **Jun**iperus**, Opun**tia, **Pi**nus **ed**ulis, **Pi**nus **po**nderosa, **Platy**opuntia, **Pros**opis, **Quer**cus, **Rhus** trilobata, **Scir**pus**, Vitis**, Yucca

Grasses: **Gram**ineae**, Phrag**mites**, Spor**obolus

Cultivars: **Cuc**urbita, **Phas**eolus, **Zea** mays

Annuals will be underrepresented at sites without flotation analyses (Beth's Cave, Block Lookout).

together with milder winters and a longer growing season (180 to 200 or more days), favor denser and more widely distributed populations of various cacti and broad-leaf yucca. Mesquite and certain species of agave are restricted almost exclusively to this zone. Prehistoric people living in the Hondo Valley and other corridors to higher elevations took advantage of these auspicious conditions and used a variety of perennial plants for food, fuel, and manufacturing.

Diversity of perennial species seems to have been greatest at the Townsend site, Sunset Shelters, Abajo de la Cruz, and Robinson Pueblo (Table 176). This is an interesting pattern, given that the Townsend site is at a much lower elevation than the other three sites. The higher-elevation piñon is missing from the Townsend record, as is grape, which occurs at both Sunset Shelters and Robinson Pueblo, but perennial diversity is the same as for the other three projects (six types form all four projects). As with the majority of sites in the region, the perennial plant assemblage is dominated by cacti and mesquite.

Despite the Townsend site's location in prime yucca territory, evidence of the leaf succulent was absent from the archaeobotanical record there. Yet yucca was identified at the higher elevation sites of Beth's Cave (woven fiber artifacts), as well as Sunset Shelters and Robinson Pueblo (seeds). It may be that exploitation of yucca at the Townsend site was restricted to leaf fiber extraction, or that yucca was not one of the primary perennial species used by site occupants. Yucca seeds (interpreted as debris from processing the fruits) are more durable than fiber products, which tend to be recovered only in exceptional preservation situations, such as dry caves and masonry structures with intact roofs.

Although corn was clearly part of the subsistence regime at Townsend, it occurred in low frequencies (present in only 10 percent of samples from the early Ceramic period occupation, and increasing to just 30 percent of samples from the ensuing occupation). By contrast, goosefoot presence in samples is 33 and 87 percent, respectively. Low cultivar ubiquity is repeated at other sites in the region. For example, at Sunset Archaic site (LA 58917) and Sunset Shelters (LA 71167), "Cultivar remains are never in high density, but occur in enough locations to denote corn and bean farming as part of subsistence at both sites" (Toll 1996a:152). In comparison, the presence of cultivars is noted at levels such as 32 to 65 percent in Chaco, and 34 to 55 percent in the La Plata Valley in northwest New Mexico (Toll 1993). *Zea* ubiquities of 80 to 100 percent are not uncommon in agricultural sites of the Rio Grande Valley and Colorado Plateau (Toll 1996b:Table 15). Note also that, everywhere, ubiquity of corn and other cultivar remains increases toward the later sedentary farming era (approximately A.D. 1000-1300).

In the Hondo Valley and Sierra Blanca-Capitan area, corn remains show up consistently in the small sample of 11 Archaic and Ceramic period sites for which we have specific botanical data available, with the single exception of the King Ranch site (Table 176). Those ten sites with corn, however, include three with beans, two with squash, and only three (Beth Cave, Fox Place, and Robinson Pueblo) with all three taxa thought to form the basis of southwestern prehistoric farming. There are other records of Ceramic period cultivars in the region: corn at Henderson Pueblo (Dunavan 1994), and all three taxa at nine sites sampled by Adams and reported as a consolidated group of data (1991:226-227). This seems to support the contention by several researchers that agriculture did not become a significant part of local economies on the southeastern plains and foothills until much later than similar subsistence regimes in northwestern New Mexico. Low population pressure allowed late addition of farming to the subsistence repertoire, after which hunter-gatherers and sedentary farmers wandered side by side until ca. A.D. 1100 (Stuart and Gauthier 1981:289). Lord and Reynolds (1985:237) refer to these late, mobile foragers, who appear to have pursued an Archaic adaptation with benefit of ceramics and the bow and arrow, as "Neoarchaic." Sebastian and Larralde (1989:83) suggest that Ceramic period agriculturalists may have been "much less dependent on agriculture and far more mobile than their contemporaries elsewhere." The data from the Townsend site lend additional evidence for a prehistoric economy in southeastern New Mexico that depended more on knowledge of the landscape and availability of resources, making seasonal rounds to exploit various niches and incorporating agriculture into this regime when convenient.

Summary

Plant remains from the Townsend site demonstrate that corn agriculture was part of the subsistence regime but probably did not play a major role. Annual and perennial species such as goosefoot, pigweed, purslane, seepweed, cacti, and mesquite were important resources not only at Townsend, but also on a regional scale. Wood that could only have grown at higher elevations may have been collected in the Capitan Mountains, but more likely was gathered as driftwood from Salt Creek. The Townsend site was probably not occupied on a permanent basis, but rather fit into a seasonal round of hunting and gathering with limited horticultural pursuits.

CHAPTER 20

HUMAN BURIAL

The human burial recovered from the upper fill of Structure 4 at Townsend East is that of a young female who probably died between A.D. 1050 and 1200. The generally poor condition of her bones precludes many of the observations that would inform on her health. Parts of a four- to five-year-old child were recovered in the 1982 excavations (Rayl 1986b:85). Otherwise, only one other individual is known to have been found at the site. Shortly before the field work associated with this project, a burial was observed eroding out of the north bank of the creek on the east side of U.S. 285 and well outside the project area. Before it could be excavated, someone removed and collected the bones. We were unable to locate and evaluate the context because the landowner required we stay within the project area.

Few human remains have been recovered from the Roswell area, in part because the generally mobile groups inhabiting the area had no formal cemeteries. Thus, the few individuals from the nearby sites of Henderson and Los Molinas and sites to the northwest (Angus and Gran Quivira) provide a basis for comparison. None of these are strictly comparable to the Townsend site in time or subsistence practices. They do, however, provide a contrast that reflects on the health and adaptation of this particular individual.

Methods

The burial was analyzed and reported following the guidelines in *Standards for Data Collection from Human Skeletal Remains*. These methods are designed to systematically gather information on demography, health, interment procedures, diet, and genetic relationships that will inform on the lifeways of prehistoric populations (Buikstra and Ubelaker 1994:4). Cleaning was accomplished with brushes, dental picks, and wooden tools during the analysis. Because most of the bones were fragmentary, long bones were reconstructed as much as possible to provide measurements and other observations.

Age and Sex

None of the more preferred methods for aging could be used with this individual. Diagnostic parts of the pelvis were either missing or too eroded to provide reliable aging criteria. However, several factors suggest she was between 18 and 22 years of age. The medial clavicle epiphysis, which fuses between 18 and 30 years of age, is unfused, as is the iliac crest, which fuses between 14 and 22 years of age (Buikstra and Ubelaker 1994:43). In addition, the tips of the third molar roots are barely open. These generally close around 21 years of age (1994:51). The overlapping range for these three is 18 to 22 years.

Again, some of the pelvic and cranial indications of sex were missing from this individual. However, the greater sciatic notch and preauricular sulcus size and form are clearly female. Similarly, the mastoid process indicates a female, while the prominence of glabella is more ambiguous.

General Indicators of Health Status

Most researchers look at a variety of skeletal and dental indicators of stress to assess general health. While this approach is particularly informative for populations, it also can be used to evaluate the health of individuals. When a single adult is the population, the most useful indicators include growth and development (stature, long-bone morphology, rates of dental development), enamel defects, dental caries and abscessing, osteoarthritis, osteophytosis, the presence of trauma, periosteal reactions, and porotic hyperostosis (e.g. Larsen 1997:6-63; Martin 1994:94-95). Many of these indicators of stress reflect conditions during childhood and are due to poor nutrition and increased infectious diseases (Larsen 1997:61).

Her early death and some indicators of stress indicate the health of this individual was compromised to some extent. Repeated episodes of stress are recorded as dental hypoplasias beginning about the age of two and continuing throughout the span recorded by the developing teeth with peaks at about age 2.0 to 2.5, 3.6 to 4.0, 5.0, and between 11 and 12 years (Table 177). The mandibular third molars also have occlusal pits or developmental defects that would have formed at age 9 to 10 years. The hypoplasia lines are generally light, suggesting the stress-causing event was of short duration or not very severe (Larsen 1997:50). Weaning stress, which occurs when a child loses the nutritional and immunological advantages conferred by maternal antibodies acquired from breast feeding (Goodman et al. 1987:17), may well have caused the first episode of hypoplasia lines. Those that follow could be the result of seasonal shortages of food that lead to nutritional or some other form of stress.

