ARCHAEOLOGICAL DATA RECOVERY AT LA 184618, FOR A BRIDGE REPLACEMENT ALONG NM 104, SAN MIGUEL COUNTY, NEW MEXICO

Prepared for
NEW MEXICO DEPARTMENT OF TRANSPORTATION
P.O. Box 1149
1120 Cerrillos Road
Santa Fe, New Mexico 87504-1149

Edited and Prepared by
Jim A. Railey, Ph.D.

With contributions by
Christopher A. Carlson and Kimberly A. Parker

SWCA ENVIRONMENTAL CONSULTANTS
5647 Jefferson Street NE
Albuquerque, New Mexico 87109
Telephone: (505) 254-1115; Facsimile: (505) 254-1116
www.swca.com

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CHAPTER 1
INTRODUCTION AND PROJECT DESCRIPTION

Jim A. Railey

This document provides a report on archaeological data recovery at site LA 184618. The New Mexico Department of Transportation (NMDOT) is preparing to replace Bridge 3961 on New Mexico Highway 104 (NM 104) in San Miguel County, New Mexico (Figure 1.1). Part of the site lies within a Temporary Construction Permit (TCP), part of the proposed project area that extends between milepost (MP) 62.9 and MP 65.35. The data recovery investigations were limited to the portion of the site within the TCP, hereafter referred to as the work area.

The NMDOT retained SWCA Environmental Consultants (SWCA) to prepare a data recovery plan (Railey 2016), conduct the fieldwork proposed in that plan, and complete an interim report describing the results of the fieldwork and providing recommendations. This work has been carried out to fulfill the requirements for this bridge replacement project under Section 106 of the National Historic Preservation Act. Federal funds will be used for the project, and because the proposed investigations are part of an NMDOT undertaking, this plan has been prepared pursuant to New Mexico Administrative Code 4.10.16 following the terms of a general permit. To conduct this project, SWCA requested a general permit from the New Mexico Historic Preservation Division’s (HPD’s) Cultural Properties Review Committee (CPRC), which was granted (CPRC Permit SE-356).

Parsons Brinckerhoff, Inc., recently completed a cultural resources survey of the project area between February 26 and March 18, 2016 (Lawrence and Del Frate 2016). LA 184618 was discovered and recorded during this survey, and was recommended eligible to the National Register of Historic Places (NRHP) under Criterion D. The site location can be found on the Bookout Ranch (1972) 35104-C3 U.S. Geological Survey (USGS) 7.5-minute quadrangle map.

SWCA began the data recovery fieldwork on July 22, 2016, and finished 5 days later on July 27. The fieldwork was directed by Kent Mead, with the crew made up of Umair Khan, Calvin Lehman, Andrew Larsen, Adrian Martinez, and Megan Weldy. Dr. Jim Railey, SWCA Project Manager and Principal Investigator, was present at the site on the final 2 days of the fieldwork (July 26 and 27).

James Hirsch is the Project Manager for the NMDOT (P.O. Box 1149, 1120 Cerrillos Road, Santa Fe, New Mexico 87504-1149; telephone: [505] 827-1591; james.hirsch@state.nm.us), and Gary Funkhouser of the NMDOT provided technical oversight (telephone: [505] 827-5692; gary.funkhouser@state.nm.us). The project was conducted out of SWCA’s Albuquerque office (5647 Jefferson Street NE, Albuquerque, New Mexico 87109; telephone [505] 254-1115, facsimile [505] 254-1116), with Jim A. Railey (jrailey@swca.com) as Principal Investigator and Project Manager. Matthew Bandy (mbandy@swca.com) manages the on-call contract under which this task falls. Danielle Desruisseaux and Justin Elza were the Technical Editors, and Alayne Hamilton formatted and Jackie Cronin produced the document.
The public disclosure of the location of archaeological sites on state and private lands is prohibited by § 18-11.1 NMSA 1978. The public disclosure of the location of archaeological sites on federal lands is prohibited by 36 CFR 296.18.

(4 NMAC 10.15.2.J.[1])
This document is divided into eight chapters. Following this introduction, Chapter 2 and Chapter 3 present the environmental and cultural-historical settings, respectively. The research design is presented in Chapter 4. Chapter 5 describes site LA 184618, the previous investigation conducted here, and the data recovery field methods, observations, and results. Analysis of the lithic artifacts collected from the site is presented in Chapter 6, and analysis of the historical artifacts collected from the site is presented in Chapter 7. A summary of the project findings, along with management recommendations, are provided in Chapter 8.

Details on the location of LA 184618 are provided in Appendix A. Locational information is confidential and for official use only—public disclosure of archaeological site locations is prohibited by 16 United States Code (USC) 470hh and 36 Code of Federal Regulations (CFR) 296.18.
CHAPTER 2
ENVIRONMENTAL SETTING

Jim A. Railey

LA 184618 lies near the western edge of the Great Plains physiographic province (Fenneman 1917). The Triassic-age, upper Chinle group comprises the local bedrock geology, and there is a diversity of other geologic units within 10-20 kilometers (km) of the site (Figure 2.1; see Table 2.1 for unit descriptions). These are all flat-lying, mixed clastic sedimentary rocks including thick sandstone deposits, and the local area has been eroded into numerous mesas and stream valleys. The site lies in the upper portion of the Canadian River drainage, along Cuervo Creek, which just a few kilometers north of the site flows into Conchas Lake—a reservoir formed by a dam along the Canadian River. Site elevation is 1,314 meters (m; 4,310 feet) above mean sea level.

LA 184618 lies within a mapped unit of Latom-Newkirk-Rock outcrop association, rolling (Natural Resources Conservation Service 2016). The Latom and Newkirk soils are derived from eroded red shale and sandstone. These soils tend to be thin, typically ranging 10 to 20 centimeters (cm) in depth, and are underlain by decomposing bedrock. They are well drained and have poor agricultural potential. The site itself appears to sit atop a small remnant of Pleistocene alluvium (see Chapter 5).

The area’s climate is semiarid, with a mean annual temperature of 16 degrees Celsius (61 degrees Fahrenheit). Annual average precipitation is 368.3 millimeters (mm; 14.5 inches), with most falling as rain during the summer monsoon season (U.S. Department of Agriculture 1981). A Plains and Great Basin grassland characterizes the natural vegetation, with grasses, mesquite, cholla, yucca, prickly pear, and sage, along with scattered junipers on upland surfaces (Griffith et al. 2006). Some cottonwoods occur along and near drainages, along with the invasive saltcedar. This environment provides habitat for a variety of animals, including pronghorn, deer, and rabbits. Bison were present at various times in the past.
Figure 2.1. Geologic map of the LA 184618 vicinity (Source: Scholle [2003]).

Table 2.1. Geologic Units of the LA 184618 Vicinity

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Age</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qa</td>
<td>Quaternary</td>
<td>Quaternary alluvium</td>
<td>Unconsolidated alluvium</td>
</tr>
<tr>
<td>To</td>
<td>Tertiary</td>
<td>Ogallala Formation</td>
<td>Alluvium (including gravels) and eolian, with thick calcrete horizon</td>
</tr>
<tr>
<td>Kdg</td>
<td>Cretaceous</td>
<td>Dakota Group</td>
<td>Medium-grained, mixed clastic sedimentary rocks, primarily sandstone</td>
</tr>
<tr>
<td>Jm</td>
<td>Jurassic</td>
<td>Morrison Formation</td>
<td>Fine-grained, mixed clastic sedimentary rocks, includes limestone</td>
</tr>
<tr>
<td>Jsr</td>
<td>Jurassic</td>
<td>San Rafael Group</td>
<td>Fine-grained, mixed clastic sedimentary rocks, includes evaporites and limestone</td>
</tr>
<tr>
<td>Je</td>
<td>Jurassic</td>
<td>Entrada Sandstone</td>
<td>Sandstone</td>
</tr>
<tr>
<td>Rcu</td>
<td>Triassic</td>
<td>Upper Chinle Group</td>
<td>Medium-grained, mixed clastic sedimentary rocks</td>
</tr>
<tr>
<td>Rs</td>
<td>Triassic</td>
<td>Santa Rosa Formation</td>
<td>Primarily sandstone, followed by mudstone and conglomerate</td>
</tr>
</tbody>
</table>
CHAPTER 3
CULTURAL HISTORY

Jim A. Railey and Kimberly A. Parker

Northeastern New Mexico has a rich trove of archaeological resources and occupies an important interface between the Great Plains and Southwest geographic and cultural areas. Owing to the comparative dearth of public land, however, there have been fewer archaeological investigations here than in most other parts of the state. Some important archaeological work has occurred here, such as the important discoveries and ongoing research at the Folsom site near the Colorado state line (Cook 1927; Figgins 1927; Hay and Cook 1930; Meltzer et al. 2002; Roberts 1938; Wormington 1957); excavations at the San Jon site, located south of the Canadian River on the northern edge of the Llano Estacado in Quay County (Hill et al. 1995; Hofman 1989; Roberts 1942; Sellards 1952; Wormington 1957); and investigations for the Ute Lake Dam and Reservoir in the early 1960s (Hammack 1965). Still, to some extent prehistoric developments in northeastern New Mexico must be inferred from better-known sequences in surrounding regions. These sequences begin with the earliest known hunter-gatherers who lived in small-scale, loosely organized, and highly mobile groups whose economy focused, at least in part, on large game including some now-extinct megafauna. Following the end of the Pleistocene, their descendants evolved specific adaptations designed to cope with the area’s increasingly arid environment. This generalized Archaic lifeway persisted for several millennia, but important changes occurred over this time span as well. One of these changes involved the integration of maize-based horticulture into the otherwise foraging subsistence economy across much of the American Southwest. However, it remains unclear exactly when and how maize-based farming began in the southern Great Plains. Although discoveries in both northeastern and southeastern New Mexico suggests that farming began on the eastern mountain slopes in late pre-ceramic times (e.g., Campbell and Railey 2008; Kirkpatrick and Ford 1977), out on the Plains there is little or no evidence for farming prior to ca. A.D. 1000, with most groups continuing a mobile, hunter-gatherer lifeway (cf. Kalasz et al. 1999a, 1999b; Railey 2013; Railey et al. 2011).

During the early second millennium B.C., however, nucleated villages and other intensively occupied residential sites, including houses that were more substantially constructed than those from previous periods, appear in many areas of the Southern Plains. The economy of at least most of these Southern Plains villagers was based on a mix of maize-based farming and bison hunting, and after A.D. 1300 they were engaged in a region-wide interaction sphere involving trade with the pueblo societies to the west. But these Southern Plains villages were largely abandoned by A.D. 1450, if not earlier, as the region’s native inhabitants shifted to a more mobile, tipi-dwelling lifeway focused more squarely on bison hunting. This shift may coincide with the arrival of Athapaskan-speaking ancestors of the Apache. The next major cultural-historical punctuation occurred with the arrival of the Spanish in the American Southwest. The impact of these new arrivals in the region was distant and indirect at first, but Spanish and other Euro-Americans settlers eventually entered the region in several waves and settled and developed the area according to new social and economic principles and a rapidly evolving technology. The end result was the extermination and eviction of native peoples from northeastern New Mexico and the development of a Euro-American culture.
This cultural history is discussed here in terms of standard chronological units developed over the years. Although there is some disagreement and variance in the terminology employed by archaeologists working in the region, the framework employed throughout this report is widely recognized. This framework is based on a high-order division of cultural traditions, which are characterized by distinctive material, economic, and sociopolitical features, which themselves undergo variable rates of evolutionary change over the time span of a given tradition. The sequence of cultural traditions for the Four Corners region used here is as follows: 1) Paleoindian, 2) Archaic, 3) Ancestral Pueblo, 4) Protohistoric Athapaskan, and 5) Historic Native and Euro-American. Evolutionary and historical changes within these traditions are described in terms of sequential time periods or phases, which subdivide each tradition and are identified and described over the course of this chapter.

**PALEOINDIAN TRADITION**

The earliest, well-established presence of humans in northeastern New Mexico dates from the Paleoindian tradition (ca. 11,500–7000 B.C.). This period spans the climatic transition from the Pleistocene to the Holocene. Climatic conditions were generally cooler and moister but also were changing rapidly as the vast ice sheets of the north (and alpine glaciers, including ones in the higher mountains of New Mexico and Colorado) retreated and the climate approached the warmer and more arid conditions of the Holocene. In the Great Plains and the Southwest, the distinctive Paleoindian projectile points have been recovered in association with the remains of large Pleistocene mammals, such as mammoth, camel, and several bison species, and these discoveries have contributed to an image of Paleoindians as specialized big game hunters. But a growing number of researchers are questioning the conventional image characterization. Some suggest that big-game hunting and the production of exquisite projectile points—typically made from exotic materials obtained from distant sources—may have been motivated more by status-hungry males rather than by daily subsistence needs (Speth et al. 2013). If so, then Paleoindians pursued more diverse subsistence strategies that included foraging for wild plant foods (although perhaps more on an opportunistic than an intensive basis) and hunting small game.

Low population densities prevailed among these early inhabitants of the Americas, who apparently were organized as small-scale, residentially mobile, and socially fluid groups. These conditions, along with wide-ranging exchange and interaction networks maintained by Paleoindians, worked to homogenize projectile point styles and other cultural marker traits over vast areas (although some regional differentiation in style zones becomes apparent over the course of Paleoindian times). Moreover, high mobility and very low population densities mean that Paleoindian sites are generally rare and have low archaeological visibility. Still, eastern New Mexico is rich in Paleoindian archaeological remains (Cordell 1984:122, 124; Gunnerson 1987:8–16; Sebastian and Larralde 1989:19–38), and the Paleoindian tradition here is customarily divided into three periods: Clovis (11,500–10,800 B.C.), Folsom (10,800–9800 B.C.), and Late Paleoindian (9800–7000 B.C.).
**Clovis Period (11,500–10,800 B.C.)**

The Clovis period corresponds to the later part of the Bølling-Allerød oscillation (12,600–10,900 B.C.) and the early part of the Younger Dryas (10,900–9700 B.C.) of the late Pleistocene. Bølling-Allerød was a period of warming and drying following full-glacial conditions, although it was still cooler and wetter than today. The Younger Dryas brought a return of cold and wet conditions. Some researchers have equated the Clovis period to the Younger Dryas and/or characterized this climatic interval as cool and dry (e.g., Cordell 1997:89; Haynes 2008; Holliday and Meltzer 2010; Polyak et al. 2004). But radiocarbon dates indicate that most of the Clovis period occurs in the late Bølling-Allerød. Under the comparatively dry conditions at the time, Clovis people in the region may have concentrated their camps near reliable water sources, and there is evidence that some groups at Blackwater Draw even dug water wells (Haynes et al. 1999). Clovis people hunted mammoths and other Pleistocene megafauna, along with smaller animals (Cannon and Meltzer 2008; Cordell and McBrinn 2012:110). Tool assemblages include not only the distinctive Clovis fluted point, but also large flake blades, biface and blade cores, knives, scrapers, core choppers, and burins (see Collins 2007).

**Folsom Period (10,800–9800 B.C.)**

The Folsom period spans most of the Younger Dryas (10,900–9700 B.C.), when cold/wet conditions prevailed. The mobile hunter-farager lifeway continued. Mammoths were extinct by this time, and the focus of big game hunting shifted to *Bison antiquus*, a larger ancestor of the present-day bison (MacDonald 1981; Meltzer 2009; Surovell 2009). Smaller animals were also hunted by Folsom and later Paleoindian groups as well (Amick 1996; Bamforth 2002; Cannon and Meltzer 2004). Tool kits were somewhat more diverse than those of the Clovis period and include the diagnostic Folsom fluted points and their unfluted counterparts (called Midland points), along with knives, gravers, spokeshaves, pointed scrapers, cores (bifacial, discoidal, and informal), drills, burins, choppers, abrading stones, awls, and needles (Frison and Bradley 1980; Huckell and Judge 2006; Meltzer 2006).

**Late Paleoindian Period (9800–7000 B.C.)**

The Late Paleoindian period begins toward the end of the Younger Dryas and spans more than half of the Early Holocene (9700–5000 B.C.). The climate become warmer and drier over the course of this time span. The fluted points of the Clovis and Folsom periods were replaced by various unfluted lanceolate styles, classified as Plainview, Firstview, and Cody (Cordell and McBrinn 2012:106–107). Otherwise, tool assemblages were, overall, similar to those of the previous periods. People continued to rely on hunting and foraging for their subsistence (Cannon and Meltzer 2004). Bison continued to be the main big game prey, although *Bison antiquus* was extinct by this time, with smaller bison similar to the present-day species having taken their place (MacDonald 1981). The San Jon site has yielded the best evidence of Late Paleoindian activity in northeastern New Mexico, including a bone bed with an associated square-stemmed, lanceolate point (Hill et al. 1995; Hofman 1989; Roberts 1942; Sellards 1952; Wormington 1957).
**Archaic Tradition**

The beginning of the Holocene epoch, around 10,000 years ago, corresponds to the termination of major glacial activity, a shift to drier and warmer climates, and the extinction of the Pleistocene megafauna. Following these changes, prehistoric peoples of the Southwest developed new lifeways and material items during the time referred to by archaeologists as the Archaic tradition. Spanning roughly 6,000 years, the Archaic tradition highlights several salient trends. One is population growth, evidenced by the much larger numbers of sites relative to those of the Paleoindian tradition and increasing numbers of sites for successive Archaic periods and phases. Another trend involves a progressive decrease in residential mobility, indicated by the preserved remains of structures and other facilities (including storage pits) that suggest a more substantial and long-term commitment to at least certain settlements and localities. Social development over the course of the Archaic tradition probably led to increasingly larger sociopolitical groups that inhabited progressively smaller, more sharply defined territories, with one archaeological outcome being an increasing regionalization of artifact styles over time. Archaic peoples intensively utilized a wide variety of plants and animals, and developed new strategies to feed larger numbers of people crowded into ever-smaller territories. Such strategies included both subsistence intensification and complex exchange and interaction networks. Increasing population densities (especially by Late Archaic times) and the consequent shrinkage of group territories probably also led to increasing competition and conflict, which probably helped further motivate intensified subsistence production.

Archaeologically, the intensification of subsistence practices is best reflected in the appearance, and gradually increasing abundance, of ground stone implements over the course of the Archaic and the eventual appearance and spread of domesticated maize. Ground stone milling tools appeared long before the advent of maize cultivation, which took place during the Late Archaic. Hunting also provided a significant part of the subsistence economy throughout the Archaic sequence, since food-producing domesticated animals were absent. Contrary to prevailing notions, people may not have exploited a broader range of resources during this time than their Paleoindian predecessors, although they clearly exploited them using less opportunistic, more intensified strategies. New cooking techniques included the use of pit ovens, often involving quantities of heated stones, leaving behind rock-filled pits and scatters of burned rock.

Besides ground stone implements, Archaic tool assemblages included knives, scrapers, drills, perforators, and stemmed and notched projectile points of various types. Awls, handles, and flakers were fashioned of bone and antler. Although rarely preserved, wood was used for a variety of implements, including spear throwers or atlatls (the bow and arrow did not appear in this area until around the end of the Archaic tradition).

Lifeways were not static over the course of the Archaic tradition, however, and notable trends are evident in the archaeological record for this long span of time. To characterize these changes, archaeologists typically employ a three-period division of the Archaic—Early, Middle, and Late—that is generally applicable to the entire American Southwest, with local phase sequences that either equate to one or more of these periods, or subdivide them. Irwin-Williams’s (1973) Oshara tradition entails five phases that are widely used to subdivide the Archaic tradition in northwestern New Mexico, and which may be broadly applicable to the northeastern part of the state. The sequence consists of: 1) the Jay phase (5500–4800 B.C.), 2) the Bajada phase (4800–3200 B.C.),
3) the San Jose phase (3200–1800 B.C.), 4) the Armijo phase (1800–800 B.C.), and 5) the En Medio phase (800 B.C.–A.D. 400). The En Medio phase subsumes the Basketmaker II period of the Pecos Classification. Each phase of the Oshara tradition is characterized by a distinctive projectile point style, not all of which are well dated. The applicability of the Oshara tradition to northeastern New Mexico remains unclear, as in many respects the area appears more closely related to developments on the High Plains rather than the Southwest.

Archaic lifeways were directly affected by climatic change over this 6,000-year time span. Berry and Berry (1986) have examined evidence from three different sources (Mehring 1967; Petersen 1981; Wendlund and Bryson 1974) to characterize climatic changes in the Southwest during the terminal Pleistocene and most of the Holocene, and their periods covering the Archaic tradition are summed up in Table 3.1. Hogan (1994) describes climatic trends in the San Juan Basin, based on Petersen’s (1981) pollen data from the La Plata Mountains and additional data from pollen samples, packrat middens, and geomorphological studies collected in the San Juan Basin (Hogan 1983). Trends based on Hogan’s sources are summarized in Table 3.2. Note that following extreme dry conditions prevailing over most of the Early Archaic period, both sequences agree that there was a dramatic increase in effective moisture beginning around 3300–3000 B.C., lasting until sometime between 800 and 300 B.C., after which conditions fluctuated and drought conditions periodically struck the Southwest. An upsurge in effective moisture during the Late Archaic is also indicated by stalagmite data from southeastern New Mexico (Table 3.3). The specific climate trends in northeastern New Mexico may differ in details from all of these sequences. But the general trend involving hot, dry conditions during the earlier portion of the Archaic, followed by an overall wetter climate during the latter portion of this time frame, is almost certainly relevant to northeastern New Mexico.

### Table 3.1. Climatic Sequence for the Archaic Tradition in the American Southwest

<table>
<thead>
<tr>
<th>Period</th>
<th>Time</th>
<th>Sub-Episode</th>
<th>Climatic Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Atlantic</td>
<td>800 B.C.–A.D. 400</td>
<td>N/A</td>
<td>Decline in effective moisture, reaching minimum midway through the period (ca. 200 B.C.), with a minor peak at end</td>
</tr>
<tr>
<td>Sub-Boreal</td>
<td>3100–800 B.C.</td>
<td>III</td>
<td>Continued moist conditions, with brief, cool-dry interval in La Plata Mountains at end</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II</td>
<td>Effective moisture peaks ca. 2000 B.C.; warm and wet in La Plata Mountains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>Increased effective moisture; warm-wet conditions, ending in a brief, cool-dry interval, in La Plata Mountains</td>
</tr>
<tr>
<td>Atlantic</td>
<td>6500–3100 B.C.</td>
<td>IV</td>
<td>Cool and dry in La Plata Mountains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>III</td>
<td>Warm, wet conditions in La Plata Mountains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II</td>
<td>Marked decline in effective moisture; cooler conditions in La Plata Mountains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>Increased effective moisture in southern Southwest; warm-wet conditions in La Plata Mountains</td>
</tr>
</tbody>
</table>

Adapted from Berry and Berry (1986:312–314).
Table 3.2.  Climatic Trends for the San Juan Basin

<table>
<thead>
<tr>
<th>Time</th>
<th>Climatic Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.D. 650–850</td>
<td>Warm and moist</td>
</tr>
<tr>
<td>A.D. 350–650</td>
<td>Cool and dry</td>
</tr>
<tr>
<td>150 B.C.–A.D. 350</td>
<td>Warm and moist; optimal conditions for maize cultivation</td>
</tr>
<tr>
<td>350–150 B.C.</td>
<td>More variable than in previous interval</td>
</tr>
<tr>
<td>550–350 B.C.</td>
<td>Warmer, with increased summer rainfall</td>
</tr>
<tr>
<td>850–550 B.C.</td>
<td>Cool and dry</td>
</tr>
<tr>
<td>1450–850 B.C.</td>
<td>Warm and wet</td>
</tr>
<tr>
<td>2050–1450 B.C.</td>
<td>Cool and wet</td>
</tr>
<tr>
<td>2350–2050 B.C.</td>
<td>Warm and wet</td>
</tr>
<tr>
<td>3000–2350 B.C.</td>
<td>Cool and moist, with winter-dominated precipitation</td>
</tr>
</tbody>
</table>

Adapted from Hogan (1994).

Table 3.3. Precipitation Trends Inferred from Stalagmite Data from the Guadalupe Mountains

<table>
<thead>
<tr>
<th>Time</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.D. 1200–present</td>
<td>Overall dry, equal to or drier than present. Interrupted by interval of slightly increased precipitation from mid-sixteenth to mid-nineteenth century, which coincides with the Little Ice Age</td>
</tr>
<tr>
<td>A.D. 700–1200</td>
<td>Continued overall wetter than present</td>
</tr>
<tr>
<td>A.D. 300–700</td>
<td>Distinctly drier than previous intervals, similar to present but still slightly wetter</td>
</tr>
<tr>
<td>1000 B.C.–A.D. 300</td>
<td>Significantly wetter than present, including the wettest late-Holocene interval at 800–600 B.C., and another spike in moisture at ca. A.D. 1</td>
</tr>
<tr>
<td>2000–1000 B.C.</td>
<td>At least intervals slightly wetter than present</td>
</tr>
</tbody>
</table>

Note: Based on Polyak and Asmerom (2001).

**EARLY ARCHAIC PERIOD (5500–3200 B.C.)**

The Early Archaic period corresponds to an interval of global warming widely referred to as the Altithermal (Antevs 1948, 1955, 1962). The Altithermal spans the Early Archaic period and a portion of the Middle Archaic. Citing evidence from Lubbock Lake in west Texas, Johnson and Holliday (1986:44) inferred two periods of aridity (4400–3500 B.C. and 3000–2500 B.C.) during the Altithermal, separated by a more mesic period. There is a dearth of Early Archaic sites in many areas where reliable sources of surface water were probably rare or absent at this time, such as Albuquerque’s West Mesa (see Walth and Railey 2011). Conversely, Early Archaic remains are much more abundant in the Jemez Mountains and northern Rio Grande valleys (Vierra 2008a). Evidence from Colorado also suggests occupation of high-mountain refugia during the Altithermal (Benedict 1975, 1979, 1981; Benedict and Olson 1978). These and other high-elevation areas probably served as refugia where precipitation levels were still sufficient to sustain human populations and the resources they relied upon (including surface water). River valleys such as the Canadian and Pecos probably also provided critical refugia for people at this time. Still, the extremely arid conditions of the Altithermal “may have been paralleled by a shrinkage in human population” (Irwin-Williams and Haynes 1970:70). Benedict (1979:3) uses radiocarbon data to argue that the Altithermal “was the cause of population dislocations that affected much of the North American continent.” On the Llano Estacado and around its southern margins, Early Archaic peoples dug water wells, underscoring the desperate conditions at this time (Evans 1951; Green 1962; Hester 1972; Meltzer and Collins 1987; Smith et al. 1966; Warnica 1966). Bison populations were severely reduced and nutritionally stressed (Johnson and Holliday 1986), and those still present on the Southern Plains may have stuck close to playa depressions.
Thus far discoveries in northeastern New Mexico have shed little light on Early Archaic occupations here. At the San Jon site, a scatter of lithic debitage and bone fragments, along with two projectile points were found eroding from a stratum that is radiocarbon dated to the Late Paleoindian/Early Archaic time frame (Hill et al. 1995). The projectile points have shallow side notching and expanded stems, and typologically suggest affinities closer to the Plains than to the Southwest (cf. Kay 1998:186–187; Thies and Witty 1992:144–145; Turner and Hester 1993:134–135, 166). The discovery suggests Early Archaic people were active at playa depressions on the Llano Estacado, either during or just before the Altithermal, and were hunting bison at these localities. In the Cimarron District to the north, in the pre-ceramic levels at the Bear Canyon shelter, Glassow (1980:71) reports “heavily patinated hornfels and basalt chipped-stone tools in association with large projectile points.” These sound vaguely similar to Early Archaic materials in the northern Rio Grande Valley to the west (cf. Vierra 2008a). To the west, in the Pedernal Hills east of the Estancia Basin, investigations at the aceramic Leland site (LA 109487) collected an Early Archaic stemmed point (Bradley and Brown 1998; Gerow 2008; Trowbridge and Whitehead 2015). Closer to the project area, no Early Archaic materials were reported from the Ute Lake Dam and Reservoir excavations (Hammack 1965).

**Middle Archaic Period (3200–1800 B.C.)**

In northwest New Mexico, Irwin-Williams’s (1973:7) San José phase is equivalent to the Middle Archaic period, but it is unclear whether this phase is relevant to the plains of northeastern New Mexico. The highly variable San José projectile point is the main diagnostic artifact of this phase, and points similar to the San José type do occur in eastern New Mexico (e.g., Railey and Rissetto 2011:243). Large side-notched types (Sudden Side-notched and San Rafael Side-notched) appear during this period as well. Assemblages also include poorly made side scrapers and large, heavy chopping tools; the well-made side scrapers and bifacial knives found in the Early Archaic are now rare. Ground stone milling implements appear in the form of shallow, basin-shaped grinding slabs and one-hand cobble manos. Cooking pits and burned rock, which appeared during the Early Archaic, continue into the Middle Archaic period. Structure remains also become more common in the Southwest during the Middle Archaic, and typically mark small, expedient, brush-covered huts set in shallow pits (Huckell 1996).

The harsh climate of the Altithermal continued into the Middle Archaic period, but by 2500 B.C., conditions were improving, as cooler and moister conditions set in. Paleoclimatic evidence suggests that at this time there was a shift toward increased effective moisture, dune stabilization, and soil formation (pedogenesis) (Johnson and Holliday 2004:291). This climatic shift was apparently associated with an increase in biomass and expansion of surface water sources. These conditions appear to correlate with the beginnings of dramatic population growth and expansion into many upland areas and open, dune-grassland settings that were largely unoccupied during the Early Archaic period. Evidence from multiple regions suggests both population growth and more extensive land use at this time. This evidence includes increasing frequencies of radiocarbon dates in several regions, although in far southeastern New Mexico the number of dates remains low throughout the Middle Archaic period (Figure 3.1 and Figure 3.2). There are currently too few dates from the Great Plains of northeastern New Mexico to produce meaningful plots similar to those shown in Figure 3.1 and Figure 3.2, so it remains unknown to what extent (if at all) population growth occurred here during the Middle Archaic.
In the Southwest, maize was present in the Tucson area by 2100 B.C. (Mabry 2005), and similarly early, and even potentially earlier, occurrences have been reported for the Middle Archaic period in northwestern New Mexico. Southeast of the San Juan Basin, in the Rio Puerco valley east of Albuquerque, possible maize phytoliths were identified at LA 133528 in a feature with radiocarbon dates of 3310–3230 and 3110–2910 B.C. (Jones-Bartholomew et al. 2002). Assuming the phytoliths are indeed maize and the dates accurately identify their age, then this would predate the earliest known maize in the Southwest by about a millennium, and perhaps even push maize back to the end of the Early Archaic. In the San Juan Basin, maize pollen-bearing organic particles from packrat middens in Chaco Canyon have yielded a series of dates extending back to before 2500 B.C. (Hall 2010). In the Fruitland area of the northern San Juan Basin, maize pollen and one charred piece of possible maize were identified in samples from several late Middle Archaic contexts (Honeycutt and Fetterman 1994; Horn et al. 2002). This mounting body of evidence suggests that maize may have been present in the northern Southwest during Middle Archaic times, if not earlier. Still, the very sporadic and low frequencies of occurrences in the archaeological record suggests that any Middle Archaic cultivation of maize was not at all intensive, and local groups in northeastern New Mexico probably relied primarily or wholly on hunting, foraging, and collecting wild foods.

Middle Archaic remains are rather scarce in northeastern New Mexico. At the Moriarty Airport, data recovery at LA 60977 uncovered remains of at least two Middle Archaic occupations, with four radiocarbon dates collectively ranging from 3300 to 1740 B.C. (Boggess 2011). The occupations at this site were small and short term, but did include ground stone milling tools. In the Pedernal Hills, at the Lobo Ranch site (LA 109455) excavation uncovered a roasting pit with associated cooking stones and 12 lithic artifacts including nine flakes, one flake cutting tool, and two pieces of a quartzitic sandstone slab metate (Elyea 1998a). A radiocarbon sample from this feature produced a late Middle Archaic date of 2300–1950 B.C. At LA 84318 near El Cerrito, two of three Archaic-like projectile point bases resemble San José-style points (Post 2000:83). In more intensively investigated areas in southeastern New Mexico, identified Middle Archaic components are rare and consistent with the temporary camps of highly mobile hunter-gatherers (e.g., Polk et al. 2004; Railey 2013). No clear evidence of Middle Archaic occupation was discovered during the excavations for the Ute Lake Dam and Reservoir (Hammack 1965). Also in the Ute Lake area, data recovery at LA 54329 and LA 149043 collected a large quantity of lithic materials and no ceramics (Barnes and Boggess 2006; Barnes and Silberberg 2006; Railey and Walth 2013). A Middle Archaic projectile point was the only diagnostic artifact, although much of the assemblage could also date from the Late Archaic period. Archaeological remains were in surface/near-surface contexts, and there was evidence of considerably mixing of materials, which included a historic period sheep skull in the subsurface. No discrete, dark-stained features were uncovered at these sites, and no radiocarbon dates were obtained. Analysis of the site’s lithic assemblage revealed a heavy emphasis on producing bifaces from locally occurring, flattened pebbles.
Figure 3.1. Count plots of radiocarbon dates for the pre-A.D. 600 time frame, sized to the same time scale. Top: Bureau of Land Management (BLM)-Carlsbad Field Office region in far southeastern New Mexico (n = 206 dates); middle: Albuquerque’s West Mesa (n = 204 dates); bottom: Mid-American Pipeline (MAPL) project in the Fruitland area of northwestern New Mexico (n = 111 dates). BLM-Carlsbad data from Railey (2012); West Mesa data from Walth and Railey (2011); MAPL data from Horn et al. (2002:Table [2]-5).
Figure 3.2. Selected regional radiocarbon-frequency profiles. The Wyoming data show the summed probability of 3,237 dates from the entire state (courtesy of Matthew S. Bandy, personal communication 2011). The graph for the Arkansas River Basin is taken directly from Kalasz et al. (1999a:Figure 4-2), the data for the Albuquerque graph are from Walth and Railey (2011), and the Permian Basin graph is from Railey (2013; EF = Early Formative, LF = Late Formative, P/H = Protohistoric/Historic).
**LATE ARCHAIC/BASKETMAKER II PERIOD (1800 B.C.–A.D. 500)**

This period marks a major shift in the prehistory of the American Southwest and, to an extent, the southwestern margins of the High Plains. Settlements with remains of habitation structures proliferate throughout the region and, along with other high-investment facilities (such as storage pits), indicate further reduction in mobility and an increased residential commitment to at least certain localities. In her Oshara tradition, Irwin-Williams (1973) divided the Late Archaic period into two phases: Armijo (ca. 1800–800 B.C.) and En Medio (ca. 800 B.C.–A.D. 400). The En Medio phase subsumes the Basketmaker II period of the Pecos Classification, which entails the earliest firm commitment to maize-based farming in northwestern New Mexico (e.g., Hogan 1994; Reed 2000:6–7; Simmons 1982, 1986; Walth and Railey 2011; Vierra 1994, 2008b; Vierra and Ford 2006), and in the eastern mountain slopes from southern Colorado to southeastern New Mexico (Campbell and Railey 2008; Kalasz et al. 1999b:176–178; Kirkpatrick and Ford 1977). But it is unclear to what extent, if at all, farming was practiced by Late Archaic peoples living east of the mountains in present-day New Mexico. In the far southeastern part of the state, there is a growing number of maize identifications from microbotanical remains and residues, but the complete absence of maize macrobotanical remains there casts leaves questions about the potential implications of these finds (see Railey 2013). At present, there is no evidence that Late Archaic peoples in eastern New Mexico were engaged in farming, and at least most groups probably continued a highly mobile, hunter-gatherer lifeway.

Regardless of the local subsistence economy, there is clear evidence of substantial population growth in both the Southwest and adjacent portions of the High Plains during the Late Archaic.

One of the best indicators of this trend is the continued increase in the number of sites and radiocarbon dates relative to earlier periods (see Figure 3.1 and Figure 3.2). Late Archaic/Basketmaker II sites are more numerous than those of previous periods, occurring in a wide range of environmental zones indicating a continuation of overall favorable climatic conditions (see also Sebastian and Larralde 1989). The character of some of these sites suggests larger and more intensively occupied settlements, which likely represent repeatedly occupied seasonal camps, or even semi-sedentary hamlets and early villages. The number of sites with structures and multiple features attributed to Basketmaker II/Late Archaic groups increases substantially, indicating an apparent increase in population and changes in social organization. The diversity of tool assemblages on these sites implies a wide range of activities that included hunting, gathering, food processing, butchering and hide preparation, woodworking, and general manufacturing. Non-habitation sites also appear at this time. For example, along the Pecos River, at Carlsbad in far southeastern New Mexico, the site of Punto de los Muertos (Wiseman 2003a, 2003b) may have been a mortuary monument that signaled territorial claims by a local Late Archaic group.

The favorable climate and enhanced biomass that continued into Late Archaic times included enriched grasslands, which among other things apparently resulted in increased numbers of bison. Bison hunting is documented for the Late Archaic period over a wide area, including the Albuquerque Basin (Condie and Smith 1992; Hibben 1992; Higgins and Lundquist 2004; Walth and Railey 2011), the San Jon site at the northern edge of the Llano Estacado (Hill et al. 1995), far southeastern New Mexico (Railey 2011a; Wiseman 2003a, 2003b), and the Texas Panhandle (Lintz et al. 1991; Quigg 1997).
The Late Archaic is slightly better represented than previous Archaic periods in northeastern New Mexico, but still poorly known compared to the subsequent Formative tradition. Evidence to date suggests the region was still occupied by mobile hunter-gatherers during the Late Archaic. In the Pedernal Hills east of the Estancia Basin, two Late Archaic projectile points were collected at the aceramic Leland site (LA 109487), but no cultural features or radiocarbon dates were obtained for this site (Bradley and Brown 1998; Gerow 2008; Trowbridge and Whitehead 2015). Further to the east, at the multi-component LA 84318, near El Cerrito, obsidian hydration analysis included dates that fall in the Late Archaic period, but no associated diagnostic artifacts for this period were found (Post 2000).

At the Ute Lake Dam and Reservoir, Hammack (1965) discovered remains of Late Archaic occupations at several surveyed sites, and in excavations at rockshelter site LA 5573. The Archaic projectile points from LA 5573 appear similar to those of the En Medio phase (800 B.C.–A.D. 400) in the Rio Grande northwestern New Mexico, and similar point styles from this time frame to the south and east. There is a great diversity of artifacts from LA 5573, including a variety of flaked stone items, ground stone milling tools, an atlatl weight, polishing stones, abraders, bone and shell, gaming pieces, and pigment. These items suggest the rockshelter was used as more than just a temporary camp, and perhaps hosted ritual activity. However, it is unclear which of the items are associated with the Late Archaic component as opposed to the ceramic period occupation of this site. Most of the items come from the uppermost levels of the shelter’s deposits, which appear to contain mixed remains of both Late Archaic and later occupations. The lower levels appear to be exclusively Late Archaic and contain a lower diversity of artifacts. LA 5550 is a possible Late Archaic site on the valley floor of the Ute Lake area. Here, a buried occupation surface containing burned rock, lithic debris, and manos was investigated, and among the “hearths” encountered was a large, burned-rock feature that extended below this surface and contained bison bone (Hammack 1965:49). Although the description is sketchy, there is no mention of ceramics at this site, so it may mark a Late Archaic occupation.

**FORMATIVE TRADITION**

The appearance of ceramics in North America provides a time marker that is highly visible archaeologically and is used to subdivide the end of the Archaic tradition with whatever follows. In the Southwest and western margin of the Southern Plains, various cultural-historical taxa are used to describe post-Archaic developments. The term “Formative” is commonly used to denote the ceramic time frame in much of southern New Mexico. Although it is arguable to what extent the term is relevant to the northeastern part of the state, it is used here to bracket the time span beginning with appearance of ceramics, to the widespread abandonment of villages and other intensively occupied residential sites on the Southern Plains by A.D. 1450. Besides the appearance of ceramic technology, the Formative tradition marks a time of accelerating population growth, greater sedentism, increasing dependence on farming and storage of cultivated plant foods, and remarkable developments in architecture, sociopolitical organization, and various cultural marker traits. These developments may only be partially applicable to eastern New Mexico, but at any rate the appearance of pottery and eventual rapid changes in ceramic styles and attributes make Formative sites much easier to place within a more chronologically precise sequence than pre-ceramic sites. Still, chronology within the Formative tradition is not known in any great detail in the plains of northeastern New Mexico. So, various developments and trends must be largely inferred from surrounding areas, where more archaeological investigations have occurred and
cultural period developments are better known. These include the Jornada Mogollon region and upper Pecos River valley to the south and west, the Salinas area to the southwest, the Rio Grande valley and Four Corners further to the west, the Park Plateau and Arkansas River valley to the north, and the Texas/Oklahoma Panhandle to the east.

**Early Formative (ca. A.D. 500–1200)**

Based on evidence from areas to the west and south, it can be inferred that ceramics probably arrived in northeastern New Mexico sometime between A.D. 400 and 600. In the Hondo Valley to the southwest, excavations in numerous, well-dated contexts suggest that pottery arrived there in the middle of the sixth century A.D. (Campbell and Railey 2008). The earliest ceramics in the Jornada Mogollon region and Pecos River valley consist of undecorated brown wares, and decorated ceramics do not appear until near the end of the first millennium. A similar situation holds in the Middle Pecos valley, north of Roswell, where the earliest ceramics are undecorated brown and gray wares in the Early 18 Mile phase (ca. A.D. 600—900) (Jelinek 1967; Sebastian and Larralde 1989:78). Middle Pecos micaceous brown ware and Red Mesa Black-on-white mark the subsequent Late 18 Mile phase (ca. A.D. 900–1000). To the west, the earliest pottery also consists of undecorated brown and gray wares, and these may have been present in the Four Corners as early as A.D. 200 or 300 (e.g., Breternitz 1986; Dittert et al. 1963; Eddy 1961, 1966; Fowler 1988; Toll and Wilson 2000:23–24; Wilson and Blinman 1993), but decorated, black-on-white wares appear around A.D. 550 or slightly later (Toll and Wilson 2000:26). Neck-banded gray wares and red wares appear during the Pueblo I period (A.D. 750–900), and corrugated gray wares appear in Pueblo II (A.D. 900–1100), along with a shift from mineral to organic pigments used for painted wares.

On the Southern Plains, a very different ceramic tradition expanded up the river valleys from the east. This “Woodland” cultural expression features conoidal-shaped vessels that are either cord-roughened or plain, and cord-marked pottery appears along the Canadian River in the Texas Panhandle, and in southeastern Colorado, perhaps as early as A.D. 250 (Campbell 1969; Johnson and Johnson 1998:217; Quigg 1997). A mix of Woodland ceramics and Jornada brown wares are found in the Lake Creek complex (A.D. 500–1000) of the Oklahoma and Texas panhandles, although Jornada brown wares are much less common along the Canadian River in west Texas than in the Red River drainage to the south (Boyd 1995, 2004; Hofman and Brooks 1989; Johnson and Johnson 1998:217).

Evidence also suggests that the bow and arrow appeared throughout the region at about the same time as ceramics. This is marked by a shift from larger notched and stemmed projectile points—which presumably tipped dart shafts used with atlatls—to distinctly smaller points. In the Hondo Valley, the well-dated sequence there suggests this shift occurred in the sixth century A.D., at roughly the same time that ceramics appear (Campbell and Railey 2008; Railey 2010a). The earliest arrow points in the Hondo Valley sequence are corner notched with pronounced shoulders and recurved blades, similar to the Bohnam and Homan types of Texas (Turner and Hester 1993:202, 219) and the Sequoyah type further to the east (e.g., Nassaney and Pyle 1999:248). But these are quickly replaced by strongly shouldered points with straighter blade edges, referred to as Scallorn in the Plains (Turner and Hester 1993:230) and Trujillo (Turnbow 1997:202–205) or Dolores (Justice 2002:242–246) in the northern Southwest. This latter point type continues in use until ca. A.D. 1200.
Settlement and subsistence patterns vary between the regions surrounding northeastern New Mexico. In the Jornada Mogollon region to the south, a hunter-gatherer lifeway featuring high mobility, extensive land use, and simple huts set in shallow basin, continues with little apparent change from the Late Archaic through at least most of the first millennium A.D. (Miller and Kenmotsu 2004; Railey 2013; Railey et al. 2011). At the Townsend site (LA 34150), 23 km (14 miles) north of Roswell and about 16 km (10 miles) west of the Pecos River (Akins 2003; Maxwell 1986; Wiseman 2013:56-57), excavations here uncovered the remains of several structures, some of which date from the Early Formative period. Two of these are rather shallow structure (Structures 2 and 3), whereas the others are set in deeper pits but are very small in diameter. Bison remains were found in Early Formative contexts at Townsend, and these mark a prominent exception to the otherwise absence of bison during this period (Boyd 1995, 2004; Dillehay 1974:187; Hughes 1991:8, 30). Overall, across the region hunting appears to have shifted to a focus on pronghorn, deer, and/or rabbits at this time, with some local variation in the relative emphasis on these game animals (e.g., Boyd 2004:318–319).

Along the Pecos River south of Fort Sumner, Jelinek’s (1967) Early 18 Mile phase (A.D. 500–900) corresponds to the earliest ceramic interval. Undecorated brown wares dominate the ceramics of this phase, but also present is Lino Gray, an early plain ware from the northern Southwest (Colton and Hargrave 1932; Dittert and Plog 1980; Wilson 2012). Jelinek’s excavations did not encounter any structures associated with the Early 18 Mile phase, and lifeways associated with this phase are unclear, and the area may have been occupied by mobile, hunter-gatherers at this time.

Jelinek’s Late 18 Mile phase (A.D. 900–1000) is contemporary with the first half of the Querecho phase in the Bureau of Land Management (BLM) Carlsbad Field Office (CFO) region. The local Middle Micaceous Brown displaces Jornada Brown as the dominant utility ceramic ware at this time. Red Mesa Black-on-white is the most prominent intrusive ware and temporal index for this phase (cf. Wilson 2012). The earliest structure remains from his excavations date from this phase, and they signal an appreciable degree of reduced mobility.

Architectural forms associated with this phase include slab-lined storage cysts, slab-lined pithouses, the large peculiar shallow pithouse structure from Site P4AB, and small contiguous-roomed rectangular structures, slightly excavated in to the ground and incorporating small vertical sandstone slabs in the wall bases. (Jelinek 1967:148)

Although direct subsistence evidence was not collected during Jelinek’s excavations (flotation processing had yet to be invented and routinely implemented), the architectural patterns are consistent with those associated with substantial farming dependence. Interestingly, pollen evidence collected by Jelinek suggests that “[c]onditions in the valley may have been slightly less moist” (Jelinek 1967:147), a finding consistent with widespread drought conditions at the onset of the Medieval Warm Period.

Jelinek’s Early Mesita Negra phase (A.D. 1000–1150) straddles the boundary of the Early and Late Formative periods as defined here. Middle Pecos Micaceous Brown continues as the dominant ceramic, Jornada and South Pecos Brown diminish in frequency. The earliest locally produced, reduced-fired gray wares appear in this phase. Red Mesa Black-on-white continues into this phase. Chupadero Black-on-white—a marker for the beginning of the Late Formative—
appears in this phase, along with a variety of other black-on-white types (Cebolleta, Socorro, Mimbres, Reserve, and possibly Santa Fe) and Broadline (San Andres) Red-on-terra-cotta. Corner-notched forms characterize arrow points, as was the case in his two 18 Mile phases. Jelinek excavated one structure that he associated with this phase, Structure 2 at site P24 (LA 8801).

Northwest of Roswell, along the Pecos River and extending through the Mescalero Sands toward the Llano Estacado, the U.S. 70 Roswell-Portales data recovery uncovered evidence of Early Formative occupation at three sites: LA 2713, LA 75159, and LA 75163 (Polk et al. 2004). Archaeological remains at these sites are consistent with a continuation of mobile, hunter-gatherer lifeways, although it is unclear if this pattern holds for the entire Early Formative period in the Roswell area or not.

Maize farming and pit house communities are evident in the archaeological record of the Salinas Highlands/Chupadero Mesa area, immediately south of Estancia Basin. LA 2579 apparently contained several circular pit houses, with two excavated ones measuring between 4 and 5 m in diameter (Fenenga 1956; Green 1955; Roček and Rautman 2012:117). These were rather substantial structures, dug to at least 0.8 m and 1.5 m in depth, and contained central hearths and roof support posts. A mass of charred maize came from one of the pit houses, and at least five bell-shaped pits, 1 to 2 m in diameter, were located outside these structures. Ceramics suggest an occupation within the A.D. 600–900 interval. A later pit house period (ranging from the late A.D. 900s up to A.D. 1250–1300) is indicated from excavations at other sites on Chupadero Mesa. This includes discoveries at Gran Quivira (Beckett 1981; Ice 1968) and a pit house village at the nearby Kite site (Rautman 1990, 1991, 1993; Wiseman 1986). These pit houses are reportedly smaller and squarer in shape than the earlier ones from LA 2579, and apparently overlap in time with the earliest surface structures of slab-lined jachal and puddled adobe, which reportedly appear in the late twelfth century (Caperton 1981; Roček and Rautman 2012:117).