Table 177. Townsend burial dental defects.

Tooth	Defect	Age (years)
R maxillary M3*	linear hypoplasia	11-12
	linear hypoplasia	11-12
R maxillary M2	linear hypoplasia	5.1
R maxillary M1	diffuse brown opacity	1.9
R maxillary PM1	linear hypoplasia	5.1
R maxillary canine	linear hypoplasia	2.9
R maxillary I2	linear hypoplasia	2.3
R maxillary I1	linear hypoplasia	2.5
L maxillary I1	linear hypoplasia	2.5
L maxillary I2	linear hypoplasia	2.1
L maxillary C	linear hypoplasia	3.6
L maxillary M2	linear hypoplasia	5.3
L maxillary M3*	linear hypoplasia	11-12
	single pit	11
	linear hypoplasia	11-12
L mandibular canine	linear hypoplasia	3.6
L mandibular I2	linear horizontal pits	2.6
R mandibular canine	linear hypoplasia	3.6
R mandibular M3	linear hypoplasia	11-12

Calculated using regression formulas from Martin et al. (2001:Table 2.3).

*No formula available; estimated from dental development charts (e.g., Buikstra and Ubelaker 1994:51).

Long-bone length measurements for this individual are greater than those recorded for neighboring populations. However, her long bones are quite slender, and the fibulae are bowed toward the posterior. Since the tibiae are fragmentary, it is difficult to say whether this is the result of ground pressure or an actual deformity. The right radius is not only slim but also has a notably large distal end. While short stature is considered a result of growth suppression in childhood, better nutrition in later childhood years can help compensate (e.g. Larsen 1997:62; Powell 1988:39). It is difficult to say what this combination of relatively large long-bone lengths but small diameters means in terms of this individual's health.

The overall poor condition of the bone precludes observation on osteoarthritis, periositis, and porotic hyperostosis. Ends of long bones are eroded or deteriorated, the surface of all bone is deeply etched, and the mesquite root has badly fractured and removed some cranial bone. No evidence of trauma was observed, but again, minor trauma could easily be obscured by the condition of the bone.

Dentition

All but one (the right mandibular first premolar) of the teeth are present, but few are in place due to the fragmentation of the cranium. Dental wear is moderate (ranging from 2 to 5) except on the first molars, which had considerable dentine exposure (4 to 6) (scored following Buikstra and Ubelaker 1994:52-53). Caries are present in four teeth (interproximal and cervical on both maxillary first molars and the left mandibular first premolar; anterior and cervical on the right mandibular first molar). Frequencies of dental caries reflect the presence of carbohydrates in the diet. These include not only corn but succulent fibers (as in sotol), prickly pear fruit, and mesquite (Larsen 1997:67). Interproximal and cervical caries increase with age and periodontal disease (Buikstra and Ubelaker 1994:54). This frequency is more than would be expected for a woman this young. A slightly younger (16-18 years) female from Los Molinas has no caries (but eight teeth are missing), one from Angus (18-22 years) has no caries, and three younger females from Henderson have two caries (17-20 years), no caries (17-23 years), or two to three caries (19 to 22 years) (Rocek and Speth 1986:76, 125-126, 132-134).

Table 178. Townsend measurements (mm) compared to females from Los Molinas (Roswell area), the Angus site (Sierra Blanca), Henderson, and Gran Quivira.

Measurement	Townsend	Los Molinas	Angus B1	Angus B2	Henderson	Gran Quivira
Height of mandibular body	29.8	30.5	25	30		
Breadth of mandibular body	11.2	10.1	11	9		
Maximum ramus breadth	47.1	33.8	32	35	32-36	
Maximum ramus height	55.2	54.2	53		52-64	
Mandibular angle	123	116	113	119		
Clavicle: ant-post dia at midshaft	11.3*R		9R	8*		
Clavicle: sup-inf dia at midstaft	8.7*R		8R	7*		
Humerus: maximum length	324*		280		279-285	248-302
Humerus: max dia at midshaft	20.1		21	23	20-25	
Humerus: min dia at midshaft	13.5		15		13-15	
Radius: maximum length	254++*	228	206		214-254	196-245
Radius: ant-post dia at midshaft	9.4	10.1	10	8*		
Radius: med-lat dia at midshaft	11.9	13.5	14	10		
Ulna: maximum length	272*				235-266	204-261
Ulna: ant-post dia	10.0	13.4R	11	10R		
Ulna: med-lat dia	14.1	11.2R	14	13R		
Ulna: minimum circumference	33	30	33	23	30-34	
Sacrum: ant superior breadth	117.4		112			
Sacrum: max trans dia of base	43.8		47	44*		
Innominate height	200.7		186		184-209	
Innominate: iliac breadth	114.5*R		128*			
Femur: maximum length	442*R		388		393-408	
Femur: ant-post subtroch dia	23.8	21.2	22	20*	21-25	
Femur: med-lat subtroch dia	33.4	28.1	26	27*	21-25	
Femur: ant-post midshaft dia	26.2	27.8*	24	22*	24-33	
Femur: med-lat midshaft dia	24.1	21.7*	23	21*	21-27	
Femur: midshaft circumference	84	80	78	69	74-85	
Tibia: max dia at nutrient foramen	30.8R	32.8R	29R	29	33-42	
Tibia: med-lat dia at nutrient foramen	20.7	20.9R	22R	17	18-22	
Tibia: circumference at nut foramen	80	86R	81	78R		
Fibula: maximum length	363*R				319-371	
Fibula: max diameter at midshaft	13.5		15*			
Calcaneus: maximum length	74.1R					

Sources
Los Molinas: Akins in prep.
Angus: Akins 2000:205.
Henderson: Rocek and Speth 1986:180, 184-186.
Gran Quivira: Reed 1981:195.

Table 179. Femoral indices (midshaft anterioposterior ÷ mediolateral) for selected New Mexico female burials.

Site and Burial	Index
Townsend	1.09
Los Molinas	1.28
Angus B1	1.04
Angus B2	1.04
Henderson F1	1.12
Henderson F8	0.92
Henderson F21	1.22
Henderson F40	1.24
LA 3333 (Galisteo Basin, mean n=11)	1.14
La Plata (NW New Mexico, mean n=8)	1.03

Henderson: Rocek and Speth 1986:185.

Almost all teeth have some calculus formation, always light and either buccal, mesial, and/or distal. Accumulations of calculus are closely linked to inflammation of the gums that can eventually involve the alveolar bone (Larsen 1997:77).

The upper left central incisor has a notch in the crown edge. It is worn smooth and could be the result of past trauma or some habitual activity. The right upper second molar has a large chip in the crown on the mesial end of the buccal face, while the adjacent first molar has a small chip in the same location. It is less worn and again could result from trauma or an activity that chipped the tooth. Wear on the anterior mandibular teeth is in a flat plane, while the anterior through the first molars of the maxilla are worn in a steep bevel on the lingual side.

Metric Observations

When compared to other females from the general region and beyond (Table 178), the Townsend burial is often outside or at one extreme of the measurements reported. She is larger in the anterioposterior midshaft clavicle, all length measurements, and the mediolateral subtrochanter diameter of the femur. In contrast to the maximum lengths, which are greater than the other burials, the diameter measurements for her arm bones fall on the lower end, illustrating how long and thin these elements are. Her femurs have a distinctive shape, much broader in the mediolateral subtrochanter diameter. Other lower limb diameters fall within the reported range.

Measures of external dimensions correlate with long-bone strength, while the shape of the femur at midshaft reflects mobility. As mobility decreases, shapes become more circular, so that agricultural populations have more rounded cross sections than hunter gatherers (Bridges 1996:112, 118-119). In roundness (Table 179), the Townsend burial is closer to agricultural populations than to more mobile groups. In the sample here, the Los Molinas burial probably comes from an Archaic hunter-gatherer population. The LA 3333 and Henderson populations were mobile to semisedentary agriculturalists, and the La Plata and Angus groups were sedentary agriculturalists. With a sample of one, it is difficult to generalize, but the Townsend burial could be seen as supporting a view that some late prehistoric southeastern groups were seasonally mobile agriculturalists.

Nonmetric Observations

Very few nonmetric observations could be made for this individual because of the surface erosion and fragmentation of the bones. Those found include one large zygomatico-facial foramina (R), a patent condylar canal (R), a bifurcate flexure of the superior sagittal sulcus, a single mental foramen (L), a true perforation or septal aperture on the humerus (L), and the absence of tympanic dehiscence, auditory exostosis, a mylohyoid bridge (L), and atlas bridging (e.g. Buikstra and Ubelaker 1994:89-92).