Across the mountains, in the Cimarron area at the base of the Park Plateau in New Mexico, investigations decades ago at numerous sites revealed a sequence of Formative tradition phases (Glassow 1972, 1980; Kirkpatrick and Ford 1977). The sequence begins with the Vermejo phase (A.D. 400–700), which includes aboveground stone structures and some maize, but no ceramics. Structures at site MP-4, in Middle Ponil Canyon, are circular, typically no more than 5 m in diameter, and have walls of horizontally laid sandstone slabs that originally stood at least 1 m in height (Glassow 1980:71–72). A charred maize cob with still-attached kernels was found at MP-4, and metates are slabs with only shallow depressions. In North Ponil Canyon, Glassow (1980:72,
117) reports an unusually large (dimensions were not specified), circular structure with a stone masonry foundation at site NP-17, which he cautiously suggests dates from the Vermejo phase.

The Pedregoso phase (A.D. 700–900) follows the Vermejo phase in the Cimarron District (Glassow 1980:72–73) and is contemporary with the Pueblo I period to the west. Excavations at NP-1/Area 2 uncovered possible pit houses (the structures were actually excavated into a sloping surface and were not true pit houses), linear alignments of sandstone blocks, scattered post holes, hearths, “bottle-shaped” pits (apparently bell-shaped storage pits), a midden with a dense concentration of burned rock, and other artifacts, along with maize cobs and faunal remains. A small amount of crude, thick, oxidized pottery sherds are the earliest known ceramics in the Cimarron District.

The Escritores phase (A.D. 900–1100) in the Cimarron District is contemporary with Pueblo II in the Anasazi region (Glassow 1980:73). Among the ceramics are Kiatuthlanna and/or Red Mesa Black-on-white, and neck-banded wares similar to Kana’a Gray. A pit house excavated at NP-1/Area 1 exhibits classic Pueblo I period elements, including a ventilator-shaft-deflector configuration, an adobe-collared central hearth, and four-post roof supports. An associated, thick midden deposit was the richest recorded in the Cimarron District.

Further south, just south of Las Vegas, excavations at Sitio Creston (LA 4939) uncovered the remains of eight circular stone enclosures (Wiseman 1975). There were four enclosures outside the right-of-way. The enclosures are the remains of domestic structures, and range 3.7 to 14.6 m² in floor area. Only three of the structures had discernible hearths, and no superstructure materials were found. Archaeological fill within the enclosures ranged from 5 to 40 cm in thickness. Based on the presence of Taos Plain ceramics and corner-notched arrow points, Wiseman suggested an occupation period between A.D. 1050 and 1100, which straddles the Early and Late Formative periods as defined here.

Sitio Creston is similar to other sites with stone enclosure sites in northeastern New Mexico and southeastern Colorado (Kalasz et al. 1999b:179; Renaud 1942), once assigned to the Early Panhandle period (Campbell 1969). As in the Cimarron District, some farming may have occurred in upland areas of southeastern Colorado at this time, but there is little evidence for it out on the plains (Kalasz et al. 1999b:176–178). A similar situation is evident in the Palo Duro complex (A.D. 500–1100) of the Caprock Canyonlands and Panhandle of west Texas (Boyd 2004). Here, substantial, rectangular house remains are also present, and although Boyd (1995:498) suggested that some maize cultivation may have occurred in the Palo Duro complex, the evidence is lacking and subsistence appears to be based largely or wholly on hunting and gathering.

Closer to the project area, excavations at LA 84318 near El Cerrito (Post 2000) uncovered remains of Formative period occupations at this multi-component site. Obsidian hydration dates, pottery, projectile points, and other artifacts in the upper half-meter of (mostly disturbed) deposits at this site indicate mixed remains from occupations spanning the entire length of the Formative tradition. These occupations appear to have been more intensive, long term, and or frequently repeated compared to the lower, Archaic period levels at this site. Still, no structural remains were found and the only features encountered were hearths and/or roasting pits, and burned rock clusters.
During the investigations for the Ute Lake Dam and Reservoir, Hammack (1965) found no indicators of reduced mobility, sedentism, and farming, and concluded that “Plains influences are strong with ceramics as the only major derivative from Puebloan groups” (Hammack 1965:62). Although Hammack concluded that ceramic period occupation of the area postdated A.D. 1200, small arrow points from Level 1 at the LA 5573 rockshelter include strongly shouldered forms consistent with the Scallorn/Trujillo/Dolores types, which largely or wholly predate A.D. 1200. Unnotched triangular arrow points were also present in Level 1, although the dating of these is less certain. Only one sherd of micaceous brown ware was found at this site, suggesting that some of the Formative period occupation remains in Level 1 (which are apparently mixed with Late Archaic materials, see above) were left by groups who had the bow and arrow but had not yet adopted ceramic technology, or at least not to any great extent. Early Formative occupations may also have occurred at the two Tucumcari rockshelters, where micaceous brown ware occurred in all levels, and among the variety of projectile points were small, corner-notched forms consistent with the Scallorn/Trujillo/Dolores types (Dick 1953; Hammack 1965:62).

In summary, it appears that there was a complex mix of settlement and subsistence strategies across northeastern New Mexico and surrounding areas during the Early Formative period. Maize-based farming was well-established in the Rio Grande valley to the west, the Cimarron District to the north, the Salinas area and Sierra Blanca highlands to the southwest, and perhaps also the Pecos River valley north of Roswell. But across most of the open plains, at least most people continued to live as hunter-gatherers. But mobility indicators vary among the areas where hunting and gathering apparently persisted, with high mobility continuing in the Jornada Mogollon region, and in the plains to the north, while in southeast Colorado and Texas-Oklahoma panhandle there is evidence of reduced mobility (as indicated by remains of rather substantial houses), but without any discovered maize.

**Late Formative (ca. A.D. 1100–1400)**

While there was considerable variation in terms of settlement and subsistence patterns prior to ca. A.D. 1100, after this time more or less permanent settlements appear across most of northeastern New Mexico and surrounding regions. Intensively occupied residential sites of the Late Formative time frame are distinctive and highly visible even on the surface, due to their dark-stained midden deposits with abundant artifact debris and, in many cases, aboveground architectural remains. A diversity of decorated ceramics is typically found at these sites, including a variety of nonlocal wares that provide rather precise temporal indices. Prestige items of turquoise, marine shell, and other exotic materials, which were generally rare before, are rather common in sites of this time frame. Beginning around A.D. 1200, arrow points change in style from the strongly shouldered Scallorn/Trujillo/Dolores types to side-notched forms variously referred to as Harrell, Desert Side-notched, or Pueblo Side-notched (Justice 2002:298–300; Turner and Hester 1993). Unnotched triangular points, at least many of which were probably unnotched preforms, are also common at this time (Newlander and Speth 2009).

In the western Jornada Mogollon region, maize-based farming and formal pit houses and polychrome pottery appear in the Late Doña Ana phase (A.D. 1150–1300), with room blocks constructed during the subsequent El Paso phase (A.D. 1300–1450) (Miller and Kenmotsu 2004). Generally similar trends are evident in the eastern Jornada Mogollon, although it remains unclear to what extent farming was practiced east of the Pecos River. Room blocks appear to be less
common than in the western Jornada, although possible ceremonial structures are present (Railey 2013). To the north, a mix of pit house and pueblo sites, all with at least some evidence of maize-based farming, occurs in the Late Formative time frame in the Roswell area, the Sierra Blanca Highlands, and the Middle Pecos valley north of Roswell (e.g., Kelley 1984; Jelinek 1967:133; Speth 2004; Wiseman 1981, 1985, 2002; Zamora and Oakes 2000). The pit houses here encompass a variety of sizes and shapes, including a ceremonial structure at Fox Place with a mural painting on the wall (Wiseman 2002).

In the Rio Grande valley to the west, increasingly larger pueblo communities develop from the end of the Late Developmental (A.D. 900–1200) through the Coalition (A.D. 1200–1300) and Classic (A.D. 1300–1600) periods (Wendorf and Reed 1955). Farming cultures also spread northward along the Rio Grande, up to the Taos area, at this time (Vierra and Ford 2007). Pecos Pueblo was established ca. A.D. 1100 and by 1450 had grown to a five-story pueblo that housed over 2,000 inhabitants (Noble 1993). Pueblo culture occupation expanded to the northeast along and beyond the eastern side of the Sangre de Cristo Mountains and on the Park Plateau, including Tecolote Pueblo (LA 296) and other settlements with black-on-white pottery along Ponil Creek and near Watrous (Glassow 1980; Holden 1930; Lister 1948; Lutes 1959; Wendorf 1960). In the Cimarron District, pueblo occupations continued through the Ponil (A.D. 1100–1250) and Cimarron (A.D. 1200–1300) phases which include multi-room, masonry architecture structures and maize-based farming (Glassow 1980). By A.D. 1300, this Pueblo expansion into the fringes of the Plains ended. After this time, Pecos Pueblo became the nexus between the Southwest and Plains in this area and continued to be occupied into historic times.

Village-farming complexes also appear further out onto the southern High Plains at this time. In the Arkansas River valley of southeastern Colorado, and extending to the lower slopes of the Park Plateau in northeastern New Mexico, villages with slab foundation houses and those associated with maize-based farming mark the Apishapa phase of the Diversification period (ca. A.D. 1050–1450) (Campbell 1976; Kalasz et al. 1999b:195–198). This complex extends into northeastern New Mexico (Drake 1992; Krieger 1946). To the east, the Antelope Creek phase (ca. A.D. 1200–1450) of the Texas Panhandle exhibits a similar pattern of maize farming with slab-lined architecture including both standalone houses and multi-room residences (Brooks 2004; Lintz 1984, 1986, 1991).

Following an apparent hiatus in bison numbers between A.D. 500 and 1200, bison were hunted widely during the Late Formative period east of the mountains (e.g., Brooks 2004; Collins 1966, 1968; Creel 1991; Dillehay 1974; Driver 1985, 1990:254–257; Gunnerson 1989; Kalasz et al. 1999b; Kelley 1991:173; Lintz 1984, 1986; Speth 1984:11, 2004, 2005; Zier et al.1988). Mauldin et al. (2012) have challenged the long-held notion that this trend corresponds to environmental conditions that favored a return of bison to the region beginning in the late thirteenth century. They point to environmental data from central Texas to argue that bison populations may have actually declined, and that the increased numbers of bison in the Toyah phase (A.D. 1200/1300–1700) may indicate patchier availability of bison and more focused, logistical hunting of these beasts (but see Prewitt [2012] for some push-back on this argument).

Anyway, the resurgence of bison hunting may or may not relate directly to climate and environmental changes, but either way it does relate to the origins and development of the Pueblo-Plains interaction sphere. One result of the abandonment of the Four Corners region by A.D. 1300
was a huge influx of people into the northern Rio Grande valley, where large Pueblos (some containing more than 1,000 rooms) were constructed in the Classic period (A.D. 1300–1600). Depletion of game and other resources in the vicinity of these mega-villages may have encouraged Pueblo peoples to establish symbiotic trading arrangements with Plains groups. Plains groups traded hides, dried meat, and perhaps other products to the more settled farmers to the west in exchange for decorated pottery, obsidian, turquoise, scarlet macaws, copper bells, cotton blankets, and maize (Creel 1991; Hackett 1937; Speth 2004, 2005; Speth and Newlander 2012; Spielmann 1983, 1991). Creel (1991) argues that this regional exchange system was underway around or soon after A.D. 1300, with a key archaeological indicator being the appearance in the southern Plains of numerous beveled knives and endscrapers that were used to process bison hides (see also Boszardt and McCarthy 1999; Scheiber 2005). Spielmann (1983) presents evidence indicating that, prior to A.D. 1450, Pueblo-Plains interaction was limited mostly to gift exchange involving small numbers of items. This trade symbiosis actually extended across the Plains to the edges of the Eastern Woodlands as well, and it continued well into historic times. The early Spanish explorers observed the brisk trade between the Pueblo villages and nomadic bison hunters to the west, bison hides being the most important product traded to the Pueblos (Creel 1991:40–41; Hammond and Rey 1940:261).

For Southern High Plains villagers, bison hunting during the Late Formative was only one component of a varied subsistence strategy that also included not only maize-based farming, but also wild plants, hunting of other game species (including pronghorn), and fishing. Bison hunting had to be scheduled along with these other pursuits, and it is widely assumed that at least some portion of a village’s population left for the winter to pursue bison in mobile camps. The numbers of bison bones vary considerably among late prehistoric village sites east of the mountains, but whether this indicates variability in the intensity of bison hunting is an open question. The differences may stem from discovery biases; note that at the Henderson site near Roswell,

The tremendous importance of bison would not have been evident had our excavations focused solely on Henderson’s room blocks. Bison remains in these parts of the site were quite scarce … Only when we encountered the deposits in and around the earth oven complexes did the real importance of these animals become apparent. (Speth 2004:421)

At Henderson, the selective culling of bison parts appears to have increased in the late phase of the site’s occupation (early to middle fourteenth century). This corresponds to other evidence suggesting an increased reliance on bison by the site’s inhabitants at this time, with more logistical hunts focused on herds that were roaming farther from the village than was the case in the early (middle to late thirteenth century) phase.

Speth (2004, 2005; Newlander and Speth 2009) paints an admittedly speculative, but otherwise plausible, scenario to account for the patterned evidence observed at Henderson, the nearby and slightly later Bloom Mound, and throughout the southwestern Plains. According to this scenario, it was not only environmental conditions that favored an increase in bison hunting beginning in the late thirteenth century, but that bison hunting may indeed have been a response to profound changes in the Pueblo world to the west. At Henderson, this region-wide process apparently prompted the site’s inhabitants to focus increasingly on bison hunting, and the site’s occupants themselves (or perhaps only some of them) may have become full-time, nomadic bison hunters following the abandonment of the site (Speth 2004:426). At the same time, the apparent reduced
focus on bison hunting at the nearby (and slightly later) Bloom Mound, coupled with the substantial increase in exotic items at Bloom relative to Henderson, may signal that the occupants of this site were less focused on bison hunting and instead served as middlemen between the Pueblo world to the west and the nomadic hunters to the east. Also, changes in projectile point raw materials suggest that Bloom Mound hunters did not venture as far to the east as their Henderson predecessors. Long-distance mobility may have been curtailed as a result of increasing competition and specialization among nomadic bison hunters out on the plains, some of whom may have been the very assailants that massacred the victims found at Bloom Mound (Newlander and Speth 2009).

A big question with respect to the Late Formative period in northeastern New Mexico and neighboring areas is whether some groups continued a mobile, hunter-gatherer lifeway while others settled into villages and substantially built structures. Several researchers have advanced (or at least considered) the notion of a “Neo-Archaic” lifeway, in which a mobile, hunting-gathering economy continued relatively unchanged from Archaic times, with the only distinguishing characteristics being the addition of ceramics and the bow and arrow (e.g., Lord and Reynolds 1985; Mobely 1979; Phippen et al. 2000:34; Prewitt 1981; Roney 1985; Sebastian and Larralde 1989:47; Wiseman 1996:205). However, in far southeastern New Mexico there is a considerable decrease in the number of radiocarbon dates following a prominent peak in the Early Formative period (Railey 2013; Railey et al. 2011). At the very least, these data suggest that at no time after this peak were there hunter-gatherers who utilized the landscape in an extensive manner similar to that of Late Archaic and Early Formative times, that population levels of mobile hunter-gatherers were severely reduced at best, and/or rather sweeping subsistence changes indeed occurred after the Early Formative. To what extent similar radiocarbon-frequency trends characterize northeastern New Mexico remains an open question.

Close to the project area, the Late Formative period is poorly known in the Los Esteros Reservoir along the Pecos River, and Ute Lake along the Canadian. The apparent absence of intensively occupied village sites and diagnostic, Late Formative ceramics in these project areas suggests that either they was not occupied or only lightly utilized during this period. If so, then the area may have been occupied by mobile hunter-gatherers at this time or utilized on occasion by people from villages located elsewhere. Alternatively, it may be that village sites are present in the area, but located outside the dam area and reservoir impoundment.

**POST-FORMATIVE NOMADS (A.D. 1450–1870)**

The post-Formative begins with the widespread abandonment of late prehistoric villages in the southern Plains by A.D. 1450, as groups throughout the region shifted to a more nomadic lifeway centered more squarely on bison hunting (Baugh 1986; Bozell 1995; Brooks 2004; Collins 1966, 1968, 1971; Creel 1991; Dillehay 1974; Drass and Flynn 1990; Jelinek 1967; Speth 1979, 1983, 1984, 2004; Speth and Parry 1978, 1980; Spielmann 1983, 1991). As discussed above, in northeastern New Mexico evidence suggests Pueblo villages along the eastern front of the Sangre de Cristo Mountains and Park Plateau were abandoned even earlier, around A.D. 1300. Archaeologically, this period is somewhat of a phantom, as many of the diagnostic ceramic types largely disappeared along with village sites. Ceramics are not as strong a marker for the Post-Formative as they were during the Formative tradition. Spielmann (1983) argues that people on the west side of the Llano Estacado ceased making pottery at this time, obtaining vessels from the Pueblo societies to the west. Ocate Micaceous ware appeared in northeastern New Mexico at some
point in the Post-Formative, and is associated with ancestors of the Jicarilla Apache (Baugh and Eddy 1987; Brugge 1982; Gunnerson 1969). Side-notched arrow points, similar to those that appeared after A.D. 1200 (see above), continued into this period to an unknown date, along with Perdiz points that are characteristic of the Toyah phase in Texas and spill over in small numbers into the CFO region. During historic times stone arrow points were replaced by metal points and, eventually, firearms.

A key question is to what extent this abandonment of Southern Plains villages was stimulated by the economic opportunities of the Pueblo-Plains interaction sphere and/or to some other factor(s). Did people on the Southern Plains give up village life and farming (to whatever extent that farming was practiced) due to a downturn in environmental conditions? Or did they decide that a more intensive focus on nomadic bison hunting—in exchange for maize, beans, squash, and other cultivated foods—simply made more sense economically? Or was it some combination of both?

At any rate, by A.D. 1500, if not earlier, people on the Southern Plains had given up their attempts at village life, with its mixed focus on farming and bison hunting, and had become nomadic, tipi-dwelling bison hunters. This probably occurred at least in part due to increased demand from the pueblos for bison products and other resources from the Southern Plains (such as Alibates and Edwards chert). Spielmann (1983) cites evidence for an increased volume of Pueblo-Plains trade after A.D. 1450, with much more bulk trade of utilitarian goods in addition to continued gift exchange. Pecos Pueblo became a major entrepôt for Pueblo-Plains trade, and the Plains sites with Pueblo goods from the post-1450 period are mostly north of the CFO region. During historic times along the western edges of the Plains, the Jumano, Apache, Comanche, and Hispanic ciboleros successively filled the role of mobile hunters who supplied the pueblo and Spanish villagers of the Southwest with meat and other bison products.

As part of the shift to nomadism during post-Formative times, it is likely that tipis became a more common dwelling form and may have made their first appearance on the Southern High Plains at this time. The only archaeological remnants of tipis are rings of stone, commonly referred to as “tipi rings,” which were used to help secure the hide covering to the ground. The origin of tipis extends at least back to the Middle Archaic period in the northern Plains (ca. 3000–1300 B.C.) (Frison 1998:154), and they of course continued to be used into historic times, even into the early twentieth century. Tipi rings are most common on the Northern Plains; in Alberta there were 4,290 occurrences documented by early 1989, and estimates of tipi rings for that province range up to one million (Burley 1990:343–344). They are less common, but still widespread, in the Central and Southern Plains (e.g., Boyd et al. 1997; Collins et al. 2000; Gunnerson 1974; Mobley 1983; Tiller 1983; Young 1981), and are much less frequent in the Southwest and the Great Basin (Gibbon and Ames 1998:839). Not all rings of stone are tipi rings; others include medicine wheels and other non-tipi constructions (Malouf 1961; Oetelaar 2004).

Tipi have been the subject of numerous archaeological studies (e.g., Adams 1983; Banks and Snortland 1965; Davis 1983; Kehoe 1958, 1960, 1983; Malouf 1961; Oetelaar 2004; Quigg 1983; White 1998), and near the project area were documented in the Santa Rosa (formerly Los Esteros) Reservoir and Ute Lake areas (Hammack 1965; Levine and Mobley 1976; Mobley 1983; see below). Tipi rings often thy lack associated traces of hearths, have few or no associated artifacts, and as a result are notoriously difficult to date. For example, in one study of 2,785 stone circles in Wyoming (the vast majority of which are tipi rings) only 1.2 percent were securely dated.
Data Recovery at LA 184618, for a Bridge Replacement along NM 104, San Miguel County, New Mexico

(Schreiber 1993). These conditions may owe in part to the exposed surface context of most known tipi rings, leaving them vulnerable to the effects of erosion and non-professional surface collection. Tipi rings in buried contexts sometimes have numerous associated artifacts and preserved hearth remains (e.g., Loendorf and Weston 1983; Loendorf et al. 1981).

Sometimes the inner lining of a tipi was also weighted down with stones, creating a “double ring” of rocks (e.g., Finley and Schreiber 2007:5). Also, in some tipi rings more rocks were placed on the windward side to better anchor it to the ground (Finnegan 1983). Tipi rings were often robbed of stones by occupants of subsequent tipi encampments, and thus incomplete stone rings are often taken as an indicator of site reoccupation. Conversely, complete rings may indicate no reoccupation, or at least none after the tipi occupations marked by complete rings. Some have suggested that tipi rings should have become larger following the introduction of the horse and the consequent increased capacity for transported loads (e.g., Kehoe 1958, 1960), but the abundant evidence collected in the years since does not consistently support this hypothesis (e.g., Davis 1983), and in some study areas the largest tipi rings date well before the arrival of Europeans and their horses (e.g., Larson 1979). It is now widely acknowledged that the size range of tipi rings is related to season of use, family size, individual wealth, and ethnicity (Kehoe 1983). Following the introduction of steel axes, there was a shift to more frequent use of wooden pegs, rather than (or in addition to) stone weights to secure tipi coverings to the ground.

Seymour (2002, 2004; Lone Mountain Archaeological Services 2001) argues that tipi rings in the Southwest and southern High Plains are very late in time, postdating other types of structures, and even concludes that at least some are late nineteenth century Apache or Comanche dwellings. Such conclusions lack supporting evidence, however (see Kenmotsu et al. 2009:96–97). Similarly, Hammack (1965:62) assumed that tipi rings in the Ute Lake Dam and Reservoir project area were “early historic” in age, but there were no diagnostic materials or datable charcoal to support this conclusion. Hammack found tipi rings at five sites in the project area, including two of his excavated sites: LA 5543 (which had 37 tipi rings) and LA 5578 (one ring). Again, tipi rings date back several thousand years on the Plains, and it is possible that at least some in the Ute Lake area predate the post-Formative time frame. Most, however, probably indeed date to the Post-Formative time frame, including the centuries following the arrival of the Spanish in New Mexico.

Mobley (1983) conducted a detailed study of 97 rings at 11 sites near Santa Rosa, New Mexico. These ranged from 2.3 to 8 m in diameter, and nearly half of the rings (46) occurred at one site. The lack of evidence for stone “robbing” suggests that multiple rings at these sites are contemporaneous. Associated artifacts, including the micaceous-paste Kapo Black, indicate at least some of the tipis here were occupied after A.D. 1680. But many of the rings could not be dated. The Mescalero Apache used tipis, both in protohistoric times and after being confined to their reservation in the Sacramento Mountains.

**Historic Tradition (A.D. 1540–Present)**

When the earliest Spanish explorers entered the Southwest and southern Great Plains, they arrived in a world that had been substantially transformed over the preceding couple of centuries. The interaction sphere between the Southwest and the Plains continued well into historic times, into the early nineteenth century, with different ethnic groups filling the various roles on both sides. Because of the survival of Native Americans in eastern New Mexico well after the arrival of the
Spanish, the historic tradition overlaps in time with the post-Formative period. Here the historic time frame is divided into initial Spanish exploration (1527–1598), Spanish colonization and continued exploration (1598–1821), and the Mexican and American periods (1821–1875).

**INITIAL SPANISH EXPLORATION (1527–1598)**

In 1540, Francisco Vásquez de Coronado’s set out from Mexico on his expedition to southwestern North America and the Southern Plains. The Canadian River provided a natural route through the High Plains and beyond, and Coronado’s expedition probably passed through or near the present-day Ute Lake area during its 1541 journey in search of Quivira (Flint and Flint 1997; Hammond and Rey 1940; Winship 1904). Four decades later, the Chamuscado and Rodriguez expedition of 1580–1581 journeyed up the Rio Grande to the pueblos of New Mexico and also traveled eastward onto the Plains, probably in the vicinity of Santa Rosa (Hammond and Rey 1966; Mecham 1926). A little over a decade later, another Spanish venture set out for New Mexico in 1593, this time led by Antonia Gutiérrez de Umana (or Humana) and Francisco Leyba de Bonilla. This effort began as an officially sanctioned punitive expedition against marauding Indians living in southern Chihuahua. But the expedition leaders pursued an unauthorized quest for riches far to the north, to the New Mexico pueblos and out onto the Plains in present-day Kansas, probably in 1595. Like the earlier Coronado’s expedition, Umana and Leyba’s journey to the Plains probably passed through or near the present-day Ute Lake area. The sole survivor of this expedition was an Indian named Jusepe Gutiérrez. He was captured by the Apache, with whom he lived for a while, but eventually returned to New Mexico by the time the earliest Spanish colonists had arrived (Hammond and Rey 1953, 1966).

During their journeys out onto the Plains, these early Spanish entradas witnessed herds of bison and the tipi-dwelling nomads who hunted them. The nomads moved with the herds using travois pulled by dogs. These “dog nomads” were usually referred to by the earliest Spanish explorers as the “Querecho” or “Vaqueros,” at least some of whom were probably ancestral to historically known Apache groups (Sonichsen 1973:35; Opler 1983:385–386). Along with the Navajo, the Apache are Athapaskan speakers whose linguistic homeland lies far to the north in subarctic Canada. These groups moved southward through the western Plains and entered the Southern Plains and Southwest probably not long before the arrival of Coronado’s expedition (Opler 1983).

Non-Apache groups living on the Southern Plains and Southwest were also observed by, or reported to, the early Spanish explorers. Among the more prominent of these are the Jumanos, whose ethnic identity remains largely a mystery. The term “Jumanos” may actually refer to multiple ethnic groups centered primarily to the south, in the La Junta area along the Rio Grande and eastward into Texas, although reports suggest they ranged widely beyond this area (Anderson 1999:15–66; Kenmotsu 2001). It has also been suggested that “Jumanos” may refer, at least in part, to the occupants of the Tompiro or Salinas Pueblos (located between the Rio Grande and Pecos River valleys), given references to the “Humanas” or “Ximenas” in association with these settlements. The Tompiro Pueblos were abandoned by 1672, and it has been suggested that their Tonoan-speaking occupants may have become, or merged with, the Tonoan-speaking Kiowa (Flores 1991:472–473). But this is disputable at best, given that the Kiowa’s own legends recount a migration from the northwestern Plains, along the eastern Rocky Mountain somewhere between the upper Yellowstone and southern Alberta, and they do not appear in the Southern Plains or Southwest until the late 1700s (Hanson 1998:471–472). The Wichita, a farming and hunting people
who lived in villages of grass-thatched houses on the plains of southern Kansas, and who were probably encountered by the Coronado expedition, frequently referred to the Jumanos and were themselves sometimes called Jumanos (or various spellings of this name) by Euro-Americans (see Hämäläinen 1998:491).

Pinning down the ethnicity of the various nomadic groups reported by the early Spanish explorers is difficult for several reasons. A variety of names are attributed to what were probably the same linguistic groups, single names were likely attached to multiple ethnic groups (as was probably the case with “Jumano”), the ranges and territories of various nomadic groups overlapped, and ethnic extinction often involved absorption of some groups by others. Relating archaeological remains to specific protohistoric and contact period groups is even more challenging. Seymour (2002, 2004, 2009, 2010) argues that specific connections can be made between archaeological remains and specific ethnic groups (or at least Apache versus non-Athapaskans), but others have strongly questioned the evidential basis of her claims (Kenmotsu and Miller 2008; Kenmotsu et al. 2009). Archaeological remains dating from the time of Spanish contact and the early Spanish Colonial period have probably been found and documented in the Ute Lake area (Hammack 1965), but given the lack of associated chronological indices it is at best difficult to know with certainty whether such discoveries date from late prehistory as opposed to the post-contact time frame.

**Spanish Colonization and Continued Exploration (1598–1821)**

The Spanish colonization of New Mexico began in 1598 with the expedition of Juan de Oñate, whose team traveled up the Rio Grande valley, staying well to the west of the plains. The ensuing settlement of the region remained focused on the Rio Grande valley, with settlers clustered in the El Paso-Las Cruces and Albuquerque-Santa Fe areas throughout the Spanish Colonial period, although excursions out onto the Plains continued. These included a journey in 1601 by Oñate deep into the Plains of present-day Kansas, as part of an investigation of Umana and Leyba’s illegal expedition, and a 1634 expedition by Captain Alonzo Baca that probably followed a similar route (Bolton 1915; Hammond and Rey 1953; Simmons 1991; Twitchell 1911:345). Like earlier expeditions to the Southern Plains, these followed the Canadian River and probably passed through or near the present-day Ute Lake area. After that, there were few Spanish expeditions onto the Plains until after the Pueblo Revolt of 1680 and the subsequent Reconquest in the 1690s, the Spanish more firmly and permanently entrenched themselves in New Mexico.

Throughout the seventeenth and eighteenth centuries, relations between the Spanish, Pueblos, and Apaches fluctuated between states of mutual hostility and brutality at one extreme, to alliances, trade relations, and even co-residence at the other. By the early to mid-seventeenth century, some Plains Apache groups took up farming and a seasonally sedentary lifeway. This change was stimulated at least in part by Pueblo Indians who fled Spanish control and took up residence among Apache groups on the Plains (Gunnerson 1969; Schlesier 1972; Thomas 1935, 1940). As a result, some Plains Apaches began building more permanent structures, such as pit houses and even small room blocks. These include some archaeologically excavated remains on the eastern slope of the Sangre de Cristo Range in northeastern New Mexico (Gunnerson 1969).

Apache raiding became a much more effective strategy once they acquired the horse, but this apparently did not happen until sometime after the arrival of the earliest Spanish explorers and settlers. Some Jumanos may have acquired horses prior to the settlement of New Mexico, through
their trade links with the Spanish in northern Mexico (Hämäläinen 2003:835–836). But to the north, even as late as 1630 Apache traders arrived in the settlements of New Mexico with their loads on dog-drawn travois, and descriptions of their bison-hunting practices at this time did not include use of the horse (Haines 1938a:116). Yet by the 1650s the Apaches were skilled horsemen, were making raids on Spanish settlements to acquire more horses, and the intensity of their raids apparently increased during a severe drought that struck the region in the 1660s and early 1670s (Thomas 1940:4).

The spread of horses among the Apache and other Native Americans was catalyzed by the Pueblo Revolt of 1680, as the Spanish fled south and left behind large herds of horses in the Santa Fe area. Captured animals were added to the centuries-old menu of items traded from the Pueblos to Plains groups in exchange for bison hides and dried meat (Haines 1938a, 1938b). The spread of the horse had a profound impact on lifeways and geopolitical dynamics among various Native American groups, as well as the Spanish colonists (see Hämäläinen 2003). The acquisition of the horse by the Apaches, in conjunction with their growing numbers and perhaps superior military tactics, at first gave them a decisive advantage over their rivals on the Southern Plains. They hit the Jumano and other groups especially hard, effectively destroying them on the Southern Plains and gaining control of east-west trade routes by 1700 (Forbes 1959; Haines 1938a:117; Hämäläinen 1998:488, 2003:836). The Canadian River provided one of the main routes for the east-west trade between the Plains and Southwest. In his published maps, Schlesier (1972) shows the Canadian River lying within the “Panhandle division” of the Southern Plains Athapaskan Aspect in 1692, the Cipayne-Lipan in 1706, and the Lipan in 1724. The first punitive attack against the Apache by the Spanish occurred in 1715, which failed to encounter any Indians but confirmed that various bands of Apache were living along the Canadian River (Thomas 1940:7).

The Apache’s advantage on the Southern Plains proved short lived, as the Comanche soon became the main beneficiary of the historical geopolitical shake-up following the spread of the horse. Belonging to the Eastern Shoshone language group, the Comanche were descendants of Numic speakers whose dramatic expansion was the signature development of late prehistory in the Great Basin (see Bettinger and Baumhoff 1982). Comanche ethnogenesis probably occurred in and/or near southeastern Wyoming, sometime before 1700 (Hanson 1998:469–470; Shimkin 1940). They likely acquired the horse in their ancestral homeland around 1690 (cf. Haines 1938b), and from there migrated out onto the Plains, moving mainly to the southeast, to take advantage of opportunities offered by the Southwest-Plains interaction sphere. By the early eighteenth century they were specialized, horse-mounted bison hunters concentrated along the Arkansas River in southeastern Colorado and western Kansas (Hanson 1998:470; Richardson 1933), and their historic role in New Mexico history commenced during this period. Along with their Numic-speaking linguistic relatives, the Utes, Comanches first appeared as traders in New Mexico in 1706 (Hämäläinen 1998:488; Hanson 1998:469; Richardson 1933:55; Shimkin 1940), and in 1719 they started raiding and trading widely in New Mexico.

Building on their new lifeway as tipi-dwelling, bison-hunting nomads with exceptional horsemanship skills, the Comanche became renowned warriors, raiders, and traders. Along with their allies, the Kiowa and Wichita, they hit the Plains Apache groups especially hard. Having developed a semi-sedentary lifeway that included seasonal farming, Plains Apache settlements were sitting ducks for the more mobile Comanche and their well-organized cavalry attacks (Flores 1991:471; Hämäläinen 1998:489). Just as the Apache had previously dispatched the Jumano and
perhaps other nomadic Plains groups with whom they competed, the southern Apache in turn were pushed off the Plains and into neighboring portions of Texas, Mexico, and New Mexico (Hämäläinen 1998:489; John 1975:227–230, 1991; Kavanagh 1995; Kenmotsu 2001). The Lipan Apache are mentioned as being in the Texas Panhandle for the last time in 1715 (Schlesier 1972:111), when they apparently were farming and bison hunting. Following a nine-day battle in 1723 between Comanche and Apache, somewhere “on the Plains east of Pecos” (Schlesier 1972:117), the Lipan retreated southward. By 1743 the Lipan were centered on the Colorado River of west Texas, far to the south (Schlesier 1972). The Canadian River was probably Comanche territory, although they may not have permanently occupied northeastern New Mexico at this time. Rather, it appears they transited and raided the area from their base along the Arkansas River to the north (Thomas 1958). By 1740 the Comanche’s range had expanded southward, extending from western Kansas and southeastern Colorado to south-central Texas, and from the Pecos River on the west to central Kansas, Oklahoma, and Texas on the east. In 1751 the Comanches attacked deep into New Mexico, at Galisteo in the Rio Grande valley (Thomas 1958:21). By the 1760s the Comanche had effectively driven the Apaches from the Southern Plains to their margins (Hämäläinen 2003:837).

As with the Apaches and other Southern Plains groups before them, raiding was just one component of the Comanche’s more complex relationships with neighboring groups in the region. Apart from their prowess as warriors, their skill as traders (who often bartered goods and people obtained through raiding and kidnapping for ransom) enhanced their role in the regional economics and geopolitics of the Southern Plains and neighboring regions. The French entered the mix in the early 1700s, as traders fanned out across the Plains, established relations with various native groups, and among other things began supplying them with firearms (Eccles 1990; Jaenen 2001). In 1739, the French Mallet brothers traveled with Indian allies from present-day Nebraska and reached Picuris Pueblo in northern New Mexico (Schlesier 1972:119, 121; Thomas 1940:15–16). The Mallet Brothers then returned to New Orleans following the well-worn route from Pecos and down the Canadian River (Thomas 1940:16–17). The accounts of this journey confirm the presence of Comanche in the area at this time, and the absence of Apache. To the northwest and north, however, the Jicarilla Apache were able to blunt the Comanche advance somewhat, with help from the Spanish (Thomas 1958:1).

For nearly a century, from the 1740s to around 1830, the Western Comanche operated a major trade center along the Arkansas River in southeastern Colorado, which “was the nexus point of an extensive trade network that stretched from the Rio Grande to the Mississippi River and from central Texas to the Missouri River” (Hämäläinen 1998:487). This trade center was, in a large sense, one of many historical successors within the Plains-Southwest interaction sphere that had already operated for several centuries (Hämäläinen 1998:488), although by now its scope was much wider and was of critical importance to the Spanish in New Mexico. Although Indians continued to supply bison products, Hispanic bison hunters, or Ciboleros, also ventured out onto the Plains from as early as the late seventeenth century (Morris 1997:155–166; Shinkle 1970). Hispanic shepherders also attempted to expand onto the Plains of northeastern New Mexico during the Spanish Colonial period, but their efforts were frustrated by continued threats from the Apache and Comanche (Bannon 1964:154; Levine 1980:65).

Relations between the Spanish, Comanche, and other players in the region continued to fluctuate between trading, raiding, and all-out war during the late eighteenth century, and the Comanche-
orchestrated trade network suffered some serious setbacks beginning in 1779 and into the 1780s (Hämäläinen 1998:502–503). But the Comanche’s trade capabilities were enhanced and reinvigorated by a peace agreement with Spain in 1786, after which Comancheros (settled traders of Spanish, Pueblo, and other Native American ethnic affiliation) began to trade more actively with the Comanche. The Spanish also supported further Comanche attacks against Apache groups at this time (Hämäläinen 1998:504–505; Kenner 1969:53–58). The Comancheros continued to support their Comanche allies into the Mexican and American periods, when the Comanche made their last stand against the U.S. military in the Llano Estacado.

**Mexican and American Periods (1821–1875)**

Following the Louisiana Purchase in 1803, most of the Great Plains became part of the United States. American traders began following their French predecessors into the Plains, and on to New Mexico along the Santa Fe Trail. Mexico’s independence from Spain in 1821 further reshaped the geopolitical mosaic of the Southern Plains and the Southwest. The Mexican government approved land grants near present-day Tucumcari, including the Pablo Montoya Grant in 1824 and the Baca Location #2 in 1835, both west of the Ute Lake area. The Hispanic ranchers that occupied the Montoya Grant abandoned it by 1840, however, due to constant threats from the Comanche. Mexico’s financial troubles adversely affected trade, and relations between the Comanche and New Mexico shifted from an emphasis on exchange to warfare. Meanwhile, incursions by the Arapahoe and Cheyenne into the upper Arkansas led to intense competition between them and the Comanche based in that area. The once-flourishing Western Comanche trade center was already facing considerable challenges when it was finally brought to an end with the establishment of Bent’s Fort in 1833. Bent’s Fort was intentionally situated in the same area as the Western Comanche trade center, along the upper Arkansas River (which was now part of the U.S.–Mexico border), to take advantage of the vast trade network’s existing geographic nexus and position along the Santa Fe trail (Hämäläinen 1998:512–513). Another fortified trading post was established in 1845 at Adobe Walls in the Texas Panhandle, but was intentionally blown up by the traders three years later, following repeated attacks by the Comanche and Kiowa (Baker et al. 2001).

Meanwhile, following the American Revolution, Euro-Americans from the southeastern United States began expanding deep into Texas, which became part of Mexico after 1821. Neither Texas nor New Mexico remained part of Mexico for long, however, as they were acquired by the United States following the Mexican-American War of 1846–1848. During and after the war, Hispanic Ciboleros continued hunting bison in the Plains of eastern New Mexico. In 1847, a group of Jicarilla Apache attacked a small party of Americans traveling along the Santa Fe Trail along the Lower Cimarron Crossing. A U.S. Army unit under Captain W.N. Grier pursued the attackers and caught up with them near present-day Tucumcari (Thomas 1958:25).

The Comanche’s fortunes suffered greatly with the demise of their trade center along the Arkansas River, the decline of bison herds as a result of market hunting (and in response to a severe drought in the 1850s), and the swelling and expanding population of Americans, especially in Texas. By the mid-1850s many Comanche were starving, and fell back on raiding as the mainstay of their economy, along with commercial bison hunting (Flores 1991). Along with their Kiowa allies, the southern Comanche carried out attacks on both Apaches and Spanish-speaking settlers in surrounding areas. While the Spanish and Mexicans had necessarily turned somewhat of a blind eye to Comanche aggression, following the Mexican-American War, the United States was not so
forgiving. In 1858 Texas Rangers carried out the Antelope Hills Expedition, against Comanche and Kiowa in the Canadian River valley of the Texas Panhandle and western Oklahoma, which culminated in the Battle of Little Robe Creek on May 12 (Richardson 1933).

In 1863 the United States established Fort Bascom along the Canadian River, just west of present-day Ute Lake. It was one of a series of forts aimed at controlling Comanche and Kiowa raiding, as well as now-illegal activities by their Comanchero allies (Fugate and Fugate 1989:354). American settlers began arriving in the area, but the Civil War drained the region of military troops and Indian attacks intensified. The U.S. Army’s response included a campaign by Kit Carson at the First Battle of Adobe Walls in 1864, in the heart of the Texas Panhandle. The Army expedition, which included Ute and Jicarilla scouts, encountered approximately 1,300 Comanche and Kiowa warriors who forced Carson into a tactical withdrawal (Pettis 1908). The Indian threat in northeastern New Mexico was largely eliminated by 1870, when Fort Bascom was abandoned. The Comanche, who had made their last stand on the Llano Estacado in southeastern New Mexico and western Texas, were finally subjugated during the 1874–1875 campaign under Lieutenant Colonel William R. Shafter and Colonel Ranald S. Mackenzie. The Comanche were then confined to their reservation in Oklahoma, ending more than a century of activity and extensive control over the Southern Plains (Leckie 1967; Shafter 1933; Smith 2000; Wallace and Hoebel 1952).

**LOCAL HISTORY AFTER 1875**

With the threat of Indian attacks removed, settlers began moving into the Canadian River valley of New Mexico in earnest during the 1880s and 1890s. The project area and its surroundings have been used primarily for grazing.

**Conchas and Trementina**

Communities near the project area include Conchas and Trementina. The small community of Conchas was established around 1939 by government workers employed by Conchas Lake State Park after the completion of Conchas Dam (Fugate and Fugate 1989). The town of Trementina was established ca. 1900, however, the area had been occupied for many years prior to the town itself. A post office was established in 1901 and remains today (Pearce 1990). Although the town is now considered a ghost town, it thrived in the first half of the twentieth century. A Presbyterian medical missionary, Miss Alice Blake, was instrumental to the growth and establishment of the town. She served as not only the postmistress but also as the principal of the Presbyterian School (Sherman and Sherman 1975). By the end of World War II, the town was practically empty. Its decline was caused by several events including the retirement of Miss Blake, the drought, and the number of residents of the area that enlisted in the military during World War II (Ghosttowns.com n.d.).

**Homesteads**

A search of the BLM General Land Office online records show that the project area is located within a parcel patented to Simon Garcia on December 9, 1892 under the Homestead Entry Act of 1862 (12 Stat. 392). Mr. Garcia patented 159.32 acres of land within Section 5 of Township 12 North, Range 25 East (BLM 2016).
NM 104

LA 184618 is located on the south side of NM 104 between the NM 104 intersection with NM 129 to the east and Trementina to the north. NM 104 is the main highway connecting the small town of Conchas, on the southeast side of Conchas Lake, to Las Vegas to the west and Tucumcari to the east-southeast. The highway as it exists within the current project vicinity was not given the NM 104 designation until the 1930s; it first appears on the Official Road Map of New Mexico on the 1939 version extending west from Gate City, north of Newkirk, to Las Vegas. Prior to that, on the 1935 Official Road Map of New Mexico, it was identified as NM 65 and followed a slightly different alignment which first appeared on the 1923 map (Wallace 2004).
CHAPTER 4
RESEARCH DESIGN

Jim A. Railey

The data recovery plan (Railey 2016) presented a research design that oriented the proposed data recovery effort to a general theoretical perspective and more specific research domains and questions. These domains and questions arose in part from our current knowledge of regional and local cultural history, which is presented in Chapter 3. In particular, we were prepared to investigate not only what data from LA 184618 might tell us with respect to basic questions about chronological age, subsistence information, assemblage patterning, etc., but also how basic information about the site relates to broader patterns at local and regional scales of analysis. Some research issues cannot be fully explored in depth within the context of a data recovery project, either because the available data at the local or regional levels are not sufficient, or such an endeavor might be beyond a reasonable scope of work for a particular project. It was also recognized that the amount of information that would be obtained from LA 184618 might be very limited, which indeed proved to be the case. Here the research design from the data recovery plan is revisited, in light of the limited findings at LA 184618.

GENERAL THEORETICAL ORIENTATION

The general theoretical approach for this project emphasized the importance of four factors:

- environmental conditions;
- the structural dynamics and organizational variability of human societies;
- the role of human agency; and
- the role of cultural-evolutionary forces that simultaneously channel human behavioral patterns and serve as a source of cultural variation and the historical contingency of evolutionary change.

This perspective recognizes the value of different approaches to explaining human cultural and social variability and long-term evolutionary change, which can be divided into three main groups: 1) ecological/demographic, 2) social-structural, and 3) neo-Darwinian (see Railey 1999:13–73, 2001:38–46). These approaches essentially consider the full sweep of factors that shape human cultures, ecological adaptations, technologies, and social structures. The theoretical approach embraced here recognizes that the organization of actors and groups within a region, their perception of the landscape, the decisions they make at the household and community levels, and the actions they ultimately take are largely structured by both the immediate environmental and social conditions in which they live and what has come before, that is, their history. Thus, although environmental and social conditions affect or constrain the behaviors and influence the ideologies of a given group, that group's history, its place of origin, its established connections to places and other groups, and the ways it has coped in the past with environmental, population, and resource stresses, all directly affect its response to
these stimuli at any given point. In addition, human agency – the choices people make as they take action to realize their goals – plays a role in their responses. In other words, individuals are not just passive receptacles of cultures and "norms," they are conscious actors or agents with diverse aims who draw upon and manipulate resources to their strategic advantage. Yet these actors are socially constituted beings who are embedded in socio-cultural structures and ecological surroundings that both define their goals and constrain their actions. In this view, cultural patterning is viewed as a long-term process resulting from the interplay of historically constituted structure(s), human agency, and environmental adaptations, rather than simply as an adaptive response to particular environmental stimuli. (Potter 2006:7)

The atomizing effect of historical contingency works in conjunction with forces of cultural transmission and environmental variation to produce both a remarkable patterning of behavior within a particular culture, as well as the exceeding divergence of behavioral patterns among cultures. At the same time, biological evolution has produced equally remarkable recurrences of behavioral patterns shared cross-culturally by the human species. Thus, cross-cultural patterns of human behavior can be recognized, for example, in recurrent organizational structures, such as the family group–local group–chiefdom–state evolutionary taxonomy (Johnson and Earle 1987), Johnson’s (1982, 1989) sequential versus simultaneous hierarchy model, the corporate versus network model (Feinman et al. 2000), the transmission of information involving culturally constituted symbols or material marker traits (Wobst 1977), exchange patterns of prestige goods, and peer-polity interaction (Renfrew and Cherry 1986). In the end, though, a central challenge in explaining the past is to understand how cross-cultural (or region-wide) patterns of human behavior play out on a particular, historically unique stage, such as eastern and southeastern New Mexico.

**OBJECTIVES AND RESEARCH PROBLEMS**

The research objectives of the data recovery investigations proposed for LA 184618 were divided into five research domains: 1) geomorphology, 2) the number of temporal components at the site and their chronological ages, 3) the nature and intensity of the prehistoric occupation(s) at the site, 4) subsistence and land use, and 5) flaked stone technology. Specific analytical methods are referred to here, but are described in detail in Chapter 5. The objectives and research domains described here are considered pertinent to a data recovery investigation and, in some respects, the specific characteristics of LA 184618 as it is currently known.

**RESEARCH DOMAIN 1: GEOMORPHOLOGY**

The geomorphic context of LA 184618 appears to be comparatively straightforward, with surficial deposits overlying residuum and bedrock. Accordingly, a detailed geomorphic study was not planned for this effort, although investigations were geared to address certain key questions:

1. How thick are the Holocene-age sand deposits at this site, how many stratigraphic units are present, and what is the geological history of sedimentation and erosion at the site?