Summary and Conclusions

The Townsend burial is that of a young female with no obvious cause of death. Interred in the upper fill of a pit structure, she appears to represent a late prehistoric group of relatively sedentary agriculturalists. Both the number of caries, which are more consistent with a carbohydrate diet, and her femoral shape index suggest at least a somewhat agricultural subsistence base. Hypoplasia lines indicate several episodes of stress, possibly from inadequate nutrition during her developing years. Metric observations differ from those of surrounding populations. While this could be entirely due to the small sample of comparative burials, the variability found within females from sites in the southeastern part of the state could also suggest that women were moving into the area (e.g., Katzenberg and Kelley 1991:215).

CHAPTER 21

DISCUSSION

Chronology

Perhaps the largest contribution of the Salt Creek project is finding and dating structures built during the early Ceramic and early part of the late Ceramic periods. While small, relatively shallow pit structures lacking indications of prolonged occupation have been found in the area (Fox Place, A.D. 1200-1420, Wiseman 2002; King Ranch, A.D. 1150-1250, Wiseman 1981; Red Lake Tank, A.D. 1035-1245, Bullock 1999), few date as early (Dunlap-Salazar, A.D. 980, Rocek 1990; Macho Dunes, near Carlsbad, A.D. 670-950, Zamora 2000). The presence of early structures, along with Late Archaic deposits at the same site, gives the Townsend site the time depth necessary to examine changes in mobility, subsistence, and other aspects of prehistoric life during these early periods and provides a contrast with the better-known sites in the area.

Radiocarbon dates (Table 180) were obtained from the lower fill of structures, a deeply buried cultural horizon at Townsend West, and thermal features at Townsend Area C and LA 117255. The deeply buried

Table 180. Chronometric dates for the Townsend site and LA 117255.

	Provenience	Type	Material	Conventional	Calibrated 2-Sigma
Radiocarbon Beta Sample Number					
133472	Structure 1	AMS	mesquite	990 ± 40	1005 - 1175
133473	Structure 2	AMS	mesquite	680 ± 40	670 - 870
133474	Structure 3	AMS	mesquite	650 ± 40	655 - 785
134631	Structure 3	standard	*Atriplex*	690 ± 70	650 - 910 920 - 955
133475	Structure 4	AMS	mesquite	790 ± 40	775 - 980
134632	Structure 4	standard	*Atriplex*	1050 ± 80	995 - 1275
134633	Structure 5	AMS	mesquite	600 ± 50	625 - 770
134634	Structure 5	standard	*Atriplex*	940 ± 70	890 - 1185
134635	Structure 6	AMS	*Atriplex*	570 ± 40	615 - 690
134636	Structure 7	AMS	*Atriplex*	720 ± 70	660 - 980
133471	Feature 39	AMS	conifer	650 B.C. ± 40	820 - 770 B.C.
134637	Townsend West	AMS	*Atriplex*	320 ± 40	350 - 535
134638	LA 117255	standard	mesquite	570 B.C. ± 60	840 - 410 B.C.
Archaeomagnetic					
SC1099	Structure 2	hearth			625-725 905-950

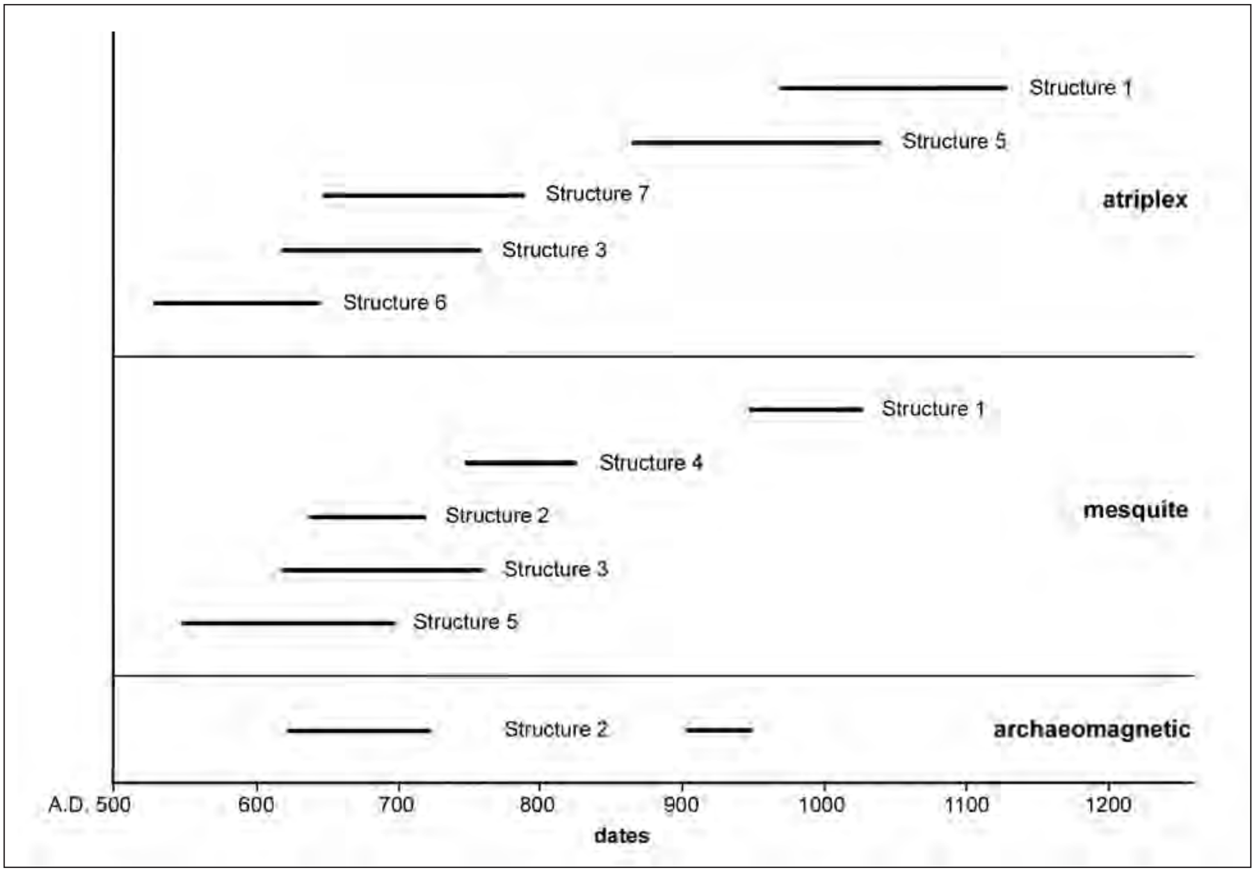

Figure 115. Conventional radiocarbon and archaeomagnetic dates for Townsend East structures.

sample from Townsend West (1.00 to 1.40 m bgs) and an absence of ceramics suggests that the use of brown ware pottery was fairly late (post A.D. 300 to 500) for groups using the Townsend site. Features uncovered at Townsend West in the 1982 excavations dated as early as 490 to 250 B.C. and as late as A.D. 660 to 820 (Maxwell 1986:22) and are consistent with our dating of both the early deposits at Townsend West and dates for the Townsend East structures. The presence of later dating ceramic types such as El Paso Polychrome, Chupadero Black-on-white, and Tularosa Black-on-white in the assemblage collected in the earlier work (Rayl 1986c:27), indicates some use of Townsend West by later groups as well.

Paired samples of *Atriplex* (saltbush and greasewood) and mesquite from the Townsend East structures reflect a pattern of using any available material for fuelwood. The mesquite samples date anywhere from 40 to 340 years, earlier than the *Atriplex*, and indicate the use of old wood (Fig. 115). The single archaeomagnetic date places Structure 2 at the late end of the early Ceramic period.

Artifact Scatters

While we were able to obtain chronometric samples for only one of the artifact scatters, attributes of the lithic assemblage suggest that LA 117257 also dates to the Archaic period. Other project sites have such small assemblages they could not be evaluated (LA 115250 and LA 117246) or the assemblages are dominated by primary reduction (LA 51095, LA 117248), which is not chronologically sensitive (Moore, this volume). Two of the scatters also had thermal features (LA 117257 and LA 117255), and one was observed outside of the project area at LA 117248. While few conclusions can be made concerning these sites, their presence does indicate long-term use of the area, which resulted in a range of site sizes and activities.

Townsend in a Regional Perspective

The presence of three fairly discrete temporal components provides an opportunity to evaluate how the use of this particular area, where most resources may have changed little, reflects differences in mobility, subsistence, and interaction for Late Archaic, early Ceramic, and late Ceramic groups in the general Roswell area. Since any one site or component represents only one facet of a subsistence regime that involved a much larger area, other site information is used when possible. Unfortunately, the better-known sites in the region (Fig. 116) are later than the latest component at Townsend, making it difficult to construct a comprehensive picture of any of these time periods.