2. How does the site’s geomorphology relate to its archaeological components? Is there any stratigraphic separation of components and are there any living surfaces preserved below the surface at the site?
Data Needs and Considerations

To address these questions, a backhoe was used to excavate two trenches within the work area. The backhoe trenches (BHTs) uncovered vertical exposures deeper than those provided by manually excavated hand units. A profile description was completed for these trenches from a representative column, and photographs were taken.

Research Domain 2: Number of Components and Chronological Ages of the Site’s Occupations

Based on diagnostic artifacts, it was known that LA 184618 contained both Archaic and historic period components. But these components were known only from surface artifact indicators. Thus, the following question was posed:

1. How many components are represented in the archaeological remains within the construction corridor at LA 184618?

Data Needs and Considerations

As with most excavation projects, we were prepared to utilize at least two lines of evidence to acquire chronological data for this project: temporally diagnostic artifacts and chronometric data. Within the work area, artifacts were collected from the surface and from the subsurface through excavations, and information from diagnostic artifacts outside the work area was considered as well. No intact archaeological features containing charcoal were identified, and so chronometric dates were not an option for this project.

A second question under this domain is:

2. How do the prehistoric occupations at the targeted site relate to broader cultural-historical trends in the region?

Data Needs and Considerations

Compared to Question 1, this is more of a synthesis-level question. Given the somewhat detailed level of knowledge for at least some cultural-historical trends in the surrounding region (see Chapter 3), it was anticipated that even basic chronological data from the investigations would allow us to relate the site occupations to broader trends, and perhaps sharpen our understanding of those trends as well.

Research Domain 3: Nature and Intensity of the Site’s Prehistoric Occupations

Survey-level documentation suggested that the prehistoric occupation(s) at LA 184618 was (were) probably small scale and short term. The observed artifact assemblage was small, and no features or dark staining was visible on the surface. Still, there was a variety of artifacts, including both flaked and ground stone, suggesting more than just a momentary camp. As such, it was surmised this was probably a place provisioned with items by highly mobile hunter-gatherers; such provisioning is expected when mobile people anticipated reusing a site and/or stayed there for a relatively long time (Kuhn 1995, 2004; Rockman 2008; Schlanger 1992). Yet stone-tool
assemblage diversity, or richness, is also not a direct indicator of site function because it “is routinely correlated with, and potentially dependent upon, assemblage size” (Grayson and Cole 1998:928; see also Beck 1984; Jones et al. 1983; Kintigh 1984; Thomas 1989:86–87). Assemblage size itself can relate to a variety of factors, including multiple kinds of occupations at a given site.

Still, even though assemblage diversity is related to assemblage (or sample) size, there is still at least a theoretical relationship between hunter-gatherer site function and assemblage diversity. Thomas (1989:86), for example, expressed these theoretical relationships in graph form (Figure 4.1, left side). Essentially, residential sites have the highest artifact diversity, logistical camps are in the middle range, and diurnal sites have the lowest artifact density. With increasing assemblage (sample) size, residential sites are expected to show a rapid increase in assemblage diversity, with the rate of diversity increasing less with logistical and, especially, diurnal sites. However, Thomas’ graph implies that diversity will increase infinitely with ever-larger assemblage size. This ultimately means that every artifact would be assigned to its own category, which of course would make categorization meaningless. In reality, of course, the number of categories that make up assemblage diversity (however, they are defined by any particular observer) is not infinite. Moreover, the number of potential categories should be especially limited with open-air sites, where only non-perishable materials (lithic artifacts, ceramics, and sometimes bone artifacts) are present. Thus, at some point assemblage diversity should start leveling off with increasing assemblage (sample) size. Accordingly, perhaps a more realistic expectation would look something like the graph on the right side of Figure 4.1. For residential sites, diversity would still increase rapidly with an increase in assemblage (sample) size, but as the number of observed artifact categories approaches the actual number present at a site, the frequency trend line will begin to fall off, and go flat eventually. For logistical and diurnal sites, diversity should increase more slowly, and the trend line should flatten out sooner (this should be especially true for diurnal sites).

With these considerations in mind, the following question was posed for this investigation:

1. How does assemblage richness at the site relate to intensity and mode occupation?

Of course, artifact diversity is not the only potential measure of site function and intensity of occupation. Other lines of evidence need to be considered as well, including artifact density, presence or absence of discernible structure remains, dark-stained anthropods, and other features. It was anticipated that, if no recognizable structure remains were present at LA 184618, or if there were nothing more than the remains of expedient huts, then this would reinforce the current image of the site’s prehistoric component as the remains of one or more small-scale, short-term occupations (cf. Binford 1990). This prompted the following question:
2. Are there any preserved structure remains within the work area, and if so what do their characteristics suggest with respect to occupation intensity, duration, and anticipated use life?

![Figure 4.1](image-url)

**Figure 4.1.** Left: theoretical model showing the relationship between assemblage size and diversity within hunter-gatherer camps (adapted from Thomas 1989:Figure 9.1). Right: same graph, but modified to assume that the potential number of categories is finite.

As it turned out, no structure remains were found at the site, obviating any follow-up analysis on this front.

**Data Needs and Considerations**

To search for any preserved features within the portion of the site in the construction area, following all other field activities most of the work area was mechanically scraped. Because it was determined that the site surface had been carved into pre-Holocene matrix, and that the site was deflated to one degree or another, the entire site area was not scraped as originally proposed.

**Research Domain 4: Subsistence Practices and Paleoenvironments**

Faunal and floral remains provide the most prominent empirical evidence needed to explore questions concerning subsistence behavior and paleoenvironments, although the types and diversity of other material remains—especially ground stone milling equipment—are relevant to this research domain as well. Modern techniques for analyzing faunal and floral assemblages have provided remarkable insights into prehistoric subsistence economies, fuelwood use, and environmental impact. However, in the data recovery plan it was acknowledged that addressing these issues would depend on the presence and recovery of plant remains resulting from subsistence activities at the site. Due to the absence of any preserved features or charred plant remains, and the near-absence of archaeological faunal materials, no data were brought to bear on this research domain.
**RESEARCH DOMAIN 5: LITHIC TECHNOLOGY**

Flaked stone tools, and the waste debris from their manufacture, are among the most abundant of archaeological remains, especially at sites predating metal technology. These items offer a veritable bonanza of information, and assemblages of waste debris (typically referred to as *debitage*, or *flakes*) are especially well suited to a range of quantitative methods. Accordingly, detailed analysis of these otherwise mundane items, along with cores and tools, can tell us much about human behavior and activities in the unrecorded past. For the data recovery investigation proposed at LA 184618, we were prepared to analyze the flaked stone assemblages for potential indicators of technological variation or change through time, raw material utilization, mobility patterns and variation in site function, and local and regional interaction.

The following questions were posed for this lithic technology research domain.

1. How does the debitage assemblage compare quantitatively to others analyzed by SWCA using our standard method, and what implications can be drawn from this comparison?

2. What data can lithic tools and other non-debitage lithic artifacts contribute to interpretations concerning site function and any discernible assemblage changes through time?

3. What do obsidian (if present) and any other nonlocal materials signify in terms of extra-local interaction?

**Data Needs and Considerations**

Lithic artifacts were not very numerous at LA 184618, and restriction of the data recovery effort to the work area further limited the number of specimens available for collection. Still, enough items—almost all debitage—were collected that a meaningful, comparative analysis was possible, and the results of this analysis are presented in Chapter 6.
CHAPTER 5
LA 184618: SITE DESCRIPTION, ARCHAEOLOGICAL INVESTIGATIONS, AND FINDINGS

Jim A. Railey

Additional Site Numbers: N/A
UTM/PLSS Data: See Appendix A
USGS Quadrant: Bookout Ranch (1972) 35104-C3
County: San Miguel
Elevation: 1,314 m (4,310 feet)
Landowner: Private and State (NMDOT)
Cultural Affiliation and Age: Middle and/or Late Archaic (4000 B.C.–A.D. 500); Hispanic (A.D. 1880–1930)
Site Type: Artifact scatter with historic features
Size: 5,480 m² (58,986 square feet, or 1.35 acres)
NRHP Eligibility Recommendation: Eligible, Criterion D
Management Recommendations: Mitigation through data recovery completed; no further investigations for this undertaking.

SITE DESCRIPTION

LA 184618 (Figure 5.1) lies on an erosional terrace on the valley floor of Cuervo Creek. A sharp bend in the creek surrounds the site on three sides (east, west, and south), creating an elevated, gently sloping promontory above the present-day floodplain. Sedimentary rock crops out along the sharp drop-off that defines most of the site’s eastern boundary (Figure 5.2). The right-of-way fence defines the northern site boundary, and it is unclear how far the site originally extended in this direction, prior to the construction of NM 104. Erosion has especially impacted the eastern portion of the site, and a north/south-oriented two-track road runs through the site’s western portion, and is shallowly incised into the site’s surface. Vegetation across the site includes juniper, mesquite, yucca, broom snakeweed, cacti, and various grasses and forbs. The adjacent floodplain of Cuervo Creek hosts a radically different, riparian environment dominated today by an overstory of invasive tamarisk (also known as saltcedar). The site location and detail maps are shown in Appendix A.

PREVIOUS INVESTIGATION

Parsons Brinckerhoff, Inc. (PB), first recorded the site, as part of the current undertaking, under New Mexico Cultural Resource Information System (NMCRIS) No. 135358 (Lawrence and Del Frate 2016). The survey investigation recorded a prehistoric component, consisting of an artifact scatter confined to the northern portion of the site. About half of the scatter lies within the data recovery work area (Figure 5.3). PB observed only 38 artifacts, most of which were debitage (n = 33, or 86.8 percent of the assemblage). The remaining five artifacts consisted of a projectile point (Figure 5.4), scraper, mano fragment, chopper, and core (Table 5.1). The projectile point exhibits characteristics typical of Archaic-tradition types, and the PB investigators suggested a Middle or Late Archaic affiliation. Quartzite dominates the lithic artifact assemblage, and it is the raw
material that probably is found closest to the site. The investigators also reported basalt, silicified wood, green rhyolite, and multicolored chert in the debitage assemblage. Although the assemblage is small, there is an appreciable diversity of items, suggesting that LA 184618 may have functioned as a residential camp for a highly mobile group of hunter-gatherers.

Figure 5.1. Northwest-facing view toward the data recovery work area within LA 184618.

Figure 5.2. East-facing view from LA 184618, showing the small escarpment between the erosional terrace on which the site sits, and the present-day floodplain of Cuervo Creek below. Mesa Rica is in the distance.
Figure 5.3. Survey site map of LA 184618 (from Lawrence and Del Frate 2016).
The historic component includes the site’s only recorded feature (Figure 5.5) and a scatter of 71 observed artifacts. PB described Feature 1 as

a 36 ft E-W by 21 ft N-S rectangular-shaped sandstone rubble mound overlooking a bend in Cuervo Creek (Figure 5). At its greatest height, the rubble mound appears to be 4 ft above the surrounding ground surface indicating significant potential for buried deposits within. A concentration of large stones at the western end of the feature may be the remains of a hearth or chimney. No staining was visible; however, grass covers the area which may obscure this phenomenon. (Lawrence and Del Frate 2016:20)

Table 5.1. Non-debitage Lithic Artifacts Observed by PB at LA 184618

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projectile point</td>
<td>A potential Bajada or Ellis type projectile point (Figure 5.4) from the Middle to Late Archaic period; measures 4 × 2 × 1 cm; tan/red quartzite, stemmed with side notches.</td>
</tr>
<tr>
<td>Scraper</td>
<td>A fine-grained black quartzite expedient scraper; one edge has unifacial retouch and possible use wear; 4 × 2 × 1 cm.</td>
</tr>
<tr>
<td>Mano fragment</td>
<td>A tan quartzite one-hand mano fragment; unifacially ground; 7 × 6 × 4 cm.</td>
</tr>
<tr>
<td>Chopper</td>
<td>A gray quartzite hand chopper/tested cobble; 13 × 9 × 6 cm.</td>
</tr>
<tr>
<td>Core</td>
<td>A tan quartzite multidirectional core with 30 percent cortex; 8 × 7 × 6 cm.</td>
</tr>
</tbody>
</table>

Source: Lawrence and Del Frate (2016:Table 5)

The feature is obviously the remains of a house structure, and the site’s historical artifacts consist of domestic items (white ware, crock ware, glass, cans, other metal fragments, and some scraps of milled lumber). The historical artifact scatter occurs throughout the site, although the majority is in the southern portion, and includes an artifact concentration (AC 1) just south of Feature 1.

PB did not dig any shovel tests at LA 184618, but did note that pin flagging indicated the site is covered with sediment at least 20 cm in thickness. Because of these sediments, PB concluded there is a high likelihood of buried archaeological remains at the site and recommended LA 184618 eligible to the NRHP under Criterion D. Because the portion of the site within the proposed TCP could not be avoided, PB recommended treatment of the site prior to construction.
DATA RECOVERY INVESTIGATIONS AND FINDINGS

SWCA carried out data recovery fieldwork at LA 184618 July 22–27, 2016. Data recovery activities were restricted to the work area. Per the data recovery plan, the investigations involved surface collection and mapping, excavation of six 1 × 1–m hand units, two backhoe trenches, and machine scraping.

SURFACE ARTIFACTS AND MAPPING

A low-density scatter of surface artifacts marks the site (Figure 5.6). Artifacts were collected from the work area only. A total of 36 flaked-stone artifacts was collected from the surface within the work area, constituting 83.7 percent of the collected lithic assemblage. The “mano” that PB recorded within the work area was either not found again, or was determined to be a natural pebble. Twelve historical artifacts were found and collected within the work area.

The rest of the site, outside the work area, was casually inspected for any noteworthy artifacts. The projectile point observed during PB’s survey (see Figure 5.4) was not observed, but another point was found during the data recovery, also outside the work area (Figure 5.7). This was a basal fragment with a hafting element similar in morphology to the point observed by PB. It was fashioned from a white orthoquartzite.
Figure 5.6. Distribution of surface artifacts within the work area. Some of the historical artifact points include multiple items. Surface-contour elevations are arbitrary rather than above mean sea level.
A surface-topographic map of the work area was produced by taking vertical measurements with a hand level and stadia rod in the field, at 50 selected location points including the southwest corner of each hand unit. Each point location was recorded with a GPS unit. After the fieldwork, data from these points were used to manually draw the contour lines, which then were digitized as a map layer.

![Figure 5.7. Projectile point basal fragment of white orthoquartzite, found on the surface outside the work area (not collected).](image)

**SITE GEOMORPHOLOGY**

Hand units and backhoe trenches revealed very hard-packed soil, including a Stage II calcic horizon at or near the present-day ground surface. Bedrock crops out along the eastern margins of the site and farther downslope, and this includes both tabular slabs and some cobbles rounded by stream action (Figure 5.8). Yet no bedrock was uncovered in either of the two BHTs, which penetrated up to 1 m below the ground surface (Figure 5.9; Table 5.2). The site surface is deflated, with erosion more severe along the eastern margin of the work area, where the ground surface slopes downward. The Stage II calcic horizon is partially or totally removed in this downslope portion of the work area. But in the highest portion of the site the calcic horizon is capped by up to 20 cm of soil without any visible carbonates, and is also underlain by non-carbonate matrix. The calcic horizon itself is 40 cm thick in the best-preserved exposure within the work area. The subsurface soils have been bioturbated to one degree or another.

The subsurface exposures in the work area, and general character of the site and its immediate surroundings, suggest that the site surface rests directly upon pre-Holocene matrix. The Stage II calcic horizon is especially telling as to the age of the subsurface sediments, as “[c]alcic horizons of Stage II or greater development have not been documented in Holocene deposits in the southwestern United States” (Bachman and Machette 1977:67). The soils observed within the work area suggest the site sits on a remnant of pre-Holocene alluvium that was deposited on bedrock along the valley floor of ancestral Cuervo Creek. The cobbles on the surface indicate deposition involved one or more episodes of high-energy alluvial action. Both the deposits and formation of the Stage II calcic horizon at the site probably occurred during the Late Pleistocene (Dr. Stephen A. Hall, Red Rock Geological Enterprises, personal communication, 2016). As Cuervo Creek continued to cut down into the valley floor, this ancient alluvium was partially removed and the underlying bedrock exposed along and above the present-day margins of the creek’s floodplain. But a promontory-like remnant of the Late Pleistocene alluvial deposits
The stabilized surface atop this alluvial remnant allowed for development of the calcic horizon. As noted above, this pedogenic process probably also began during the Late Pleistocene. Some eolian sediment has probably been deposited on this low upland surface, and perhaps there is some eolian contribution to the subsurface alluvial sediments as well. At any rate, the hardness of the soil at or near the present-day ground surface is consistent with the exposure of pre-Holocene matrix at the surface across at least most of the work area (and probably the rest of LA 184618). Further erosion and deflation—which has probably accelerated with cattle grazing during historic times—has further exposed the pre-Holocene soils at this location.

Human occupation occurred on a stabilized, pre-Holocene surface, and this surface has experienced some erosion during the Holocene and (perhaps especially) in historic times. These conditions essentially precluded the potential for intact, subsurface archaeological remains at the site, with the possible exception of cultural features dug into the surface by the site’s prehistoric occupants. No such features were found, however, despite extensive machine scraping. Although it is possible, if not likely, that the site’s prehistoric occupants dug shallow hearths or roasting pits, any traces of such features have been obliterated by erosion and/or bioturbation. This scenario is supported by the fact that almost all artifacts from the hand units were restricted to the uppermost level.
Figure 5.9. Profile within BHT 1, facing northeast, and 1.4 m from the trench’s northwest end. Note the Stage II calcic horizon and the absence of bedrock. This particular location along BHT 1 was the most intact exposure of the subsurface soil horizons, and this is where the profile description provided in Table 5.2 was completed.

Table 5.2. Profile Description for Location along BHT 1 (shown in Figure 5.9)

<table>
<thead>
<tr>
<th>Depth Below Ground Surface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–19 cm</td>
<td>Reddish brown (5YR5/4); sandy silt loam; friable at top, firm at base; weak to moderate, subangular blocky structure; friable at top to firm at base; clear boundary</td>
</tr>
<tr>
<td>19–59 cm</td>
<td>Stage II calcic horizon; reddish brown (5YR5/4) mottled with pink (5YR8/3-7/3) carbonate nodules; silt loam; very weak, subangular blocky structure; firm; abrupt to clear boundary</td>
</tr>
<tr>
<td>59–100+ cm</td>
<td>Reddish brown to yellowish red (5YR4/4-4/6); silt loam; hard; massive to very weak, subangular blocky structure; hard</td>
</tr>
</tbody>
</table>
HAND UNITS

Per the data recovery plan, six 1 × 1-m hand units were excavated within the work area (Figure 5.10). Each was excavated in 10-cm levels, with the matrix screened through 1/8-inch mesh. Precisely half the units did not contain any artifacts, and very few were found in the others. The numbers of flaked stone artifacts by unit and level are shown in Table 5.3. These constitute 16.3 percent of the flaked stone artifacts collected from the site. The small number of artifacts in the units underscores the low density of materials at this site. No historical artifacts were found in the hand units, although a few fragments of what appears to be freshwater mussel shell from the surface of Unit 6 may be from the historical component. The mussel shell was in small fragments, which together weigh less than 1 g. The hand units all revealed the very shallow depth at which the pre-Holocene sediments were encountered, marked most prominently by the Stage II calcic horizon (Figure 5.11). Because no features or other intact, subsurface archaeological contexts were identified, no flotation samples were collected during the hand excavations.
Figure 5.10. Excavations within the work area. Surface-contour elevations are arbitrary.
**Table 5.3.** Number of Artifacts in Hand Units, by Level

<table>
<thead>
<tr>
<th>Unit</th>
<th>Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>

Note: All artifacts are debitage. Not included here are small fragments of mussel shell on the surface (i.e., Level 1) of Unit 6. Shaded cells indicate levels that were not excavated.

**Figure 5.11.** Unit 5 (left) and Unit 6 (right), showing the Stage II calcic horizon exposed just below the ground surface; views facing north.

**MACHINE SCRAPING**

Machine scraping was the final activity of the data recovery fieldwork. Because of the very shallow depth of the Stage II calcic horizon, machine scraping was terminated just below the top of this horizon (Figure 5.12). Moreover, machine scraping was not carried out across the entire work area, as proposed in the data recovery plan. Instead, machine scraping was restricted to the least-deflated portions of the work area (see Figure 5.10). The small two-track road, and the highly eroded, downslope, eastern portion of the work area, were excluding from machine scraping as these areas were deflated down into the Stage II calcic horizon, or even further. No features or any other intact, subsurface archaeological remains were uncovered during the machine scraping. Following machine scraping, the removed soil was replaced and recontoured within the scraped areas.
Figure 5.12. Machine scraping within the work area, just east of the two-track road. Note the Stage II calcic horizon exposed just below the ground surface. Unit 4 is visible in the right-center of the photograph. View facing west-northwest.
CHAPTER 6
LITHIC ARTIFACTS

Jim A. Railey

All of the Native American materials collected from LA 184618 are flaked stone artifacts, totaling 43 specimens collected within the work area. The majority are debitage, followed by cores and tools, and most were collected from the surface (Table 6.1). The occupations at the site appear to date mostly or wholly to the Archaic tradition, as no ceramic sherds were found and the two projectile points at the site are both Archaic forms. Both projectile points were outside the work area; they are described in the previous chapter but not included here. Also, one mano was recorded during survey within the work area, but was either not relocated during data recovery or was judged to be a natural cobble. Another (apparently different) mano was observed during data recovery, but was outside the work area and thus was not documented or collected, and is not included here. The coding, measurement, and data entry for the lithic analysis were conducted by Calvin Lehman under the supervision of Jim Railey; Railey and Emily Stovel conducted the statistical analyses for this chapter. This chapter describes the lithic artifact assemblage from LA 184618, including the raw materials, and explores aspects of raw material utilization and site function through a comparative analysis with lithic assemblages from other SWCA projects.

Table 6.1. Lithic Artifacts Collected from LA 184618 during Data Recovery

<table>
<thead>
<tr>
<th>Artifact Type</th>
<th>Surface</th>
<th>N</th>
<th>Percent</th>
<th>Subsurface</th>
<th>N</th>
<th>Percent</th>
<th>Total</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debitage</td>
<td>29</td>
<td>80.6</td>
<td>7</td>
<td>100.0</td>
<td>36</td>
<td>83.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cores</td>
<td>5</td>
<td>13.9</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>11.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools</td>
<td>2</td>
<td>5.6</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>4.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td></td>
<td>7</td>
<td>16.3%</td>
<td>43</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Percentages are by columns, except for the column totals, which are by row.

RAW MATERIALS

Five raw material groups were identified in the flaked stone artifacts collected from LA 184618. Most of the flaked stone items are quartzite, including all of the cores (Table 6.2). This suggests that quartzite is the closest and most abundant tool stone in the vicinity of the site. All of the materials are orthoquartzite (see below), which probably occurs within the abundant sandstone in the sedimentary rocks that crop out in the local area. The other materials in the assemblage occur in much lower frequencies at the site, probably reflecting greater distance and/or less-abundant sources of usable tool stone from these rock types. The following sections describe each of the material types identified in the site’s lithic artifact assemblage, in descending order of frequency.

Table 6.2. Raw Materials in the Flaked Stone Assemblage Collected from LA 184618

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>Debitage</th>
<th>N</th>
<th>Percent</th>
<th>Cores</th>
<th>N</th>
<th>Percent</th>
<th>Tools</th>
<th>N</th>
<th>Percent</th>
<th>Total</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartzite</td>
<td>19</td>
<td>52.8</td>
<td>5</td>
<td>100.0</td>
<td>2</td>
<td>100.0</td>
<td>26</td>
<td>60.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chert</td>
<td>8</td>
<td>22.2</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>8</td>
<td>18.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicified siltstone</td>
<td>5</td>
<td>13.9</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>11.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chalcedony</td>
<td>3</td>
<td>8.3</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basalt</td>
<td>1</td>
<td>2.8</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>2.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100.0</td>
<td>5</td>
<td>100.0</td>
<td>2</td>
<td>100.00</td>
<td>43</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
QUARTZITE

Quartzite forms in two ways. Sedimentary quartzite, or orthoquartzite, is essentially sandstone cemented with silica. Metaquartzite is a metamorphic rock that forms through heat and pressure of sedimentary rock, usually sandstone (Lapedes 1978:567). No attempt was made to distinguish orthoquartzites from metaquartzites in the LA 184618 flaked stone assemblage, but most if not all is orthoquartzite. At least most of the quartzite presumably derives from sedimentary rock in the Chinle formation and other locally outcropping rocks (see Figure 2.1 and Table 2.1). All of the cores in the assemblage are quartzite, which strongly suggests this material occurs in the local area. Colors vary considerably in the quartzite artifacts in the assemblage. Material quality is generally very good—sufficient for the kinds of precision flaking necessary for making formal tools such as the projectile points found at the site, both of which are quartzite.

CHERT

Chert is a “dense, microcrystalline or cryptocrystalline rock composed of free silica, either in the form of chalcedony and microcrystalline quartz or in the form of opaline silica of various kinds” (Lapedes 1978:88–89). It forms under a variety of conditions, including “solution and replacement of marine fossils, as bedded deposits resulting from either primary precipitation of silica from water or from alteration of sea floor diatomaceous oozes, or as alteration and replacement/infilling of volcanic rocks” (LeTourneau et al. 1997:10). Thus, although typically found in sedimentary rocks (mostly limestone), chert can also occur in volcanic formations. There is exceptionally wide variation in the color, texture, translucence, and opacity of chert, and the term is often used interchangeably with chalcedony, jasper, agate, and flint. In the LA 184618 assemblage, “chert” was distinguished from chalcedony by its opaqueness, duller luster, and oftentimes slightly coarser texture. However, there was not always a clear distinction between the two.

Chert probably occurs in limestones of the Chinle formation in the local area. However, given its lower frequency in the assemblage relative to quartzite, and the absence of chert cores in the assemblage, this material is probably less abundant in the local region, occurs at a greater distance from the site, and/or much of the naturally occurring chert in the area is not suitable for making stone tools.

SILICIFIED SILTSTONE

Silicified siltstone was distinguished from chert by its duller luster and somewhat grittier texture. Like chert, it probably occurs in the locally outcropping sedimentary rocks, but due to some combination of greater distance, less abundance, and/or inferior quality, it is much less frequent in the assemblage than quartzite, and does not account for any of the cores.

CHALCEDONY

Chalcedony is a fine-grained rock composed of fibrous quartz resulting from a chemical replacement by silica. For this analysis it was distinguished from chert on the basis of its transparency or translucency, and more or less waxy luster. Note that “chalcedony” and “chert” are sometimes used interchangeably by researchers (e.g., Phillips 2000), and in the LA 184618 assemblage distinguishing the two was rather arbitrary for some specimens. At least some of the chalcedony identified in the assemblage may be opalized caliche. The source(s) of the chalcedony
in the assemblage is (are) unknown, and its rarity might indicate it was transported to the site from some distance.

** BASALT **

Basalt is a dense, igneous rock of volcanic origin. Although finer grained than most basalts, most of the “basalt” flaked by the prehistoric inhabitants in the region is classified as coarse or medium in texture, to distinguish it from finer-grained materials (chert, chalcedony, obsidian, and petrified wood). The single flake identified here as “basalt” may actually be dacite, rhyodacite, or andesite (cf. Spilde 2010). The nearest outcrops of volcanic rock are 36 km due north of the site, consisting of Middle to Lower Pleistocene basaltic to andesitic lava flows (Scholle 2003). The Mora River cuts through these volcanic outcrops, and may have transported workable pieces southward toward (or perhaps all the way to) its confluence with the Canadian River, just 13 km northeast of LA 184618.

** DEBITAGE **

Only 36 pieces of debitage were collected from LA 184618, and all were individually analyzed. These items collectively weigh 348.3 g, or 9.7 g on average. Debitage includes both unmodified and incidentally modified pieces. This category also includes specimens often termed “shatter,” “blocky shatter,” or “angular debris,” and which are referred to here as “debris,” following Sullivan and Rozen (1985).

** DEBITAGE RESEARCH BACKGROUND **

Waste debris from the manufacture of flaked stone tools is typically the most abundant of archaeological remains at prehistoric sites in New Mexico, and indeed throughout the world. This is the case for four main reasons. First, throughout most of the immense span of Native American occupation of the area, people used flaked stone to produce many tools critical to their survival. Second, because flaking stone is a reductive (as opposed to additive) technology, the activities of many thousands of flint knappers—over the course of more than 10,000 years—have generated many tons of waste debris. Third, unlike many materials manipulated by humans, debitage is largely immune to the destructive forces of time. Finally, unlike stone tools, the great majority of debitage has not been subject to removal from the place where it was produced, by either stone-tool users in the past or by modern-day collectors.

Given their abundance and the variety of attributes they embody, debitage offers a rich source of information to the lithic analyst. Accordingly, these otherwise mundane items can tell us much about human behavior and activities in the unrecorded past, and debitage assemblages are especially well suited to a range of quantitative methods. The results of debitage analyses can provide data relevant not only to the technology of flaked stone tool manufacture and patterned use of raw materials, but also settlement patterns and mobility, the organization of production, and even social organization.

** Problems with Inferential Flake Types **

To deduce the behavioral patterns and other conditions responsible for debitage-assemblage variability, most lithic analysts have employed inferential flake typologies drawn from one of two primary classification approaches: reduction-stage models and technology-based types (e.g., core,
bifacial, pressure flakes, etc.). These two approaches roughly correspond to what Sullivan and Rozen (1985:576–578) refer to as non-tool and tool flake categories. Both, however, suffer from the same shortcomings: 1) there is a myriad of typological schemes that involve different combinations of analytical units, 2) definitions for the same analytical unit (e.g., “secondary flake,” “bifacial thinning flake,” etc.) are inconsistent between different analysts and analytical schemes, and 3) inferential flake types are typically not defined in an objectively measurable way (and oftentimes are not defined at all), which invites a potentially large degree of inter-observer variation in assigning the flakes to the analytical categories. The net result is a state of poor science, in that data sets generated by different analysts are not directly comparable, and analysis results cannot be replicated.

These problems are exemplified in Table 6.3, which shows flake-type classifications from a sample of several projects in the Four Corners region.¹ Note the diversity of flake-type categories employed, and note also that some schemes rely on reduction-stage typologies while others use more technologically based flake types, and some use a combination of both. Some categories within a given scheme are mutually exclusive, while others are not. Moreover, several of the reports cited in Table 6.3 do not specify the criteria used to assign flakes to a particular category. Doing a comparative analysis using data generated from the various debitage classifications, such as those shown in Table 6.3, would be largely meaningless, because of the lack of standardization in the flake typologies used, not to mention the lack of objective criteria for defining any of these types. The net result is a classificatory free-for-all that makes it essentially impossible to compare data generated by different analysts and analytical schemes, and at best difficult to replicate analytical results between different analysts, even when they are using the same scheme. These problems with debitage analysis have been explicitly recognized by several researchers:

Although the [bifacial thinning flake] is one of the most common tool debitage categories employed in the analysis of chipped stone assemblages, it has not been consistently defined and used. Often, no attributes are provided for the category ... There is little agreement, furthermore, as to which attributes or set of attributes are necessary to designate a piece of debitage as a [bifacial thinning flake]. (Sullivan and Rozen 1985:757)

Contrary to expectations and assumptions, individual flake attributes and flake types often are not good discriminators of variation in human behavior ... Flakes that might appear to be technology-specific such as bifacial thinning flakes and bipolar flakes, can be produced by multiple technologies. (Ahler 1989:87)

Freedom in the design of attribute systems promotes diversity, which is not intrinsically undesirable; archaeologists are rightly jealous of their intellectual freedom. Yet our collective failure to establish a minimum set of attributes has led to a state of anarchy by incomparability. Progress in formal [flake] analysis requires a minimum set of attributes, not linked by assumption to particular knapping behaviors that can be measured reliably to resist measurement error, that ideally can be measured quickly and efficiently, and that impart a maximum of information with a minimum of effort. (Shott 1994:79)

¹ It is not the intention here to point fingers at any particular analyst. Rather, the objective is to illustrate a widespread problem and to show that inferential flake types—even when defined by rather explicit criteria—are poorly suited to comparative analysis of debitage-assemblage data.
### Data Recovery at LA 184618, for a Bridge Replacement along NM 104, San Miguel County, New Mexico

#### Table 6.3.
Flake-Type Classifications from a Selection of Projects in the Four Corners Area of the American Southwest

<table>
<thead>
<tr>
<th>Reference</th>
<th>Flake Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acklen et al. 1991</td>
<td>Core, Biface, Retouch, Shatter / Angular Debris, Hammerstone Spall, Unclassifiable Fragments</td>
</tr>
<tr>
<td>Brown et al. 1992</td>
<td>Core, Biface, Retouch, Pecking Stone Spall, Indeterminate Fragments, Shatter</td>
</tr>
<tr>
<td>Drake 2007</td>
<td>Stages Primary (&gt; 76% cortex), Secondary (1%–75% cortex), Tertiary (no cortex)</td>
</tr>
<tr>
<td>Drake 2007 Technol. Types</td>
<td>Percussion, Biface Thinning, Pressure, Blade, Over-shot, Burin Spall, Bi-polar, Core Rejuvenation, Hinge Termination, Frag, Indeterm. Late Stage</td>
</tr>
<tr>
<td>Fetterman and Honeycutt 1982; Honeycutt and Fetterman 1994</td>
<td>Primary, Secondary, Tertiary</td>
</tr>
<tr>
<td>Fetterman and Honeycutt 1995</td>
<td>Core vs. Biface Thinning, Primary, Secondary, and Tertiary</td>
</tr>
<tr>
<td>Fetterman et al. 2001</td>
<td>Biface Thinning, Late Stage Pressure Core Reduction, Core Rejuvenation, Completely Cortical Natural Platform, Partially Cortical Natural Platform, Partially Cortical Platform Absent, Non-cortical Natural Platform, Non-cortical Platform Absent</td>
</tr>
<tr>
<td>Moore 1983</td>
<td>Microflake, Blade, Length &gt; Width, Width &gt; Length</td>
</tr>
<tr>
<td>Potter and Gilpin 2002</td>
<td>Level 1 Percussion, Thinning, Pressure, Core Rejuvenation</td>
</tr>
<tr>
<td></td>
<td>Level 2 Primary Decortication (&gt; 75% exterior cortex), Secondary Decortication (some exterior cortex + non-cortical flake scars), Tertiary (no cortex)</td>
</tr>
</tbody>
</table>
Unfortunately, these and other well-reasoned criticisms (see also Ingbar et al. 1989; Railey and Gonzales 2015; Sullivan 2001) have fallen on many deaf ears. The use of inferential flake typologies is as widespread as ever, especially (but not only) in contract archaeology. Given this situation, an alternative approach to debitage analysis was needed. The best alternative is an attribute-based approach (e.g., Shott 1994; Sullivan and Rozen 1985), which is followed here and described below, in the Analytical Methods section.

Sources of Debitage Assemblage Variation

The character of debitage assemblages appears to vary in relation to four primary factors: 1) long-term changes in lithic technological patterns, 2) the nature of available raw materials and distance from (and ease or difficulty of access to) raw material sources, 3) relative intensity of occupation and the range and kinds of activities carried out at a site, and 4) the changeover from the atlatl and dart to the bow and arrow. With respect to diachronic change, in various parts of the world numerous researchers have observed a broad shift from “formal” to “expedient” flaked stone assemblage technologies (e.g., Andrefsky 1991; Berg 2000; Bettinger 1999, 2001:159–163; Brown 1986, 1991; Chapman 1977:447; Elyea 1998b; Hogan et al. 1983; Irwin-Williams 1973:5–14; Jeske 1992; Jeter 1980; Koldehoff 1987; McDonald 1991; Myers 1986, 1989; Odell 1998; Parry and Kelly 1987; Pitts and Jacobi 1979; Railey 2010a; Schiffer 1976:104; Seddon 1992; Siggers 1997; Stafford 1999; Sullivan and Rozen 1985:766–769; Teltser 1991; Torrence 1989; Vanmontfort 2007; Vierra 1990, 2005; White and O’Connell 1982). Formal technologies involve a proportionately higher production rate of bifaces and other facially flaked tools, or blade and microblade tools (blade and microblade tools are especially prevalent in the Old World Mesolithic but also occur in certain areas and time periods in the Western Hemisphere). Formal technologies also involved more frequent use of fine-grained raw materials, because such high-quality tool stone is better suited to the kinds of precision flaking necessary for the production of facially flaked tools or standardized blade forms. The use of soft-hammer percussion, pressure flaking, and the punch technique are also more prevalent in formal technologies.

Expedient technologies, on the other hand, reflect a greater focus on simple, non-standardized flake tools struck from amorphous cores and involved much less skill and effort than is required in the production of bifaces or blades. Expedient technologies involved a wider range of raw materials, including proportionately much more use of coarser-grained and poorer-quality stone, as these are sufficient for the production and use of many simple flake tools. It has also been argued that sedentary, late prehistoric groups focused more intensively on locally available materials, which may have consisted of poorer-quality stone (e.g., Vierra 2005:188). Flakes produced by hard-hammer percussion also occur in higher proportions in expedient technologies, and these flakes often closely resemble those from the earliest stages of biface reduction or the shaping of cores for the ultimate purpose of producing bifaces or other formal tools.

As is widely acknowledged, any one “technology” involves both expedient/early reduction stage and formal/late reduction stage components, with differences between assemblages being more a matter of degree than of kind (e.g., Parry and Kelly 1987:296). Moreover, some of the conventional distinctions between expedient and formal production and tool use have not always held up. For example, while it was once thought that expedient tools were used casually and discarded near their place of production (e.g., Binford 1979), informal flake tools were sometimes transported far from their place of production, and people frequently scavenged from flake debris produced by
others to obtain usable pieces, sometimes long after the reduction event occurred (Binford 1986; Douglass and Holdaway 2011; Douglass et al. 2008; Holdaway et al. 2008, 2015).

In most of areas where these assemblage changes have been observed, they correspond at least roughly with the advent of sedentism based on intensive farming.\(^2\) In the Southwest, this broad technological shift generally occurred between the Archaic and ceramic period time frame, and reportedly involved:

1. the long-term replacement of bifacial knives with simple flake tools, 
2. a shift from the use of higher-quality materials like cherts and chalcedonies for biface production to lower-quality materials like ... basalt for expedient flake production, 
3. an increase in the variety of lithic materials being worked, and 
4. the increased use of marginally retouched and unretouched flakes. (Vierra 2005:188)

Following recognition of this broad correlation, various ideas and explanations have been advanced to account for this apparently “devolutionary” technological shift, or at least certain aspects of it. Most explanations generally relating to this phenomenon focus on reduced mobility, subsistence risk and/or intensification, and/or the advent of farming (Bamforth 1986, 1991; Barut 1994; Berg 2000; Bettinger 1999, 2001; Binford 1979; Bleed 1986; Brantingham 2006; Callahan 1987; Carr 1994; Cowan 1999; Ebert 1979; Johnson 1987; Kelly 1988, 1992; Kelly and Todd 1988; Koldehoff 1987; Kuhn 1992, 1994, 1995, 1996; McDonald 1991; Morrow 1996; Nelson 1991; Odell 1986, 1998; Parry 1987; Parry and Kelly 1987; Shott 1986, 1996; Torrence 1983, 1989; Vierra 2004, 2005; Young 1994a, 1994b). In the American Southwest, however, at least three researchers independently concluded that the advent of the bow and arrow was perhaps the most likely factor affecting the shift to expedient-looking assemblages in their respective case studies (Huckell 1998; Nelson 1994; Railey 2010a). Railey (2010b, 2011b) has also argued that increased spatial zoning with the shift to sedentism may also contribute to the apparent technological shift; that is, in cases where formal tool production becomes concentrated in specific loci within sedentary settlement, then the odds are increased that these loci will be missed during investigations, resulting in recovered assemblages that tend to be biased in favor of the more expedient component. Still others have challenged the evidential basis of the formal to expedient shift (e.g., Andrefsky 1994), prompting questions not only about causation, but as to when and where the shift actually occurs.

Regardless of how this broad technological change (real or apparent) is explained, rarely has the shift from formal to expedient technologies been systematically characterized or measured beyond the confines of individual projects, which are typically restricted in terms of time and space. This is due in no small way to the problems with flake types, which inhibit systematic comparisons between results produced by different analysts. This problem was recognized by Parry and Kelly, who noted (with respect to Mesoamerican evidence) that:

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\(^2\) In some areas there is a shift to more expedient assemblages without a corresponding shift to farming. Torrence (1989:65), for example, argues that more intensive management of wild resources over the past millennium in Australia is analogous to domestication. Also, in the Great Basin, southern Africa, and Australia, the shift to expedient technologies occurs in conjunction with reduced mobility and more intensive subsistence focus on collecting and processing seeds (see Bettinger 2001).
there is relatively little quantitative data … to measure the [formal to expedient] shift, because few persons have studies both Archaic and Formative lithic assemblages in detail (and the tabulations of different analysts are seldom strictly comparable). (Parry and Kelly 1987:294, emphasis added)

Such comparability challenges remain a fundamental barrier to the kinds of comparisons that would otherwise enable a more systematic evaluation of hypotheses relating to flaked stone patterns, such as the widespread shift to expedient technologies. By using an attribute-based approach, however, the three problems with flake types are mitigated because the units of analysis are objectively defined and consistently employed. By using a consistent, attribute-based analysis method, we can both characterize debitage-assemblage variability and better evaluate hypotheses in a systematic manner that is otherwise impossible (or at best difficult) to accomplish within the classificatory free-for-all that prevails in the realm of lithic analysis.

Distance and access to raw material sources, and relative abundance and quality of raw materials in exploited source areas, can also affect the character of flaked stone assemblages (see Andrefsky 1994; Bamforth 1986; Binford 1977, 1979; Vierra 2005:186). Specifically, where abundant tool stone is available at or near a site, then it is expected that the flaked stone assemblage at that site will contain high percentages of early-stage reduction debris characterized by flakes that are comparatively large, thick, and heavy, and contain proportionately high incidences of cortex on their exterior surfaces and have mostly plain and cortical platforms. Conversely, early-stage and expedient flaking debris should be much rarer where tool stone sources are located some distance from a site or are locally available but not abundant. In such cases, early-stage reduction frequently takes place at the source area, and tool stone carried back to a habitation site is often intensively reduced, resulting in assemblages with flakes that are comparatively small, thin, and light; contain less cortex; and have more faceted and crushed platforms.

Parry and Kelly (1987:300–302) recognized the potential effects of raw material availability and postulated that, in areas of raw material abundance, even mobile hunter-gatherers will opt for an expedient technology because conservation is not necessary and the advantages of bifaces are mostly negated under such circumstances. However, if reduced mobility is not the primary factor behind the shift from formal- to expedient-looking technologies, then we may or may not expect to find later-stage flaking debris at a site with easy access to abundant tool stone, depending on whether formal tool production and/or maintenance were focal activities at the site.

**GOALS OF THE DEBITAGE ANALYSIS**

Characterizing the interpreting debitage and other lithic artifact data from any one site or assemblage is, necessarily, a comparative exercise. Thus the goal of the debitage analysis for this project is to compare the assemblage from LA 184618 with assemblages from other sites that contain comparable, attribute-based data. The results of this analytical comparison are presented later in this section.
DEBITAGE ANALYTICAL METHODS

Following Shott’s (1994) lead, the approach to debitage analysis followed here involves a set of attributes that is both meaningful and subject to minimal observer error. Unlike most inferential flake types, the recording of these attributes is relatively straightforward, easy to teach to technician-level personnel, can be recorded quickly, and thus enhances efficiency in the expenditure of time and budget. For each individually analyzed specimen, several attributes were recorded (Table 6.4). Complete debitage data are provided in Appendix B.

Quantitative Methods

For ratio-scale data (length, width, and thickness), summary statistics for all measured parameters are provided and include the mean, median, standard deviation, and the range. A non-parametric Kruskal-Wallis one-way analysis of variance (ANOVA) was used to test whether the means of length and thickness were equal between the three groups (Zar 1999). If significant differences were detected among the three methods, then a Wilcoxon rank sum test was used to compare mean differences between each of the three groups (Zar 1999). Comparisons between sites for the recorded parameters were conducted using a Wilcoxon signed-rank test, since the distribution of values for the measured parameters were not normally distributed and were all positively skewed. The Wilcoxon test is a distribution test that behaves similarly to the two-sample t-test and may be used when the distribution of parameter in question is not normally distributed (Dalgaard 2002). Statistical significance ($P < 0.05$) of multiple comparisons was adjusted with the standard Bonferroni correction ($P = 0.05/n$). Emily Stovel conducted the analysis of ratio-level data.

Table 6.4. Attributes Recorded in the Debitage Analysis

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Method of Measurement/Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Maximum dimension</td>
</tr>
<tr>
<td>Width</td>
<td>Maximum width, perpendicular to maximum dimension</td>
</tr>
<tr>
<td>Thickness</td>
<td>Maximum thickness</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight to nearest hundredth of a gram</td>
</tr>
<tr>
<td>Percent cortex</td>
<td>Five intervals: 0, 1–10, 11–49, 50–99, 100</td>
</tr>
<tr>
<td>Platform</td>
<td>Cortical, plain (single facet), faceted (more than one facet), crushed (number of facets indeterminable), absent</td>
</tr>
<tr>
<td>Condition</td>
<td>Based in part on Sullivan and Rozen (1985): debris (exterior and exterior cannot be distinguished), medial or distal fragment (fragment missing a platform), proximal (fragment with platform), complete, split, pot lid or heat spall</td>
</tr>
<tr>
<td>Raw material type</td>
<td>Generic categories (obsidian, chert, basalt, chalcedony, etc.)</td>
</tr>
<tr>
<td>Raw material texture</td>
<td>Fine (glossy and glassy), medium, and coarse</td>
</tr>
</tbody>
</table>

Simple chi-square tests of significance and examination of adjusted residuals were performed for the non-metric data (cortex, condition, platform, and raw material) to identify which specific variables were causing significant differences. By convention, adjusted, chi-square residual values greater than 2 and less than −2 are considered significant differences from the expectations of randomness. The results of a significant chi-square indicate differences between rows and columns of counts of categorical data at a given confidence level, by convention 95 percent. It is a valuable statistical method for addressing many questions in lithic artifact analysis, where counts of artifacts are being compared to different variables.
Cores

Cores are variously shaped and sized pieces of flaked stone that have had been reduced, to one extent or another, through deliberate direct or indirect percussion. There are five cores from LA 184618 (Table 6.5). All of the cores in the assemblage were collected from the site’s surface and all are opaque quartzite (Figure 6.1). Texture was recorded as coarse for all except Field Specimen (FS) 9, which was recorded as medium. All are multidirectional cores except for FS 9, which is a tested piece (i.e., it has fewer than four flake scars). The overall character of the cores suggests they were reduced and shaped in a rather random and opportunistic manner, without any highly specialized core techniques involved. Some cores may have been used as tools themselves, although no clear tool-use wear was observed. One tool made on a core—a chopper—is treated separately, below.

Table 6.5. Complete Data for Cores from LA 184618

<table>
<thead>
<tr>
<th>FS</th>
<th>QR (AB-)</th>
<th>Color</th>
<th>Percent Cortex</th>
<th>Length (cm)</th>
<th>Width (cm)</th>
<th>Thickness (cm)</th>
<th>Wt. (g)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>TIM37933</td>
<td>Tan</td>
<td>10–49</td>
<td>9.45</td>
<td>6.75</td>
<td>7.61</td>
<td>456.1</td>
<td>Secondary cortex formed on portions on core</td>
</tr>
<tr>
<td>47</td>
<td>MWV77387</td>
<td>Purple</td>
<td>50–99</td>
<td>5.53</td>
<td>4.49</td>
<td>2.88</td>
<td>86.8</td>
<td>Approximately five flakes removed</td>
</tr>
<tr>
<td>32</td>
<td>XWC57895</td>
<td>Purple</td>
<td>10–49</td>
<td>5.10</td>
<td>4.06</td>
<td>2.68</td>
<td>53.9</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>QSW57746</td>
<td>Purple</td>
<td>50–99</td>
<td>8.10</td>
<td>4.32</td>
<td>2.91</td>
<td>134.0</td>
<td>Two or three flakes removed unidirectionally</td>
</tr>
<tr>
<td>5</td>
<td>YDB37744</td>
<td>Red</td>
<td>1–9</td>
<td>6.81</td>
<td>5.52</td>
<td>3.27</td>
<td>137.6</td>
<td>Less than 5 percent cortex present</td>
</tr>
</tbody>
</table>

Tools

Two specimens were identified as flaked stone tools, by virtue of what appears to be intentional retouch and/or use wear. Both are quartzite, and both were collected from the surface of the work area (Figure 6.2). One is a scraper made on a flake (FS 26; QR AB-CEY47595). It measures 5.8 × 3.9 × 1.9 cm, and weighs 34.2 g. It exhibits retouch on the flake dorsal surface at its distal end, with additional retouch along a lateral margin on the ventral face of the flake. It appears to have been used for light-duty scraping.