Much of the data obtained from our excavations is summarized in Table 181. This, along with information on regional sites and that derived from middle-range studies of historic and modern hunters and gatherers, is used to examine a range of research issues. As a starting point, the environmental context of the Townsend site is examined to evaluate why this site was repeatedly occupied over a very long period of time.

Environmental Context

Salt Creek is not a perennial stream, yet even today the stream bed and tributary channels support a lush plant growth (McBride and Toll, this volume). If anything,

Figure 116. Locations of Roswell area sites.

Table 181. Summary characteristics of time periods at the Townsend site.

Period	Late Archaic	Early Ceramic	Late Ceramic
Components	Townsend West (Area D); Townsend East Area C	Townsend East Area A	Townsend East Area B
Radiocarbon dates	D: A.D. 320 ± 40; C: 570 B.C. ± 60	A.D. 570 ± 40 to 940 ± 70	A.D. 990 ± 40 (mesquite) and 1050 ± 80
Location	D: just north of Salt Creek; C: several hundred meters south of Salt Creek	50 to 100 m south of Salt Creek	100 to 175 m south of Salt Creek
Site type	D: camp site, thermal features beyond project area; sparse fire-cracked rock, moderate lithics and fauna, ground stone cache; C: camp site with large thermal features, sparse lithics	short-term habitation site with abundant features and darkly stained trash deposits with abundant lithic artifacts	short-term habitation with fewer features and light sparse trash
Habitation features	none	small (1.3-3.2 m) shallow (20-44 cm) pit structures with no to few formal features	deeper (52-84 cm) but small (1.7-1.9 m) pit structures with no formal features
Features	D: small and large thermal features outside project area; C: large thermal features and possible use-surface	small to large thermal and nonthermal pits	fewer, large to small pits, one small thermal pit
Ceramics	none	predominantly El Paso Brown wares, reliable production system with temper from southern Jornada Mogollon region	predominantly Jornada Brown wares with Chupadero and Mimbres Black-on-white and red wares; more of a durable technology with more temper from the Sierra Blanca highlands
Lithics	Material: D: more use of nonlocal material and least use of glassy and fine-grained material; C: second most use of glassy and fine-grained material. Biface type: large bifaces predominate. Activities represented: early-stage core reduction, use of large bifaces as cores, tool recycling, projectile shafts refurbished, general hunting tasks	Material: less use of exotic material most use of glassy and fine-grained material Biface type: small bifaces predominate. Activities represented: early-stage reduction, large and small biface manufacture, tool recycling, informal tool use, cutting, chopping, working wood, bone, or antler, refurbishing projectile shafts, processing carcasses, general hunting tasks, perforating hard or semihard materials	Material: similar to Early Ceramic period less use of glassy and fine-grained material. Biface type: small bifaces predominate. Activities represented: same as Early Ceramic period except lacks general cutting tasks.
Ground stone	D: basin metate and one-hand mano, two indeterminate fragments; C: one mano fragment	one-hand manos, metate fragments, grinding slabs	one-hand manos
Ornaments	D: freshwater mussel disc bead	travertine disc beads, marine shell bead; worked shell and evidence of manufacture of shell ornaments	a single piece of a freshwater mussel ornament; travertine disc bead in Structure 4
Fauna	D: fairly balanced use of small and large forms, least burned bone	more use of small forms including rodents, birds, turtles, and fish; the most processed bone, burned and highly fragmented	more balanced use of small and large forms; larger amounts of fresh water mussel, some use of turtles and fish, much artiodactyl in one structure, diverse small forms and mussel in the other least processed bone, less burned and highly fragmented bone more immature animals
Botanical remains	D: goosefoot and walnuts fuel wood: predominantly saltbush/greasewood with some mesquite C: fuel wood: piñon and undetermined conifer	annuals: diverse but mainly goosefoot, purslane, seepweed perennials: mesquite, prickly pear domestic: corn in 10% of the flotation samples fuel wood: diverse but mainly saltbush/greasewood, mesquite	annuals: diverse, goosefoot most consistently found (87% of samples) perennials: mesquite domestic: corn in 30% of the flotation samples and as macrobots fuel wood: saltbush/greasewood and mesquite
Human burials			dental caries and femur shape more consistent with agricultural population than hunters and gatherers

artesian wells have lowered the water table, so the area should have been at least as moist in the past and may have supported springs that are no longer viable. John Speth (quoted in Maxwell 1986:18) noted three distinct areas of dark gray to grayish-black in the Bison Cutbank (see Fig. 32). These appeared to be confined to the cutbank area, with stringers of small gravel indicating the margins of ponded water (1986:20). Small pockets of gravel in the intact fill of the backhoe trench just north of the Bison Area could be the result of similar ponding (see Fig. 45). Given these indications of more moisture in the past, the area should have supported enhanced plant growth, which, along with a reliable water source, would have attracted a variety of animals.

There is little congruence between the plants found in the creek bottom today and those in the flotation samples. It is possible that the cheno-ams, goosefoot, and purslane so common in archaeological contexts once grew on the site, either in the area around the cienega or on the terrace, where human disturbance provided an ideal environment. Other plants found in the flotation samples, especially mesquite and cactus, are present on the terrace rather than the creek sides and bottom. The absence of the most common plants in the flotation samples suggests that other plants were used as greens and left no parts behind, or prehistoric groups were attracted to the perennial plants such as mesquite or cactus that grew on the intermediate terrace close to water, or to the animals drawn to the variety of grasses and forbs, and to the water that encouraged repeated occupation of this location.

The commonly found food plants could have been brought to the site or could have been collected while foraging in the vicinity of the campsite. For the few modern hunting and gathering groups where this information has been recorded, the mean daily foraging radius for females is 6.6 km, and that for males is 9.9 km (Binford 2001:238). A radius of even 6.0 km would extend from Townsend into the Bitter Lake National Wildlife Refuge to the east, Macho Creek to the northwest, and more rugged terrain to the west. The Pecos River, 13.5 km away, could be reached in a long day or overnight trip.

As for animals, we would expect small mammals, especially cottontail rabbits, and deer to thrive in the area. If the distribution of bison were similar to that of the southern plains, bison would have been absent or rare from about 6000 to 2500 B.C. and from A.D. 500 to 1200 or 1300 (Dillehay 1974). More recent works place the beginning of the increase in bison populations at A.D. 1000 (Hofman et al. 1989:165). The presence of bison could have been a major attraction during the Late Archaic and the late Ceramic periods, but not during the early Ceramic period. This scenario fits well with the Townsend data. If we presume the Townsend West Bison Area is late, as suggested by its location in the latest or lower terrace, both it and the bison from Structure 4 fall within a period of bison availability, as would both the Pit and Area C. This also helps explain the apparent absence of bison in the early Ceramic period structures and features and could also help account for the placement of Areas B and C. The late Ceramic structures may have been set back from the creek to avoid alerting the bison to their presence. Area C is situated far from the creek, where animal movements to and around the spring could be observed. Other Late Archaic groups camped at the edge of what may have been a pond at Townsend West, suggesting that bison were becoming scarce, some other resource caused them to camp at this location, or they moved to this location after bison were killed. Early Ceramic structures were only slightly set back from the creek edge at Townsend East, as if animal movements were less important.

Site Structure

Regardless of the particular set of resources that attracted groups to the Townsend site, the archaeological remains suggest repeated stays by small groups. This in itself is consistent with an environment that has fairly low productivity, where resources occur in patches rather than uniformly across the landscape. In recent times, groups inhabiting desert scrub environments have group sizes that range from 7 to 21 persons when most dispersed, and up to 107 when most aggregated (Binford 2001:248-249, 252). Since none of the Townsend East structures appear to be contemporaneous, group size was probably small and consistent with a subsistence regime that included hunting and gathering in a desert scrub environment.

According to one study based in Batswana (Kent 1991:39-42), environmental, economic, and even political factors can play a role in determining the presence, durability, and arrangement of activity areas, structures, and features; however, anticipated mobility, or how long a group initially plans to stay in a location, has a major influence. Formal storage features may not occur when the anticipated stay is short, regardless of whether or not the group practices horticulture. Also of interest is that house size correlates better with anticipated mobility and season of occupation than the number of occupants, and the amount of effort invested in building structures depends on the anticipated mobility.

The concept of anticipated mobility can be used to put the Townsend data into perspective. Neither of the Late Archaic components has evidence of structures or extended occupations. Widely scattered thermal features and a possible activity surface, along with a thin and sparse distribution of artifacts, all suggest short-duration occupations in Area C. This is also seen in the limited range of activities represented in the lithic assemblages. Townsend West has a similar array of thermal features, which were found during the earlier excavations at this site. The scattered fire-cracked rock, the mano and metate cache, and the distribution of lithic and faunal debris display a lack of concern for trash disposal, again suggesting that Late Archaic groups anticipated fairly short stays in this location. Evidence of longer, more substantial occupations has been found in other parts of southeastern New Mexico. Between 23 and 41 hut-like structures dating to the Archaic about 3 m in diameter and 10 cm deep with unplastered circular floors, informal hearths, probable east entries, and superstructures of mud over a dome of brush and grass were found in the El Paso area (O'Laughlin 1980:145). Similar structures should be expected when Late Archaic groups anticipated a longer stay at a site.

Area A, the early Ceramic component, has five structures, three very shallow (20 to 22 cm), ranging from 1.3 to 3.2 m in diameter; and two deeper (40 and 45+ cm), 1.5 to 1.7 m in diameter. Two have step entries, and the two shallow structures have hearths, yet none of the structures or features are well finished or with indications that their builders anticipated a lengthy stay. All are different in size and form, and the radiocarbon dates suggest that none were contemporary. Extramural features cluster around the structures, but these often originate at levels different from those of the structure and other nearby features (see Tables 40 and 53). For example, all six of the features closest to Structure 7 are thermal features that originate above where the structure walls became visible, making it unlikely that any were used by the house occupants. Yet, especially in the cases of Structures 2, 3, and 5, the proximity does suggest that at least some of the features were used in conjunction with a structure. Like the features, the densest artifact concentrations and charcoal-stained soils were found in the areas around the structures. Lithic densities were as high as 86 per 10-cm level in a single grid in the area in and around Structures 2 and 5, up to 104 in and around Structure 3, and 59 in and around Structure 7. Abundant lithics, fire-cracked rock, and charcoal indicate considerable use of the area of Structures 2, 3, 5, and 7 from prolonged use or repeated stays. Since none of these structures have indications of refurbishing or remodeling, it is unlikely that structures were reused. The lack of depth and any substantial evidence of superstructures could suggest warm-weather use, especially for those without hearths. An apparent absence of deep features that could be used for storage also suggests short stays.

Late Ceramic structures are small (1.7 and 1.9 m in diameter) but relatively deep (52 and 82 cm). The greater depth, two surfaces in Structure 4, and the possible multiple surfaces or refurbishing in Structure 1 could indicate the builders anticipated greater or repeated use of these structures. Fewer features surround Structure 1, and none were found near Structure 4. Some of this may be because the fill near these structures did not contain the powdered charcoal and cultural debris so characteristic of Area A, so that features were not apparent and were missed. Clean fill and a smaller artifact density (a maximum of only 42 for a 12-cm level in Structure 4 and up to 80 in the first level of fill above Structure 1 but generally less than 10 in lower levels) indicate that the late Ceramic groups kept the area clean by placing trash and thermal features away from the structure, the duration of their stay was not sufficient to generate the same amount of ash and trash as in Area A, and/or the season of occupation did not require the same amount of fuel use for heat or cooking and processing food.

These differences in structure depth, associated features, and artifact densities can be interpreted in terms of varying degrees of anticipated mobility. Late Archaic groups may have planned to spend little time at this location and did not invest in the kinds of shelter and features that would be needed for an extended stay or that would leave an archaeological record. The early Ceramic groups anticipated staying long enough to construct shelters and could have built extramural features as needed. Repeated use of the areas immediately adjacent to the structures resulted in high artifact densities and much charcoal, but apparently no need to manage trash and hearth fill disposal. Scant evidence of more investment in the structures (depth, multiple floors, and refurbishing), and possibly managing the ash and trash generated, could indicate that late Ceramic groups had at least an intent to occupy the area for a longer period.

Artifacts

When examined by time period, ceramic, lithic, ground stone, and miscellaneous artifacts differ in ways that generally suggest variation in the time spent at the site and different degrees of mobility. Deposits left by Late Archaic groups lacked ceramics. Perishable baskets and hide containers would have provided durable cooking and storage containers well suited to the mobile strategy of this period and served the same function as ceramics did later in time. Greater proportions of nonlocal lithic material and materials other than chert suggest a more selective use of local materials and a larger annual range for Archaic groups than for Ceramic period groups. Late Archaic groups also used more large bifaces, a characteristic of more mobile groups (Moore, this volume).

Most of the activities represented in the lithic assemblage relate to core reduction, refurbishing projectile shafts, and general hunting tasks, a much narrower range than seen in the later components. A cached basin metate and mano, if these are indeed from the Late Archaic occupation, indicate some plant processing, as does the burned goosefoot and walnut shells. That these well-used grinding implements were left behind again suggests a high degree of mobility, and possibly the intent to return to this location on a regular basis. A single freshwater mussel shell disc bead is the only ornament found in the Archaic components, and it was in the first level of fill at the Pit. Because it was so high in the fill, it could be intrusive. No comparable beads were found in the later deposits, lending some credence to an Archaic association.

Early Ceramic period ceramics are mainly El Paso Brown wares characterized by a profusion of large temper fragments and soft pastes. Walls are thick and surfaces unpolished. Wares such as these, easily made and repaired, are used for a limited number of tasks (Wilson, this volume). They are well suited to groups maintaining a good degree of mobility because these vessels can be made as needed and would provide a means to store food or other materials on the move or while at a longer-term camp. Lithic materials used during this period are mostly local chert. A wide range of activities are represented, from core reduction to tool manufacture and informal tool use. Projectile points were manufactured, projectile shafts were refurbished, and projectile tips that would have been returned to the site in animal carcasses are well represented, indicating that hunters prepared for the hunt and returned to the site with their catch. Cutting, chopping, working, and perforating hard or semihard materials indicate that a range of additional activities took place (Moore, this volume). Little ground stone was left behind, or it was reused, as suggested by the large number of fire-shattered fragments (Murrell, this volume). While a small amount of corn is associated with this component, the general lack and the form and size of the manos indicate it was not a major food resource. Most of the ornaments, as well as evidence of working shell, were found in this component, further suggesting that early Ceramic period groups spent more time at the Townsend site and performed a greater variety of activities than during the previous period.

Late Ceramic period groups still made and used the more easily made and friable wares found in the earlier period; however, considerably more of the assemblage is composed of ceramics that were made to last longer. Jornada Brown wares have well-polished surfaces and small uniformly sized grains of temper, and black-on-white wares appear. More effort was put into making these wares, which may have required specialized manufacturing and firing technology. They were made to last longer, and they include specialized forms (Wilson, this volume). Late Ceramic period groups used less glassy and fine-grained lithic material than before. Otherwise, with the exception of an absence of evidence for general cutting tasks, the same range of activities is represented in the lithic assemblage as in the earlier period (Moore, this volume). While corn is more abundant, in at least one of the structures, manos are still the small one-hand variety used by groups with a relatively low reliance on corn (Murrell, this volume). Ground stone is limited to manos and mano fragments, and there is no evidence of ornament manufacture. This could indicate shorter time periods spent at the site, a more limited purpose for being at the site, or that the group composition differed.

Subsistence

This section examines some of the general principles that apply when groups successfully exploit the resources within their territory to the extent that increases in population and/or decreasing carrying capacity force changes in subsistence strategy. We would expect that Archaic hunter-gatherers lived in a less crowded or unpacked environment, while early Ceramic period groups retained a hunting and gathering subsistence strategy but were more constrained in their ability to move throughout the region by increasing population densities and/or were faced with declining resource availability during the relative warm and dry period between about A.D. 700 and 1000 (e.g., Dean 1996:38; Mauldin 1995:176). By the late Ceramic period, at least some groups depended on corn for a considerable proportion of their diet.

Groups inhabiting the Roswell area during the Late Archaic are generally believed to have practiced a serial foraging subsistence strategy, relying on a broad spectrum of plants and small animals, with some use of larger mammals, and moving to take advantage of highly seasonal foods that were available for short periods of time (Sebastian and Larralde 1989:41, 54-56). This view is consistent with the archaeological evidence that indicates Archaic groups exploited annual species such as amaranth, goosefoot, and pigweed (see Table 176), a pattern that is often found among those practicing a foraging strategy (Binford 2001:403). However, when fauna is well preserved, as at Townsend West, a fairly balanced use of small and large mammals is indicated, that is, balanced in comparison to Paleoindian and late prehistoric groups, who relied more on bison, and horticultural groups, who relied more on small mammals. The invariant presence of dart points used in hunting large mammals is another indication that large mammals were important. However, the substantial use of small animals signals a reduction in range size because larger animals require large home ranges. The main advantage of small animals is that, like annual plants, they have shorter life spans, and they reproduce and mature rapidly (Binford 2001:366-367). While adding smaller animals to the subsistence regime suggests some reduction in range, the retention of relatively large ranges is indicated by the use of nonlocal lithic materials and a preponderance of sites lacking evidence of substantial structures and storage facilities.