The other artifact included here is identified as a chopper (FS 22; QR AB-TQG67443). It measures 8.8 × 5.8 × 3.7 cm, and weighs 215.7 g. It was fashioned from a small cobble by removing flakes unidirectionally from one end, on the same side of the cobble. This piece could have been coded as a core, but the shape of its apparent working end makes it potentially suitable as a chopper.
Figure 6.1. Selected cores from LA 184618, showing coarse-textured quartzite typical of most artifacts in the assemblage; A. FS 38, B. FS 5.
Figure 6.2. Flaked stone tools from LA 184618: A. flake scraper (FS 26), B. core chopper (FS 22).
**Debitage as Indicators of Mobility, Site Function, and Raw Material: A Comparison of Five Archaic Site Assemblages**

Arriving at meaningful interpretations of lithic assemblage data is, necessarily, a comparative exercise. Accordingly, lithic artifact data from LA 184618, the data were compared with those from four other assemblages collected elsewhere in New Mexico. These four “external” assemblages come from the following projects/sites, excavated in recent years by SWCA’s Albuquerque office: Biting Ant (Railey 2015a), Mariposa (Lundquist 2005; Railey and Lundquist 2012), I-25 site LA 123291 (Walth and Railey 2011), and Leland (Railey 2015b). Their locations are shown in Figure 6.3, and their essential characteristics in Table 6.6. They can be collapsed into two broad groups: 1) small, short-term camps occupied at least mostly by hunter-gatherers (LA 184618, Biting Ant, Mariposa, and Leland) and 2) partially settled, Basketmaker II early farmers (I-25). The Biting Ant and I-25 assemblages were demonstrably produced by late pre-ceramic occupations, and Mariposa’s lithic artifacts date overwhelmingly from the Middle and Late Archaic periods, with some minor admixture from Pueblo period and (perhaps) Paleoindian and Early Archaic occupations. Leland and LA 184618 appear to be at least mostly Archaic in age. Thus these assemblages (or, in the case of Mariposa, the vast majority of the debitage) were produced prior to the introduction of the bow and arrow, and as such they should not be affected by differences in projectile weapons technology, specifically the atlatl and dart versus the bow and arrow (see Railey 2010a, and above). Unlike LA 184618 and Leland, the other three sites included here all had substantial subsurface components. But this analysis is restricted to surface-collected debitage, for two reasons. First, the vast majority of materials from LA 184618 were collected from the site’s surface. Second, surface-collected and screen-recovered debitage assemblages consistently show significant differences (e.g., Lundquist 2002, 2004a, 2004b, 2005; Post 1994:35–37; Tainter 1979:465–466; Van Hoose and Lundquist 2002), even from the same site and occupation, so these should be clearly separated in any comparative analysis.

The goal here is a more contextualized and detailed understanding of the Archaic occupations at LA 184618. As part of this analysis, this section explores how debitage assemblage patterns relate to variation in locally available raw materials and also to different mobility strategies, including the different kinds of site occupations established by hunter-gatherers and early farmers. The analysis presented here follows a tradition of research into the relationships of mobility and lithic assemblages. Accordingly, before delving into the analysis it is useful to first discuss the theoretical underpinnings of this study.
Figure 6.3. Map of New Mexico, showing locations of sites included in the comparative analysis (base map from Raisz 1957).
Table 6.6. Characteristics Associated with Selected Pre-Ceramic Debitage Assemblages Collected by SWCA in Recent Years

<table>
<thead>
<tr>
<th>Site/ Project</th>
<th>Time Period</th>
<th>Geomorphic Context</th>
<th>Site Type(s)</th>
<th>Structures and Features</th>
<th>Dominant Raw Materials</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA 184618</td>
<td>Archaic</td>
<td>Surface/near-surface</td>
<td>Small, short-term camps</td>
<td>No preserved features</td>
<td>Quartzite, local</td>
<td>This report</td>
</tr>
<tr>
<td>Biting Ant (LA 171726)</td>
<td>Late Archaic</td>
<td>Partially buried along sloping surf. within a playa depression</td>
<td>Small, short-term camps</td>
<td>No preserved structures, but several small hearths and roasting pits</td>
<td>Chert, at least mostly nonlocal</td>
<td>Railey 2015a</td>
</tr>
<tr>
<td>Mariposa</td>
<td>Mostly Archaic</td>
<td>Surface/near-surface</td>
<td>Small, short-term camps</td>
<td>Several small structures and numerous hearths and roasting pits</td>
<td>Local gravels, mostly chalcedony</td>
<td>Lundquist 2005; Railey and Lundquist 2012</td>
</tr>
<tr>
<td>I-25 (LA 123291)</td>
<td>Basket-maker II</td>
<td>Surface/near-surface on an upland ridge adjacent to Rio Grande floodplain</td>
<td>Base camp, hamlet, or village with maize and gourd</td>
<td>Medium-sized pit houses with storage features</td>
<td>Chalcedony, basalt, chert, obsidian in local gravels</td>
<td>Walth and Railey 2011</td>
</tr>
<tr>
<td>Leland (LA 109487)</td>
<td>Archaic</td>
<td>Surface</td>
<td>Small, short-term camps</td>
<td>No preserved features</td>
<td>Local, poor-quality quartzite</td>
<td>Railey 2015b</td>
</tr>
</tbody>
</table>

**Theoretical Context**

Ideas about lithic assemblages and mobility, among hunter-gatherers and early farmers, often peel off from an idealized distinction between “foragers” and “collectors.” Much of this research is inspired by Binford (1980). He and other interested researchers (e.g., Kelly 1995:111–160; Thomas 1981) recognize that variation in these patterns actually occurs along a continuum, and that a group may even opt for different mobility strategies on a seasonal basis. Still, for analytical purposes hunter-gatherer settlement-subsistence systems are typically described in terms of patterns followed by residentially mobile foragers versus logistically mobile collectors.

In a residentially mobile settlement system, groups of foragers frequently relocate as they move across a landscape and more or less discrete resource patches. In other words, people move to available resources and thus frequently relocate their residential camps and may reoccupy certain locations repeatedly. In terms of subsistence, foragers tend to focus on back-loaded resources, which entail less time and energy to collect and store than is required for processing and preparing once removed from storage (Bettinger 1999, 2009; Tushingham and Bettinger 2013). These foods are often cached in storage pits or other facilities, but these tend to be small and strategically scattered throughout a group’s home range. This strategy, involving back-loaded resources and small, scattered caches of food, ameliorates the cost-benefit risk that some caches of food will go unused, due to scheduling uncertainties or complications that may prevent a group from returning to a food cache or theft by enemies or competitors (which small-scale, mobile groups are often poorly prepared to defend against).

Highly mobile groups are typically not very concerned over keeping their habitation structures, work areas, and trash middens spatially separated (Blomberg 1983; Lightfoot 1984). Moreover, any such segregation that may occur can become easily blurred after repeated occupations, as the locations of these particular zones shift around within a site over time. Variation among residential sites in a single settlement system may relate to several factors, including the “seasonal scheduling of activities (if any) and the different duration of occupation” (Binford 1980:9–10). Depending on
the density and seasonal availability of particular resources, residentially mobile groups may coalesce and disband, and in the process establish and occupy camps of varying size over the course of the year (e.g., Thomas 1981). The uneven distribution of tool stone across the landscape also contributes to variation among residential sites, given that raw materials may be reduced and maintained in different patterns depending on a particular site’s proximity or distance to specific lithic sources. Thus, different campsites occupied by members of the same, residentially mobile group may have dissimilar flaked stone assemblages, even if the function and activities carried out at each site are roughly similar.

The situation is a bit different in the more logistically mobile strategies attributed to collectors (and, by extension, early farmers). Here, the focus of the settlement system is the residential base camp, hamlet, or village. These kinds of base settlements are occupied on a more or less sustained basis throughout all or much of the year, and often over an appreciable span of time. At their base camps, collectors build more substantial structures than are typically found in foragers’ sites. Because they are more residentially stable than foragers, collectors and early farmers can invest in front-loaded resources, which require more time and energy prior to storage relative to back-loaded resources (maize, which requires tilling, planting, and tending prior to harvesting, is a good example of a front-loaded resource). Collectors and early farmers can also invest in fewer and larger storage pits or aboveground granaries, and these are often (but not always) located at the residential base. At these residential bases, collectors and early farmers engage in a wide range of tasks and activities, leaving behind artifacts that are more numerous and diverse than those found at most forager camps. Because people are spending longer periods of time living in one location, dealing with sanitation and other problems associated with sedentism may lead to more spatial zoning of habitation, work, and discard areas (although, once again, over time the locations of these zones may shift around to the point that, archaeologically, they become “blurred” together). The sedentary nature of base camps also typically leads to more formalized ceremonialism than is the case among more mobile foragers, and ornaments and other indicators of ritual or leisure activities are more often found in base camps and villages than in forager sites (see Chatters and Prentiss 2005).

In a logistically mobile strategy, hunting, gathering, and collecting various resources may be staged and carried out directly from the base camp, but in many cases execution of these activities involves logistical forays and the establishment of satellite camps. These satellite camps were occupied seasonally, or even for just a few days at a time, by task-specific groups. These small groups then return collected food and other resources to the base camp for processing (or further processing), storage, consumption, and fabrication into tools and other materials. In other words, in a logistically mobile pattern resources are brought to the group, as opposed to foragers’ residentially mobile strategy of moving people to resources.

In an idealized residentially mobile pattern, base camps are not established but rather a scattering of camps are provisioned and occupied sequentially within a group’s territory. Some of these forager camps may have been used more intensively and repeatedly than others, and involved a more diverse range of tasks, than is the case for satellite camps in a logistically mobile pattern. Still, it is easily conceivable that some forager camps may resemble the logistical camps of collectors. But compared to base camps, even the most intensively occupied sites of residentially mobile groups tend to have less diverse assemblages and fewer and less substantial structure
remains (if they are even present). They also generally lack ornaments or other evidence of ceremonial activities that tend to gain traction in the base camps of less mobile groups.

Although the forager–collector continuum is typically employed to explore variation among pre-agricultural peoples, the hypothetical tenets of this research realm are relevant to the earliest farmers as well, most of whom still relied heavily on hunting, gathering, and/or foraging of wild-food resources. Given the demands of planting, tending, harvesting, processing, and storing maize and other crops, farming probably took hold more easily among logistically organized collectors than residually mobile foragers. In either case, once farming was adopted it was generally more compatible with a logistically mobile (or even a more sedentary) strategy. Thus it is worthwhile to analytically compare sites of early farmers with those of pre-agricultural groups to try to identify patterns and indicators of residential versus logistical mobility, as well as variation along the continuum of these two idealized patterns.

With respect to lithic artifacts, residential sites typically exhibit very different assemblage characteristics from those associated with smaller, logistical camp. But those differences are not always consistent, nor the factors shaping them straightforward (see Thomas 1989). Binford (1978:483, 1979:269) predicted that hunter-gatherer residential sites and base camps should have lithic assemblages reflecting the full range of tool manufacture, maintenance, and repair activities, and that the randomizing effects of long-term and repeated occupations would result in low variability between residential sites in a given region (see also Hayden 1978:188; Sullivan and Rozen 1985:773). This includes a high incidence of formal tools (i.e., Binford’s [1979:267] “personal gear”) at residential sites, along with debris associated with the manufacture and maintenance of these tools. On the other hand, some researchers (citing studies linking lithic technology and mobility) have predicted that expedient tool-making should be better represented at residential sites of more sedentary than mobile groups, especially where raw materials are locally available (e.g., Parry and Kelly 1987; Roth 1992:294; Schriever et al. 2011). As noted above, it is important to remember that the nature of lithic sources in the vicinity of residential sites (or any other sites) will affect their assemblage characteristics.

Shorter-term logistical sites, on the other hand, are considerably variable in terms of their assemblage characteristics. Binford’s (1979:269–270) expectations for logistical camps varied, depending on the specific types of logistical activities involved, proximity to raw material sources, etc. Somewhat similarly, in contrast to assemblage consistency at residential sites, Sullivan and Rozen (1985) observed evidence of notable variation in flaking activities among small, short-term camps in their study of sites in Arizona. In several studies in New Mexico, Lundquist (2002, 2004a, 2004b, 2005; Higgins and Lundquist 2004:266–271) typically (but not always) found that sites with small assemblages tend to have more expedient-looking debitage assemblages than those with larger assemblages, which indicated the large sites in his samples were not simply palimpsests of smaller sites. However, in a sample of Pueblo period sites in New Mexico investigated by SWCA, the opposite pattern was found in one case; specifically, debitage at the one small, limited-activity site in the sample reflected a greater focus on formal tool finishing and/or refurbishing (Sullins and Railey 2009), whereas debitage at the other sites in the sample (all of which were sedentary, residential sites, and include one near the small, limited-activity site cited here) indicated disproportionately more expedient flaking (Railey and Gonzales 2015:14–24; Railey and Walth 2010:112–120).
Citing studies arguing for a link between formal tools and mobility, Cowan (1999) predicted that logistical sites should display disproportionately more evidence of formal-tool manufacture, use, refurbishment, and discard than residential sites. His case study focused on small sites in western New York state, and his findings also took into account raw-material geography and changes in settlement organization. Specifically, Cowan interpreted his Late Archaic sites as indicative of residential mobility, containing assemblages with both formal and expedient components. Early Woodland sites were overwhelmingly dominated by bifaces and related debris. Cowan interpreted these sites as logistical camps, occupied by mobile task groups operating out of residential sites located outside the study area. The Late Woodland sites in his study area exhibited an overall greater emphasis on expedient core reduction than either the Late Archaic or Early Woodland groups. But the Late Woodland sites also showed a bimodal pattern that Cowan interpreted as differences between winter base camps (with a greater focus on flake-tool production) and briefly occupied logistical camps (with more bifaces and related flaking debris).

Cowan’s data are open to some competing interpretations. For example, the sharp de-emphasis on bifaces between the Early and Late Woodland periods may be partially attributable to the introduction of the bow and arrow, for reasons discussed by Railey (2010a). Moreover, interpretations of site function that employ mobility-based explanations of assemblage variability run the risk of circular reasoning and conflating hypotheses and evidence (see Madsen 1981). That is, lithic assemblages are used to explain mobility and site function, and vice versa. Accordingly, mobility and site function should never be interpreted based on flaked stone assemblages alone, but rather should consider various site characteristics such as structure remains and other features (if present), subsistence-related biological remains, assemblage diversity, key site furniture (such as milling tools), etc.

**ANALYSIS**

As noted above, the assemblages selected for this exercise all date from the pre-ceramic time frame, or at least mostly so in the case of LA 184618, Mariposa, and Leland. All of these assemblages were analyzed using the same methods, and all artifacts included in this analysis are from surface collections. All of these sites and project areas have ground stone milling tools, indicating that seed processing (and/or perhaps processing of other materials) was carried out during their occupations. But note that, in the case of the Mariposa sites, only some had ground stone and there is some variation in site function.

The purpose of this exercise is to quantitatively characterize variation in debitage-assemblage patterns between these pre-ceramic sites, explore the potential factors accounting for any significant differences between them, and relate the findings to raw material conditions and the theoretical context presented above. Since all five assemblages were presumably produced prior to the arrival of the bow and arrow, the changeover in projectile weapon systems is not considered as a source of variation here (see Railey 2010a). The potentially relevant factors we are left with include mobility, subsistence, site function, and the nature and proximity of raw materials.

For this comparative analysis, debitage attributes include both ratio-level (length, thickness, and weight) and non-ratio ones (raw material type and texture, condition or completeness, percent cortex, and platform type). This analysis includes only those surface-collected debitage pieces that were individually analyzed in each assemblage. Before considering debitage data from these five
assemblages, it is prudent to first consider the nature, abundance, and availability of utilized raw materials for the four sites, since these factors can have a big effect on the character of debitage assemblages. Raw-material availability varies considerably from place to place, and the assemblages used in this analysis derive from widely separated locations in New Mexico. That variability includes the abundance or scarcity of tool stone in the local landscape, and the sizes, shapes, and textures of local lithic materials. For this analysis, both raw-material type and texture are examined. As for texture, note that there is not always a one-to-one correspondence between a particular raw-material type and texture designation in any of these assemblages, although some materials tend to be all or mostly fine-textured (e.g., obsidian, chalcedony, and, to a somewhat lesser extent, chert and petrified wood), whereas materials such as quartzite, basalt, rhyolite, silicified shale, and workable caliche tend to be medium or coarse.

The raw-material data for the five sites are presented in Table 6.7, and their adjusted chi-square residuals are shown in Figure 6.4. Note there are highly significant differences between these assemblages. LA 184618’s debitage is mostly quartzite, and is surpassed only by Leland in having the highest proportion of this material. Biting Ant has the highest percentage of chert by far, and like LA 184618 and Leland chalcedony is significantly underrepresented. Chalcedony is most overrepresented at Mariposa, whereas chalcedony and basalt co-dominate the I-25 surface debitage. Basalt is extremely overrepresented at I-25 due to the scarcity of this material in the other assemblages.

Table 6.7. Raw-Material Categories for the Five Compared Debitage Assemblages

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>LA 184618</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25 (LA 123291)</th>
<th>Leland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalcedony</td>
<td>3</td>
<td>10.3</td>
<td>2</td>
<td>2.9</td>
<td>74</td>
<td>48.1</td>
</tr>
<tr>
<td>Chert</td>
<td>5</td>
<td>17.2</td>
<td>52</td>
<td>75.4</td>
<td>216</td>
<td>7.0</td>
</tr>
<tr>
<td>Quartzite</td>
<td>16</td>
<td>55.2</td>
<td>7</td>
<td>10.1</td>
<td>30</td>
<td>1.0</td>
</tr>
<tr>
<td>Basalt and other igneous</td>
<td>1</td>
<td>3.4</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td>Petrified wood</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>5.8</td>
<td>336</td>
<td>1.1</td>
</tr>
<tr>
<td>Obsidian</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>10</td>
<td>0.3</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>13.8</td>
<td>7</td>
<td>1.1</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>100.0</td>
<td>69</td>
<td>100.0</td>
<td>3,078</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: Some percentages may not sum to 100 due to rounding.
Looking at raw-material texture, we see a somewhat predictable pattern based on what we already know about the raw-material types (Table 6.8, Figure 6.5). Most of the quartzite from LA 184618 was of a rather good-quality grade, sufficient even for precision flaking involved in making projectile points. Thus most of the quartzite from the site was coded as medium texture, whereas this material is usually mostly coarse grained. This was the case at Leland, where the quartzite was mostly coarse grained. Thus Leland has the disproportionately highest frequency of coarse-grained materials, while fine-grained tool stone is most underrepresented at this site. Again, Mariposa is the most dissimilar from Leland, owing to the dominance of fine-grained chalcedony in thedebitage from that project. Like LA 184618, medium-textured materials are overrepresented at I-25 and fine-grained materials, while present in substantial numbers, are underrepresented compared to the other assemblages as a whole. Biting Ant shows almost no departure from the expectations of randomness.

### Table 6.8. Raw-Material Texture for the Five Compared Debitage Assemblages

<table>
<thead>
<tr>
<th>Raw-Material Texture</th>
<th>LA 184618</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25 (LA 123291)</th>
<th>Leland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse</td>
<td>4</td>
<td>13.8</td>
<td>4</td>
<td>5.8</td>
<td>5</td>
<td>0.2</td>
</tr>
<tr>
<td>Medium</td>
<td>18</td>
<td>62.1</td>
<td>4</td>
<td>5.8</td>
<td>187</td>
<td>6.1</td>
</tr>
<tr>
<td>Fine</td>
<td>7</td>
<td>24.1</td>
<td>61</td>
<td>88.4</td>
<td>2,886</td>
<td>93.8</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>100.0</td>
<td>69</td>
<td>100.0</td>
<td>3,078</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: Some percentages may not sum to 100 due to rounding.
Adjusted chi-square residuals, raw-material texture group for the five compared debitage assemblages. The shaded area denotes the non-significant range.

Ratio-level data were compared for debitage length, width, and thickness (Table 6.9). Debitage length was significantly different among the five compared sites (Kruskal-Wallis one-way ANOVA, P <0.0001). Artifact length means differed significantly among all site pairs except Mariposa and I-25, Leland and I-25, LA 184618 and Leland, and LA 184618 and I-25 (Table 6.10). LA 184618 has the longest flakes on average.

Table 6.9. Summary Statistics for Debitage Ratio-level Attributes for the Five Compared Assemblages

<table>
<thead>
<tr>
<th>Assemblage</th>
<th>Parameters</th>
<th>N</th>
<th>Range</th>
<th>Median</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA 184618</td>
<td>Length (cm)</td>
<td>29</td>
<td>1.3–6.9</td>
<td>2.73</td>
<td>3.12</td>
</tr>
<tr>
<td>LA 184618</td>
<td>Thickness (cm)</td>
<td>29</td>
<td>0.33–2.3</td>
<td>0.87</td>
<td>0.95</td>
</tr>
<tr>
<td>LA 184618</td>
<td>Weight (g)</td>
<td>29</td>
<td>0.18–78.6</td>
<td>3.99</td>
<td>11.50</td>
</tr>
<tr>
<td>Biting Ant</td>
<td>Length (cm)</td>
<td>69</td>
<td>0.11–5.5</td>
<td>1.75</td>
<td>2.05</td>
</tr>
<tr>
<td>Biting Ant</td>
<td>Thickness (cm)</td>
<td>69</td>
<td>0.08–3.6</td>
<td>0.31</td>
<td>0.53</td>
</tr>
<tr>
<td>Biting Ant</td>
<td>Weight (g)</td>
<td>69</td>
<td>0.02–32.6</td>
<td>0.49</td>
<td>2.87</td>
</tr>
<tr>
<td>Mariposa</td>
<td>Length (cm)</td>
<td>3077</td>
<td>0.3–13.4</td>
<td>2.50</td>
<td>2.60</td>
</tr>
<tr>
<td>Mariposa</td>
<td>Thickness (cm)</td>
<td>3065</td>
<td>0.03–6.0</td>
<td>0.51</td>
<td>0.70</td>
</tr>
<tr>
<td>Mariposa</td>
<td>Weight (g)</td>
<td>3077</td>
<td>0.05–333.0</td>
<td>1.30</td>
<td>7.39</td>
</tr>
<tr>
<td>I-25</td>
<td>Length (cm)</td>
<td>154</td>
<td>0.9–5.5</td>
<td>2.45</td>
<td>2.58</td>
</tr>
<tr>
<td>I-25</td>
<td>Thickness (cm)</td>
<td>154</td>
<td>0.2–2.4</td>
<td>0.59</td>
<td>0.70</td>
</tr>
<tr>
<td>I-25</td>
<td>Weight (g)</td>
<td>154</td>
<td>0.1–26.6</td>
<td>2.04</td>
<td>4.11</td>
</tr>
<tr>
<td>Leland</td>
<td>Length (cm)</td>
<td>104</td>
<td>0.95–11.7</td>
<td>2.56</td>
<td>3.08</td>
</tr>
<tr>
<td>Leland</td>
<td>Thickness (cm)</td>
<td>104</td>
<td>0.1–3.3</td>
<td>0.81</td>
<td>0.99</td>
</tr>
<tr>
<td>Leland</td>
<td>Weight (g)</td>
<td>104</td>
<td>0.09–234.3</td>
<td>3.66</td>
<td>15.20</td>
</tr>
</tbody>
</table>
Table 6.10. Significance Matrix, P Values for Debitage Length for the Five Compared Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25</th>
<th>LA 184618</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leland</td>
<td>&lt;0.0001</td>
<td>0.0022</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(Leland)</td>
<td>(Leland)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biting Ant</td>
<td>0.0067</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>(LA 184618)</td>
</tr>
<tr>
<td></td>
<td>(Mariposa)</td>
<td>(I-25)</td>
<td>(LA 184618)</td>
<td></td>
</tr>
<tr>
<td>Mariposa</td>
<td>NS</td>
<td>0.0143</td>
<td></td>
<td>(LA 184618)</td>
</tr>
<tr>
<td>I-25</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: For this and the following two tables, the P values are from a Wilcoxon comparison of each pair. NS = No significant difference. For significant differences, the site with the larger mean is identified in the cell.

Debitage thickness was also significantly different among the four assemblages (Kruskal-Wallis one-way ANOVA, P <0.0001). All pairwise comparisons were significantly different except for Leland and LA 184618 (Table 6.11). Leland has the thickest flakes on average, followed closely by flakes from LA 184618.