When faced with a reduction in effective range size and the inability to go elsewhere because those areas are already inhabited, the response is one of intensification or finding the means to extract more food from the same or an even smaller area. Some of the more common means of doing this include increasing the amount of labor directed at subsistence activities, shifting to species that occur in greater concentrations, increasing the use of resources that take more time to process, using traps, increasing the use of aquatic resources, and adopting domesticated plants or animals. Where intensification can occur, the preferred strategy is usually to increase the dependence on plants (Binford 2001:188-189, 210). As intensification increases, so should storage, along with an emphasis on fewer resources that are accessible in bulk (Binford 2001:370).

Ceramic period groups should have adopted one or more methods of intensification as the population grew and areas available for exploitation became increasingly limited, or a regionwide warm and dry interval (A.D. 700 to 1000) reduced the quantity and quality of resources available. When compared to Late Archaic groups, the Townsend early Ceramic period faunal and macrobotanical assemblages seem to indicate the initial response was expanding the range of plant and animal foods used. While some of this may be due to sampling, since many more early Ceramic period deposits were found and more samples were processed, there is a considerable increase in the number of plant species. Some corn was found, but its use was incidental compared to that of later groups. Fewer large animals along with a corresponding decrease in use of nonlocal lithic material suggest a reduction in range.

Progressing through time, the late Ceramic period occupants of the Townsend site may have substituted corn for at least some wild plants. Increasing reliance on corn was undoubtedly aided by cooler, moister climatic conditions between about A.D. 1000 and 1300 (Mauldin 1995:176). Again, sampling is a consideration because less than half as many flotation samples were collected and analyzed than for the previous period. Furthermore, the two structures from this period are quite different in both the faunal and floral components, indicating that subsistence practices varied considerably from group to group within a short time frame. Structure 1 held much of the corn found at the site as well as the common annuals, cactus, and mesquite beans. Fauna was equally diverse, with rodents, carnivores, fish, and considerable amounts of freshwater mussel. Structure 4, by contrast, had only goosefoot and corn and more artiodactyl bone than any other component or structure. Appropriately, the corn was found with a human burial placed in the middle fill of the structure, a young female from a fairly sedentary and probably agricultural population (Akins, this volume). The presence of relatively large amounts of artiodactyl in one structure and mussel shell in the other, along with the corn, suggest an even greater degree of intensification than found in the early Ceramic period. Furthermore, the burial of an individual who probably lived in a fairly sedentary agricultural community indicates that area groups practicing agriculture are responsible for at least some of these relatively short-term and probably logistic campsites.

We have little information on similarly dated sites, but the Dunlap-Salazar site to the west in the foothills of the Capitan Mountains is radiocarbon dated at around A.D. 980. Along the perennial Rio Bonito, walnut, box elder, and willow grow on the floodplain in an area with good agricultural potential. The site is a pithouse village where excavations have uncovered large numbers of storage pits and two large (6.3 m and 7.1 m diameter) shallow (20 cm) pit structures, an abundance of corn, and overlapping storage features and structures that seem to suggest a short-term periodic occupation of the site. While heavily dependent on agriculture, they were still mobile (Rocek 1990:2-3, n.d.: 9). Similar but smaller structures and storage pits were found at a site 50 km to the west and dating around A.D. 875 (Rocek n.d.:11). Agriculture and storage may well have been an option in upland areas receiving more moisture but not necessarily in valleys during a warmer and drier period.

The later sites of Fox Place, Rocky Arroyo, Henderson, and Bloom Mound along the perennial Rio Hondo west of Roswell exhibit a continuing effort to intensify that implies that the region filled rapidly. What we would consider a much more attractive environment, the Rio Hondo was described by early settlers as alive with fish, with plentiful antelope, rabbits, quail, and waterfowl in season, covered by grama grass, and with boxwood, hackberry, and walnut trees growing along the river (Shinkle 1966:16,112-118).

Recent excavations at the Fox Place (Wiseman 2002) uncovered a group of 10 small and relatively shallow pit structures, a rectangular ceremonial structure similar to those found in the Sierra Blanca region, two ground stone caches, and 27 extramural storage pits.

The site is located on the floodplain of the Rio Hondo immediately southwest of Roswell and was occupied between about A.D. 1250 and 1425, with most of the occupation falling between A.D. 1250 and 1300, followed by sporadic use. As at Townsend, the structures generally lacked prepared floors, only one had a central hearth, and no postholes were found. Corn was recovered in almost 90 percent of the flotation samples, including every extramural pit sampled, but there were very few economic perennials and economic grasses and a narrow range of weedy annuals (Toll 2002). The size of the manos recovered indicates a significantly greater reliance on corn at the Fox Place than at the Townsend site (Murrell, this volume). The fauna is extremely diverse because of the birds, fish, and turtles that lived in or migrated through the area. Cottontail rabbits comprise 9.6 percent of the total assemblage, jackrabbits 5.5 percent, deer 3.4 percent, pronghorn 4.2 percent, bison 0.9 percent, birds (including two turkey and an osprey burial) 5.2 percent, turtles 2.1 percent, and fish 5.9 percent. In addition, 576 pieces of mussel shell were not counted as part of the faunal assemblage. Much of the assemblage (56.1 percent of the 25,615 specimens) are fragments identified only to the size of the animal. The age distribution indicates that animals were taken from late spring until early fall, and possibly into winter (Akins 2002). Wiseman (2002) feels the soils in the vicinity would be good for agriculture only near streams where the water table was shallow and ultimately concludes that the site was occupied by hunter gatherers or, in his words, "essentially Plains (or edge-of-the-Plains) folks who appeared in some ways to be southwesterners because of certain cultural traits acquired from their Jornada Mogollon neighbors."

The Fox Place is an interesting combination. While the structures suggest it was occupied by groups who did not live there on a year-round basis, the ceremonial structure, which was built when the bulk of the site occupation occurred, shows an intent to integrate the population that came together at this location. The ubiquity of corn, without the other plants that are typically found in a community growing corn, further suggests that either the primary community was elsewhere and corn was brought to the site or a very narrow range of plants was gathered and processed while growing corn at the site. Both options indicate a high degree of subsistence intensification focusing on one highly storable plant resource, corn. The presence of an integrative ceremonial structure suggests that some resource was important enough to warrant a show of ownership and control over resources and provide an integrating mechanism (e.g., Binford 2001:370-371). The large amount of refuse at the site as well as the variety of activities indicated in the lithic, ground stone, and worked shell assemblages indicate prolonged or repeated occupations. If the land used to grow corn was not the resource, then it may have been the wildlife. Turning to aquatic resources is one means of intensifying and providing more resources in areas where mobility has become less of an option or where access to other resources, especially during the least productive phases of the annual cycle, is limited (Binford 2001:385, 446). Fish and mussels are less storable than corn, but they could have been taken in large quantities without major investments in technology. Flooding that causes water to flow over the banks and create pools also traps fish and turtles, which are easily taken by hand as the ponds shrink. Similarly, little or no technology is needed to exploit mussels (Binford 2001:368-369). Alternatively, groups may have come together to build and operate fish traps and to trap birds. All of the structures and most of the storage pits at the Fox Place contained fish. Mussel, turtle, and bird were in every provenience but are rarely a major contributor to the overall assemblage. When turtles, fish, or birds were found in a feature, that feature contained a number of related species rather than an abundance of one particular species (Akins 2002), perhaps suggesting they were a continuing part of the diet rather than resources taken in quantity for a short period of time. It could also represent an indiscriminate trapping strategy that resulted in taking an array of prey trapped by the receding water.

Much less is known about Rocky Arroyo, 12 km west of the Pecos river and 50 m from the Rio Hondo, because most excavation has been done by amateurs. The only known architecture is three deep rectangular pit structures dating about A.D. 1250 to 1325 (Emslie et al. 1992:83; Wiseman 1985:30-31). Little of the faunal material collected from this site was systematically collected, and only the bird (n=232) is reported quantitatively. In this probably biased sample, Gruiformes (cranes and coots) are by far the most common birds, followed by Anseriformes (swans, geese, and ducks). It is said to have a wide array of species, including abundant fish, bison, pronghorn, muskrat, rodents, rabbits, and turtles, as well as a variety of birds (Emslie et al. 1992:91, 95). What little is known about the fauna sounds a lot like the Fox Place.

The Henderson site, about 20 km southwest of Roswell and dating between about A.D. 1275 and 1350, is an adobe pueblo with about sixty rooms that was the residence of a semisedentary community who occupied the site from early spring until after the harvest, spending the colder months elsewhere. Over its relatively short use, the site occupants underwent a major shift in economic pursuits. The early occupation subsistence regime was a relatively even mix of farming and hunting and fishing while the later phase (beginning around

1300) deposits have an abundance of transported bison remains (Speth 1997:1-3). Fish comprise over 10 percent of the major taxa, compared to 17.5 percent bison, 9.4 percent pronghorn, 34.3 percent cottontail, and 15.8 percent jackrabbits for both phases combined (Speth 2000:91). Two-hand manos and massive trough metates were common (Rocek and Speth 1986:31). What these data seem to indicate is an initial strategy similar to that suggested for the Fox Place, one of maintaining mobility but with a greater agricultural commitment that was supplemented by the use of readily available species, including fish and mussels from the Rio Hondo. A large diversity of bird species was found with more Passeriformes, or small perching birds, than any other order. The second most common are Gruiformes (cranes and coots) (Emslie et al. 1992:95). Again, the use of fish is interesting and appears typical of sites in this area during the late Ceramic period.

Bloom Mound, in the same vicinity as Henderson and Rocky Arroyo, was excavated by the Roswell Archaeological Society beginning in 1934 and reported by Kelley (1984). It consists of a double tier of adobe surface rooms and a deep, square subterranean structure dating to the Lincoln phase, between A.D. 1200 and 1450. Corn and beans were found, along with a trough metate (Kelley 1984:455-489). The small faunal assemblage (n=104) contains cottontail, jackrabbit, large squirrel, deer, pronghorn, and bison (Driver 1985:45) but is difficult to evaluate given the small sample and unknown nature of the sample.

The Rio Hondo site data suggest that during the later portion of the late Ceramic period, regional populations increasingly turned to the use of domestic crops and aquatic resources and eventually to bison procurement to meet their subsistence needs. This sequence of events could have been an adaptive response to the return to a warm dry climatic regime and the downcutting of regional stream systems and falling water table, which undoubtedly interrupted floodplain agriculture (e.g., Dean 1996:37-38).

Mobility

While mobility has been addressed throughout this discussion, the scale and type of mobility represented at Townsend is considered in this section. In general, people who depend more on plant than animal resources practice a foraging strategy that moves people to resources. Hunters in some environments practice a collecting strategy, acquiring a resource and transporting it back to the residence, but in warmer settings hunters tend to be organized more like foragers and move people to resources. Historic and modern mobile hunter-gatherers depending mainly on plants live in groups of 9 to 18 people at their most dispersed, move between 3 and 22 times a year, and move 12 to 39 km per move (Binford 2001:254, 276, 278). The decision to move is based on the expected return from the current versus the next camp and is weighed in terms of local resource abundance within a region while considering the cost and risk of moving (Kelly 1992:53-54).

Assuming that all three components of the Townsend site were occupied by groups who depended more on plants than animals and thus practiced a foraging strategy, the above figures provide for a considerable range in mobility. A group moving the minimum distance the minimum number of times would move about 36 km annually, while one that moves the maximum distance the maximum number of times would travel in the order of 858 km. Exotic lithic materials, one measure of distance traveled (or of scavenging in later groups), are found in all components at Townsend but in different proportions. All of the exotic or nonlocal materials found—Alibates chert, Tecovas chert, Jemez obsidian, Polvadera Peak obsidian, and Edwards Plateau chert—occur within a 400 km radius of Roswell. Both Archaic components at Townsend have more of these materials (3.6 and 5.5 percent) than the early Ceramic (0.6 percent) and late Ceramic (0.7 percent) components (Moore, this volume), indicating they were the most mobile of the groups occupying this site. A distance of about 80 km from the Pecos River to Capitan Peak is well within the annual range of all but the least mobile foragers. Groups practicing agriculture, either along the Pecos River (13 km) to the east, along Macho Creek (6 km) to the north, the Rio Hondo (32 km) to the south, or the Sierra Blancas to the west (about 60 km) could have easily included Salt Creek in their range for logistic forays.

Were the Townsend Residents Southwestern or Plains Groups? Or, They All Lived in Huts and Ate Mice

While I consider the occupants of the Townsend site to be mobile groups practicing a foraging strategy while exploiting a desert scrub environment, others have tried to force the area sites into a mold of either Southwest or Trans-Pecos Plains groups (e.g., Wiseman 2002, in prep. a). Wiseman characterizes the inhabitants of Jornada-Mogollon sites as

> "farmers who lived in pithouse or pueblo architecture and made large quantities of pottery. Farming, though greatly supplemented by wild products, provided important nutrients in the form of corn and, at least in some areas in some time periods, beans and

squash. In southeastern New Mexico, unquestionable Jornada sites are most often in mesic environments such as the Sierra Blanca/Capitan/Jicarilla/Gallina highland or in the well-watered oasis of the premodern Roswell locale" (Wiseman in prep. a).

The occupants of Trans-Pecos sites are characterized as

> "full-time hunters and gatherers of wild plants and animals. Clear evidence of farming or pottery making has not been found. . . . Durable structures other than occasional stone enclosures were not used by the Trans-Pecos until late in prehistoric and early historic times and only in restricted areas along the Pecos River and the Rio Grande. More portable or easily constructed shelters such as brush wickiups were used by these more transient people. Their environment was primarily the Chihuahuan Desert, a series of xeric vegetation communities and landforms" (Wiseman in prep. a).

Wiseman's portrayal of the Jornada Mogollon contrasts with that of other researchers, who believe that these groups maintained the broad-spectrum pattern of resource use characteristic of mobile hunters and gatherers, especially early on (e.g., Carmichael 1990:126; Hard 1983:41-51; Hill and Staley 1999:161; Moore 1996:96; Phippen 2000:478; Whalen 1994a:4, 1994b:627). Mauldin et al. (1998:16-17) describe the Mesilla phase, between A.D. 250 and 1100, as characterized by shallow, basin-shaped pithouses along with a few true pithouses. Subsistence was primarily hunting and gathering supplemented by agriculture. After A.D. 1100, population increases are indicated by larger sites, greater artifact densities, and clusters of settlements. Pueblos are found, and subsistence depended primarily on agriculture, but secondary residences were maintained in areas where hunting and gathering took place on a seasonal basis.

By ignoring the early end of the Jornada spectrum, as well as the later secondary residences, Wiseman seeks to create a dichotomy that equates the Jornada Mogollon with sedentary groups depending largely on agriculture and living in more mesic environments and Plains groups with a hunting and gathering economy based on exploiting more desertic settings. He applies these generalizations (Wiseman 2002) to conclude that the Fox Place, as well as our current findings at Townsend East, were the temporary residences of "Plains folks" who have acquired some cultural traits from their Jornada Mogollon neighbors. Dismissing an abundance of southwestern pottery and use of local lithic material along with little or no Plains ceramics and lithic material, he bases this conclusion on the presence of small shallow pit structures and a diversity of faunal remains.

Acknowledging that small shallow structures often are the domiciles of hunting and gathering groups, Wiseman (2002) catalogs the increasing number of similar structures that are beginning to be recognized in Texas and Oklahoma while ignoring similar Jornada-Mogollon and Anasazi structures. Because they are the domiciles of hunting and gathering groups, small, shallow structures have a long history in the Southwest, and not just in southeastern New Mexico. They are found at Late Archaic and Early Formative sites everywhere from southeastern Utah (Janetski 1993:236) to southwestern Colorado (Kane et al. 1988:185) to Chaco Canyon (McKenna and Truell 1986:28) to recent OAS excavations at Peña Blanca, just south of Santa Fe, to name just a few. In the El Paso area, O'Laughlin (1980:135-149) documents a series of Late Archaic houses described as shallow (10 to 20 cm), circular with diameters between 2.2 and 2.8 m (3.8 to 6.2 square meters), with unprepared floors, some with shallow hearths or hearth areas comprised of dark soil overlying the floor, and occasional evidence of entryways or slightly depressed areas on the east side. Even smaller structures (mean diameter 2.2 m) also dating to the Late Archaic have been found on the mesa west of the Rio Grande. This house form continues into the Mesilla phase, or early Ceramic period, with the same small and larger structure dichotomy. Houses at Turquoise Ridge in the Hueco Bolson are of the larger variety, measuring about 30 cm deep with a mean floor area of 11.8 square meters, and have more and a greater variety of floor features than earlier sites, along with evidence of structure maintenance and exterior storage. Late in the Mesilla phase (A.D. 750 to 1000) a larger structure (30 square meters and 75 cm deep) lacking indications of domestic use was built at Turquoise Ridge. Other communal structures with similar dates are found in the Rio Grande Valley (Whalen 1994b:628-632).

Small structures from the Late Mesilla phase Huesito site have floor areas around 5 square meters, hearths that are shallow and simple, and other than irregular depressions and a few postholes, no other features. Activity areas outside the structures had features that include fire pits, ovens, and shallow amorphous pits, none that could be interpreted as storage facilities. Whalen interprets the presence of small, simple and larger, more complex house sites in the same settlement system as a matter of occupational duration. Sites with small houses have more limited or specialized functions than sites with larger houses (Whalen 1994b:628-632).

Both the Townsend and Fox Place structures and site layouts are virtually identical to Mesilla-phase sites. Yet Wiseman insists that if the groups inhabiting the Fox

Place had more permanent residences elsewhere, and they anticipated returning to the site consistently enough to build a socioreligious structure, they should also have made normal-sized habitation structures at the Fox Place. Following this line of reasoning, he concludes that the Fox Place structures could not represent anticipated short-term habitations for Jornada Mogollon people; instead, they must represent the standard houses of hunter-gatherers, that is, "Plains folks," and since the socioreligious structure is similar to those found in Jornada Mogollon villages, it must represent an attempt at proselytizing by Jornada Mogollons (Wiseman 2002). However, as Whalen (1994b:634) points out for the Mesilla-phase ceremonial structures, the need for integration and decision-making arises once a group meets or exceeds six decision makers, probably the equivalent of households. And, as stated earlier, there could easily be a resource that was important enough to warrant a show of ownership and control and merited building a socioreligious structure. Furthermore, the presence of numerous structures and the amount of trash found at the Fox Place indicate that multiple households repeatedly occupied this location. The need for a decision-making structure as well as a show of ownership and control is a more reasonable explanation than proselytizing to explain the presence of this structure and is entirely consistent with the kind of socioreligious structure we would expect from Jornada Mogollon builders. Furthermore, there is no reason to expect that seasonal or occasional residences will look exactly like a more permanent residence; yet socioreligious structures are far more likely to have a standard construction and array of features.

The second line of reasoning involves subsistence. Rather than viewing the diversity of fauna found at the Fox Place (69 species, including 25 bird, 12 herps, and 11 fish) as part of a broad-spectrum strategy of resource use in a riverine environment and a function of a large sample size (25,615 specimens), it is labeled a Plains strategy. Admitting that Southwest faunal assemblages can be just as diverse, Wiseman's proposition becomes that Plains Villagers, and thus Fox Place residents, consumed a wide variety of smaller animals in larger numbers than they did large ones (Wiseman 2002), end of discussion. Indeed, some southwestern groups, such as those occupying a series of Rio Grande Developmental (A.D. 600 to 900) sites had a diverse faunal assemblage (45 species in a sample of just over 7,000 specimens), and some lived in small, shallow structures. Few would argue that these were occupied by Plains groups, and few would deny that they ate a variety of small animals, including rodents.

In essence, Wiseman equates settlement type and subsistence strategy—that is, the type of site left by mobile hunters and gatherers who practice a broad-spectrum pattern of resource use—with ethnicity. Questions concerning how prehistoric groups adapted in the face of increasing population densities and changes in environment are far more interesting and contribute more to our understanding of human development than seeking to place ethnic labels on groups inhabiting the Southwest.

Conclusions

Our excavations at the Townsend site document changes in the prehistoric use of one particular area over a millennium. Viewed from the perspective of groups adapting to demographic and environmental changes in a desert scrub environment, the archaeological record reflects the responses of these groups as they extracted more and more resources from an increasingly smaller area.

Late Archaic groups may have camped at the south edge of the site to watch for deer or bison, then moved to just north of the creek to take and process animals. They could also have camped along the creek when exploiting a range of plants and small animals. These groups brought some plant foods (as indicated by walnut shells) and collected others (goosefoot) from the immediate vicinity or on daily forging trips. Hunters geared up and took or returned some large game to the campsite but probably dined more often on a variety of plants and small mammals taken in the vicinity of camp. Stays at the site were undoubtedly short, because no substantial evidence of structures was found. Fire pits and ovens were built as needed and ground stone implements cached for use on later visits. Lithic materials obtained from distant locations suggest these early groups were more mobile than those who followed.

Early Ceramic period groups remained mobile but stayed longer at the Townsend site than the Archaic groups. With increasing numbers of people in the region, and warm and dry weather conditions, groups provided for their subsistence needs by more fully using the resources within increasingly smaller areas. They built small houses, probably more like huts with brush superstructures and constructed hearths, fire pits, and other features as needed. Hunters geared up by making projectile points and refurbishing shafts; large animals were hunted and returned to the site. A large array of both annual and perennial plants and small animals were collected and processed. Small amounts of corn, walnuts, and other plants were brought to the site, but foraging in the area around the site probably provided the bulk of their diet. They stayed at the Townsend site long enough to make, use, and discard a wide range of household tools, and to manufacture mussel shell ornaments, moving to another camp once resources became depleted.

Like the preceding groups, late Ceramic period groups residing at the Townsend site built small impermanent houses. These were deeper and have some evidence of remodeling, suggesting they intended to stay longer and may have returned and used the same structures, but neither of the excavated structures had hearths or the kinds of interior features expected in more permanent residences. Fewer extramural fire pits and other features were built, and the area seemed to be better maintained, with ash and trash deposited away from the structures, again a sign they may have intended to stay longer at this site. Almost the same range of activities is indicated by the artifact assemblage and a similar broad range of subsistence items as before, at least in one of the two structures. Cooler, moister climate may have encouraged more diverse and dense plant growth and allowed late Ceramic groups to stay longer at any one location and to grow corn. Whether the groups represented at Townsend during this period were an extension of the earlier hunting and gathering pattern of moving from site to site but within a smaller range and growing small amounts of corn, or task groups from more sedentary agricultural communities, remains unanswered. The best, but far from definitive, evidence for the latter comes from the human burial. This young female has both the dental problems and indications of physical activities generally associated with sedentary agricultural communities. However, we also expect task groups to focus on specific resources, so they would not have left the diversity of artifact and subsistence remains found in Structure 1. The less diverse artifact assemblage from Structure 4, and the placement of the burial in its fill, could suggest that parts of the site were used as a logistic camp. Perhaps what is represented at the Townsend site is a diversity of adaptations: one where mobility was severely reduced but agriculture still incidental; and another where agriculture was primary, with logistic forays providing additional resources.

CHAPTER 22

SUMMARY OF RECOMMENDATIONS

No additional work is recommended for the areas within the proposed rights-of-way at any of the seven sites excavated as part of this project. Of these sites, only the Townsend site (LA 34150) definitely has the potential to yield additional important information on the prehistory of the region. Large parts of the site, particularly south of Salt Creek and east of the project area, and north of Salt Creek west of the project area, remain largely intact and could have additional structures, features, and significant artifact deposits. Sites such as this one, dating to the Late Archaic, early Ceramic, and early part of the late Ceramic periods, are extremely rare, so any information gained substantially adds to our knowledge of the prehistory of this area.

Two of the project sites could yield additional important information on the prehistory of the region. LA 117255, east of U.S. 285, had two large thermal features dating to the Late Archaic. These lay close to the surface but would probably not have been detected if a shallowly bladed road had not exposed the ash-stained fill. Few artifacts were visible outside of the bladed area, so there remains a slight possibility that additional and less disturbed deposits exist east of the project area. The excavated portion of LA 117248 suggested only a shallow deposit of initial core reduction lithic debris; however, a hearth exposed in an arroyo east of the project area leaves open the possibility that more substantial deposits remain in that area.

There is also a slight possibility that LA 51095, another artifact scatter, composed largely of initial core reduction lithic artifacts, could provide additional information on the prehistory of the area. The site is centered on U.S. 285, so a substantial portion has been removed. This is the second excavation project at this site, and neither encountered buried deposits or features. However, the site is immense, and parts outside of the right-of-way could contain other kinds of deposits that would add to our knowledge of the prehistory of the area.

The potential to add to our knowledge of the prehistory of the area has been exhausted at the other three sites. LA 117257, composed of two deflated thermal features and a light scatter of lithic artifacts, has been completely excavated. LA 117246 was a very light artifact scatter in a highly disturbed area and extends very little beyond the project area. Unless there are buried and so far undetected deposits beyond the right-of-way fence, there is no possibility that this site could provide additional information. LA 117250 is another low-density scatter that extends a short distance beyond the project area. No subsurface material was found, and while two ceramics remain beyond the fence, these are unlikely to provide any new information on the prehistory of the area.

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