Table 6.11. Significance Matrix, P Values for Debitage Thickness for the Five Compared Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25</th>
<th>LA 184618</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leland</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0002</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(Leland)</td>
<td>(Leland)</td>
<td>(Leland)</td>
<td></td>
</tr>
<tr>
<td>Biting Ant</td>
<td>0.0015</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>(LA 184618)</td>
</tr>
<tr>
<td></td>
<td>(Mariposa)</td>
<td>(I-25)</td>
<td>(LA 184618)</td>
<td></td>
</tr>
<tr>
<td>Mariposa</td>
<td>0.0042</td>
<td>0.0004</td>
<td>&lt;0.0010</td>
<td>(LA 184618)</td>
</tr>
<tr>
<td></td>
<td>(Mariposa)</td>
<td>(LA 184618)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-25</td>
<td>NS</td>
<td>0.006</td>
<td></td>
<td>(LA 184618)</td>
</tr>
</tbody>
</table>

Debitage weight (g) was also significantly different among all four survey sites (Kruskal-Wallis one-way ANOVA, P <0.0001 and pairwise Wilcoxon rank sum test, all P ≤ 0.05). Leland has the heaviest flakes on average (Table 6.12). Note that weight differences do not strongly covary with length (r²=0.53) or thickness (r²=0.51), but length and thickness do covary with each other (r²=0.69).

Table 6.12. Significance Matrix, Debitage Weight for the Five Compared Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25</th>
<th>LA 184618</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leland</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>0.0049</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>(Leland)</td>
<td>(Leland)</td>
<td>(Leland)</td>
<td></td>
</tr>
<tr>
<td>Biting Ant</td>
<td>0.0406</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>(LA 184618)</td>
</tr>
<tr>
<td></td>
<td>(Mariposa)</td>
<td>(I-25)</td>
<td>(LA 184618)</td>
<td></td>
</tr>
<tr>
<td>Mariposa</td>
<td>0.0009</td>
<td>0.0011</td>
<td>0.0159</td>
<td>(LA 184618)</td>
</tr>
<tr>
<td></td>
<td>(Mariposa)</td>
<td>(LA 184618)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-25</td>
<td>0.0159</td>
<td></td>
<td></td>
<td>(LA 184618)</td>
</tr>
</tbody>
</table>
For exterior cortex (Table 6.13, Figure 6.6), LA 184618 is very similar to Mariposa and I-25 in that all have slightly more cortical than non-cortical pieces, whereas Biting Ant and Leland have much higher percentages of non-cortical specimens. LA 184618 shows no significant departures from expectations, probably attributable to small sample size. Still, its high percentage of cortical flakes probably reflects the local availability of the quartzite that dominates the assemblage. Mariposa stands out in having a higher-than-expected frequency of cortical pieces, and for I-25 exterior cortex does not show significant departures from expectations. Leland and Biting Ant may be similar for different reasons. Leland, like Mariposa and I-25, has an abundance of locally occurring raw materials. But cortex was often difficult to discern on the locally occurring quartzite that dominates Leland’s assemblage. For Biting Ant, the proportionately low incidence of cortex is due to the fact that raw materials at that site—especially the dominant chert—are not locally available. Tool stone arrived at Biting Ant in a considerably reduced state, with most cortex already removed elsewhere. For Mariposa and I-25, an analysis of the subsurface debitage presented elsewhere (Railey and Gonzales 2015) showed that the Mariposa sites are part of a group of sites on Albuquerque’s West Mesa that exhibits proportionately more expedient/early-stage reduction than at the nearby I-25 site. The numbers for exterior cortex for surface-collected debitage follows this pattern.

Table 6.13. Debitage Exterior Cortex for the Five Compared Assemblages

<table>
<thead>
<tr>
<th>Pct. Exterior Cortex</th>
<th>LA 184618</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25 (LA 123291)</th>
<th>Leland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
<td>51.7</td>
<td>52</td>
<td>75.4</td>
<td>1,703</td>
<td>55.3</td>
</tr>
<tr>
<td>1–10</td>
<td>2</td>
<td>6.9</td>
<td>5</td>
<td>7.2</td>
<td>638</td>
<td>20.7</td>
</tr>
<tr>
<td>11–49</td>
<td>9</td>
<td>31.0</td>
<td>8</td>
<td>11.6</td>
<td>413</td>
<td>13.4</td>
</tr>
<tr>
<td>50–99</td>
<td>3</td>
<td>10.3</td>
<td>4</td>
<td>5.8</td>
<td>189</td>
<td>6.1</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>135</td>
<td>4.4</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>100.0</td>
<td>69</td>
<td>100.0</td>
<td>3,078</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: Some percentages may not sum to 100 due to rounding.

Figure 6.6. Adjusted chi-square residuals, debitage exterior cortex for the five compared debitage assemblages. The shaded area denotes the non-significant range.
As for platforms (Table 6.14, Figure 6.7), when pieces with no platforms are excluded there are only slightly significant differences, a result partially due to the small sample size. In the LA 184618 debitage, cortical platforms are overrepresented whereas crushed ones (of which there are none) are underrepresented. For the other assemblages, there are only two significant departures from expectations. The most notable of these is the disproportionately high number of faceted platforms at Biting Ant. This is consistent with the character of this site’s assemblage, which derives from nonlocal materials that has been considerably reduced elsewhere, and after arriving at the site were subject mostly to late-stage tool finishing and maintenance. These activities involve precision flaking including a higher incidence of platform preparation (and, hence, multifaceted platforms).

Table 6.14. Debitage Platform Types for the Five Compared Assemblages

<table>
<thead>
<tr>
<th>Platform Type</th>
<th>LA 184618</th>
<th>Biting Ant</th>
<th>Mariposa</th>
<th>I-25 (LA 123291)</th>
<th>Leland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortical</td>
<td>7</td>
<td>24.1</td>
<td>5</td>
<td>7.2</td>
<td>268</td>
<td>8.7</td>
</tr>
<tr>
<td>Plain</td>
<td>7</td>
<td>24.1</td>
<td>12</td>
<td>17.4</td>
<td>634</td>
<td>20.6</td>
</tr>
<tr>
<td>Faceted</td>
<td>3</td>
<td>10.3</td>
<td>12</td>
<td>17.4</td>
<td>227</td>
<td>7.4</td>
</tr>
<tr>
<td>Crushed</td>
<td>0</td>
<td>0.0</td>
<td>7</td>
<td>10.1</td>
<td>317</td>
<td>10.3</td>
</tr>
<tr>
<td>None</td>
<td>12</td>
<td>41.4</td>
<td>33</td>
<td>47.8</td>
<td>1,632</td>
<td>53.0</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100.0</td>
<td>69</td>
<td>100.0</td>
<td>3,078</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: Some percentages may not sum to 100 due to rounding.

Figure 6.7. Adjusted chi-square residuals, debitage platforms for the five compared debitage assemblages. The shaded area denotes the non-significant range.
There are significant differences for debitage condition, or completeness (Table 6.15, Figure 6.8). LA 184618 has a higher-than-expected number of complete flakes, as is the case with I-25. This reflects, in part, the high proportion of coarse-grained materials in these two assemblages (quartzite at LA 184618 and basalt at I-25)—materials that tend to be more durable and less prone to breakage that finer-grained tool stone. Leland has a disproportionately high frequency of debris, and this is directly attributable to the overall poor flaking quality of the local quartzite there, which often breaks into pieces lacking discernible flake attributes. In contrast is Biting Ant, which has a significantly low incidence of debris and a higher-than-expected frequency of flake fragments. This reflects the focus on very late-stage flaking of fine-grained materials (mostly chert) at this site. Mariposa exhibits no statistically significant departures for debitage condition.

<table>
<thead>
<tr>
<th></th>
<th>Complete</th>
<th>Fragments</th>
<th>Debris</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA 184618</td>
<td>16 (55.2)</td>
<td>2 (6.9)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>Biting Ant</td>
<td>2 (3.4)</td>
<td>13 (18.8)</td>
<td>2 (2.9)</td>
</tr>
<tr>
<td>Mariposa</td>
<td>953 (31.0)</td>
<td>269 (8.8)</td>
<td>612 (19.9)</td>
</tr>
<tr>
<td>I-25 (LA 123291)</td>
<td>67 (43.5)</td>
<td>11 (7.1)</td>
<td>34 (22.1)</td>
</tr>
<tr>
<td>Leland</td>
<td>18 (17.3)</td>
<td>7 (6.7)</td>
<td>35 (33.7)</td>
</tr>
<tr>
<td>Total</td>
<td>1,076 (31.4)</td>
<td>301 (8.8)</td>
<td>687 (20.0)</td>
</tr>
</tbody>
</table>

Note: Debitage condition was not recorded for four of the Mariposa specimens.
INTERPRETATIONS OF THE FIVE-SITE COMPARATIVE ANALYSIS

The debitage data in this comparative analysis suggest some rather clear patterns with respect to variation in raw material availability, the character of the materials most frequently flaked, and the nature of the occupations that produced these assemblages. This section presents interpretations of each of the five assemblages, based on the data analyses presented above.

LA 184618

This site lies amongst mesas composed of a variety of sedimentary rocks, and materials weathered and eroded from these outcrops provided prehistoric people in the area with tool stone. The dominant material is orthoquartzite, some of which is of sufficient quality to produce projectile points. Most of the quartzite, however, is coarse grained and better suited to expedient tools, and expedient flaking appears to have been the most common flint-knapping activity at the site. Cores or raw pieces of quartzite, presumably from nearby sources, were transported to the site and rather casually reduced there. Other materials, including the finer-grained chert and chalcedony, appear to have come from more distant sources, and their low numbers seem to underscore the relative unimportance of formal tool production and maintenance at this site. The emphasis on expedient production is further evidenced by the low number of debitage pieces at the site, the significantly longer, thicker, and heavier flakes at LA 184618 compared to most of the other four assemblages, and the disproportionately high numbers of cortical pieces. Complete flakes also occur in higher-than-expected frequencies, an expectable characteristic when medium- and (especially) coarse-grained materials dominate a debitage assemblage. In this comparative analysis, LA 184618 is most similar to Leland, where use of coarse-grained local material and expedient production also characterize the lithic technology at that site. The projectile points at LA 184618 reflect hunting and/or self-defense, and the dearth of ground-stone milling tools suggest food processing involving these tools was not an important activity.

Biting Ant

Biting Ant lies within the most impoverished lithic landscape of the four project sites compared here. With the apparent exception of some workable Caprock caliche and quartzite in the local gravels, the tool stone represented in the assemblage all appears to have come from distant sources. Despite the large number of features uncovered and investigated, lithic artifacts are rather sparse at Biting Ant. Most of the flaked stone artifacts are chert, and this material arrived at the site as small cores, late-stage bifaces, or finished tools. Accordingly, flint knapping focused on late-stage reduction, mostly tool finishing and maintenance. This is evidenced by 1) few bifaces (and both are late-stage specimens), 2) the small size of debitage pieces, and 3) the high percentage of non-cortical debitage pieces among the six compared assemblages. Due to the scarcity of local tool stone availability, especially fine-grained materials, the site’s inhabitants were very careful in working what materials they brought to the site and were careful not to casually use their precious tools.

Despite the low numbers of artifacts, there is an appreciable diversity of lithic tool types at Biting Ant. This includes a lot of ground stone implements, suggesting that food processing was an important activity here. Moreover, the transport and caching of heavy, ground stone milling tools—all made from material (mostly sandstone) that does not occur locally—reflects advance planning for repeated occupations that were otherwise small scale and short term. Projectile points
are also rather common at Biting Ant, suggesting big-game hunting and/or a concern for self-defense. But a near absence of flake tools that might have been used for processing kills calls into question the importance of hunting at this site, however. Taken together, the comparative evidence strongly suggests that Biting Ant was the site of numerous occupations, at least mostly short term, by residentially mobile foragers.

**Mariposa**

This assemblage derives from numerous sites in the northwest portion of Albuquerque’s West Mesa, which were investigated by two data recovery projects. The landscape here is littered with secondary gravels containing a variety of workable raw materials, although chalcedony is clearly dominant here, and this is reflected in the surface-collected debitage. The Mariposa sites were collectively occupied over a long span of time, from the Late Paleoindian to historic Pueblo periods, but the vast majority of the remains were left by Middle and Late Archaic activity in the area. These Middle and Late Archaic occupations appear to be all or mostly small scale and short term, and involved residentially mobile hunter-gatherers and perhaps some more logistical encampments by Late Archaic peoples who were otherwise based in the nearby river valleys and were engaged in maize-based farming (see Railey 2016). The encampments ranged from momentary activities that left behind cooking features and little or no artifacts, to repeatedly occupied sites with numerous lithic artifacts, ground stone milling tools, cooking pits, and, in some cases, the remains of small pit structures.

The nature of flaking activities varied between the many Mariposa sites. But overall, lithic reduction at Mariposa involved a lot of cobble testing and early-stage/expedient flaking, and less late-stage flaking and formal tool production than at the I-25 site LA 123291. This is consistent with results from an analysis of subsurface debitage that included the I-25 site plus assemblages from two other data recovery projects by SWCA on the West Mesa (Railey and Gonzales 2015). The findings suggest that, on balance, the flint knapping at the short-term encampments on the mesa were disproportionately focused on producing expedient flakes and reducing materials that were then carried off to be finished as formal tools elsewhere.

**I-25 (LA 123291)**

This is the only intensively occupied, farming-based settlement included in this comparative analysis. The I-25 site had larger and more substantial structures than are evident at Mariposa, and is the only site included here with anthropogenic middens and recognizable storage pits. It is also the only site included here with evidence of maize-based farming, and the site’s occupants depended rather heavily on farming in their subsistence economy. This site has disproportionately more coarse- and medium-grained materials than Biting Ant and Mariposa, most of it basalt. But fine-grained materials (mostly chalcedony) are also abundant in nearby gravels and the site’s lithic assemblage, and a variety of other materials was locally available as well. A range of flaking activities was carried at this site, including all stages of reduction, but with a strong emphasis on finishing and maintaining projectile points and other formal tools. This is underscored by comparing the site’s debitage assemblage with Mariposa’s; I-25’s clearly reflects proportionately more late-stage flaking and formal tool production and maintenance, even though Mariposa’s has proportionately much more fine-grained materials.
Food processing with ground stone milling implements was also important at I-25, along with some ceremonial and/or leisure activities as evidenced by a calcite pendant fragment. Faunal remains, a comparatively high number of projectile points, and protein residues on points suggest that big-game hunting was often staged directly out of this settlement, and a variety of flake and pebble tools includes items that were probably used for processing carcasses and/or hides.

**Leland**

The people who camped at Leland had access to an abundance of locally occurring quartzite, including outcrops on and immediate adjacent to the site. This is very poor-quality material, however, from which serviceable flakes could not always be obtained. Considerable testing and reduction of quartzite at this site left behind debitage pieces that are disproportionately larger, thicker, and heavier than those from the other four assemblages examined here, and also produced a significantly high frequency of debris as opposed to flakes. The material was not at all suited to biface production, and the only biface at this site was made from chalcedony, which along with chert and obsidian appears to be from nonlocal (but not too distant) sources. But these materials occur in very low numbers at this site, and the flaking activities were focused on producing expedient flake tools from the local quartzite. The high incidence of non-cortical pieces at this site runs counter to expectations from an assemblage characterized by expedient flaking of material available in the immediate vicinity. However, as noted above, cortex was not always readily discernible on the quartzite at this site.

The occupations at Leland were apparently all very small scale and short term. The diagnostic projectile points suggest both Early and Late Archaic components. The presence of ground stone milling tool fragments indicate the site was provisioned for repeated visits to the site, and that the flaking of quartzite here may have been incidental to more focal goals such as collecting and processing of wild seeds and hunting. In other words, lithic reduction at Leland appears to have been embedded in a subsistence strategy that involved residential and/or logistical mobility. But by all measures (including the complete absence of intact, subsurface cultural features) the occupations at Leland were very ephemeral encampments.

**Summary and Discussion of the Five-Site Comparative Analysis**

The findings of this five-site comparative analysis hold some important implications for our understanding of the forager–collector continuum and the purported shift from “formal” to “expedient” technologies. As for the latter, the findings do not provide very strong support for mobility- or subsistence-based explanations for the shift from formal to expedient flaked stone technologies. There is no clear trend between the mobile hunter-gatherer campsites (LA 184618, Leland, Biting Ant, and Mariposa) on the one hand, and the more settled, early farmer hamlet (I-25 site LA 123291) on the other. Rather, the results suggest that at least two factors are behind the observed patterns, involving variability between 1) local raw materials, and 2) the nature and range of on-site activities.

Regarding the nature and availability of local raw materials, only Biting Ant lacks locally available raw materials, or at least the ones most commonly flaked at the site. This condition is clearly reflected in debitage attribute data from Biting Ant as compared to the other assemblages. LA 184618, Leland, and I-25 stand out from the other two in having significantly more coarse- and/or medium-grained materials in their assemblage, although I-25 also has abundant fine-grained tool
stone (mostly chalcedony) in its vicinity and archaeological assemblage. The Mariposa sites sat in a landscape with abundant raw materials, mostly fine-grained chalcedony.

With respect to the nature and range of on-site activities, four of the assemblages derive from small-scale, short-term encampments (LA 184618, Leland, Biting Ant, and Mariposa), and the other from a residential hamlet or base camp that was intensively occupied by early farmers (I-25). Each of these sites has a rather unique signature regarding lithic reduction activities, which is only partially affected by the availability and character of the raw materials involved. At LA 184618 and Leland, most of the flint knapping focused on obtaining usable, expedient flakes from coarse-grained, local quartzites. The Leland inhabitants were especially challenged in that their local material was mostly poor quality, and flaking it resulted in a lot of debris (i.e., shatter). In contrast, the Biting Ant assemblage reflects an emphasis on late-stage tool finishing and maintenance, involving mostly chert and other fine-grained materials, the early-stage reduction of these materials having occurred elsewhere. At the Mariposa sites people reduced the locally occurring gravels—mostly fine-grained chalcedony—with flint knapping focused more on early-stage reduction and expedient flake production rather than later-stage flaking. I-25 differs from Mariposa in its greater emphasis on tool finishing and maintenance, which is typical of base camps and other intensively occupied settlements.

In summary, this comparative exercise provides a much stronger case for interpreting the lithic artifact assemblage for each site than would be possible if no such comparisons were carried out. But such comparisons require a high level of data comparability, which (despite some minor coding inconsistencies) was possible in this case because all assemblages were analyzed using the same approach and attribute definitions, established for SWCA projects more than a decade ago. Such comparability is especially critical for the analysis of debitage, which remains in an overall state of non-standardized chaos, as a multitude of analysts continue to employ a wide variety of analytical frameworks. Despite repeated calls for implementing comparability in the analysis of lithic artifacts—and especially debitage—non-comparable data sets continue to proliferate. This inhibits or even precludes what could otherwise be statistically meaningful and interesting analyses that could further our understanding of flaked stone technological and raw-material use patterning in New Mexico.
CHAPTER 7
HISTORICAL ARTIFACTS

Christopher A. Carlson

As expected, historical artifacts were identified and collected within the work area, but were not numerous (nine FSs comprising a total of 12 artifacts). Due the distance of these artifacts from NM 104 (outside the associated right-of-way fence, beginning roughly 20 m [66 feet] south of the highway) it is unlikely that passing vehicles are responsible for these artifacts; rather—given the artifact types and chronology—it appears that almost all these artifacts are associated with the historic structure whose remains (Feature 1) lie some 65 m (213 feet) south of the work area. Feature 1 is a rectangular sandstone rubble pile measuring 36 feet east-west × 21 feet north-south, and was a single-family residence.

PB’s previous survey investigation detailed the site’s historical artifacts, which clustered largely around Feature 1.

The recorded historic assemblage totaled 71 artifacts with approximately 80 percent of the visible surface artifacts being recorded. The historic component encompasses the entire site; however, majority of the historic artifacts were found in the southern portion of LA 184618, near Feature 1. One artifact concentration (AC 1) was noted directly south of the feature which contained approximately 50 artifacts. The historic component includes plain whiteware (one base fragment reading “J. & G. MEAKIN HANLEY”…circa 1890–1930s: http://thepotteries.org/mark/m/meakin_jg.html), crockware (brown and tan/brown decorated, glass (sun-colored amethyst…, green bottle, aqua, clear, and heavily oxidized brown), steel beverage cans, one square hole-in-top lid, miscellaneous metal fragments, and a few milled lumber scraps.” (Lawrence and Del Frate 2016:22)

The previous investigation also found a J. and G. MEAKIN HANLEY on the base of a porcelain vessel fragment (Lawrence and Del Frate 2016:20) with a supplied date range of A.D. 1890–1930, though their online reference notes that “marks without “England” pre-date 1890” which is the case for this ceramic fragment (Birks 2016); therefore, this sherd dates between A.D. 1851 and 1890.

The collected historical artifacts are detailed in Table 7.1. The assemblage is made up primarily of domestic items, consisting of three brown beverage bottle fragments from two to three bottles, three sun-colored amethyst decorative glass shards from a single bottle break (possibly a perfume bottle), one beverage can, two probable potted meat cans, one hand-forged metal spike with hook (likely for hanging an oil lamp), and one centerfire cartridge case. Functionally, the can and glass artifacts indicated routine consumption of food and beverages and in the case of the sun-colored amethyst glass, personal or toiletry use. The iron spike with a hook suggests the use of an oil lamp in the pre-electric era in this area, while the cartridge points to firearms use for recreation, varmint control, and/or the need for home/personal defense.
Table 7.1. Historical Artifacts Collected from the Work Area at LA 184618

<table>
<thead>
<tr>
<th>FS No.</th>
<th>Category</th>
<th>Count</th>
<th>Dimensions (inches)</th>
<th>Description/ Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Can: food</td>
<td>1</td>
<td>&lt; 1-inch fragments; 2/16-inch thick</td>
<td>(Figure 7.1, top): rectangular hole-in-cap can: A.D. 1875–1911, probably contained corned beef (Rock 1984:102–103 in Horn 2005:4)</td>
</tr>
<tr>
<td>18</td>
<td>Bottle: liquid or beverage</td>
<td>2</td>
<td>&lt; 1-inch fragments; 2/16-inch thick</td>
<td>Brown bottle fragments: A.D. 1860+ (Horn 2005:1)</td>
</tr>
<tr>
<td>20</td>
<td>Bottle: liquid or beverage</td>
<td>1</td>
<td>&lt; 1-inch fragments; 3/16-inch thick</td>
<td>Bottle fragment: A.D. 1860+ (Horn 2005:1)</td>
</tr>
<tr>
<td>28</td>
<td>Bottle: decorative</td>
<td>3</td>
<td>&lt; 2 1/16-inch fragments; 3/16-inch thick avg. thickness; fragment curvature suggests ~3-3 8/16-inch outer bottle diameter</td>
<td>(Figure 7.1, lower left and center): sun-colored amethyst, “fancy” or decorative glass with diamond-pattern-cut exterior; appears to be a bottle fragment: ca. A.D. 1885–1920 (Horn 2005:1); possibly fragments from a perfume bottle</td>
</tr>
<tr>
<td>30</td>
<td>Bottle: liquid or beverage</td>
<td>1</td>
<td>Neck finish fragment; bore ~ 12/16 inch × 2/16-inch thickness</td>
<td>(Figure 7.1, lower right): brown bottle neck finish fragment from Ring or Oil type (IMACS Guide 2001); ca. brown: &lt; A.D. 1860 (Horn 2005:1)</td>
</tr>
<tr>
<td>37</td>
<td>Can: food</td>
<td>1</td>
<td>Partially crushed; ~ 3 × 2 8/16</td>
<td>Geared-rotary-opened sanitary food can (likely potted meat) with crimped side and end seams: A.D. 1925+ (Horn 2005:5)</td>
</tr>
<tr>
<td>39</td>
<td>Metal hook for lighting</td>
<td>1</td>
<td>7 × 10/16 × 4/16-inch thick tapering to 6/16 × 2/16-inch; bent at a 35-degree angle in the middle</td>
<td>(Figure 7.2): oxidized, hand-forged iron spike with a 2/16 hook on one end; the last inch or so has broken off. Based on form, dimensions, and distal break, this artifact was likely driven into a beam and used to hang an oil lamp or similar.</td>
</tr>
<tr>
<td>42</td>
<td>Arms and Munitions</td>
<td>1</td>
<td>Partially crushed; ~ 0.48 × 1.24 inches</td>
<td>(Figure 7.3): partially crushed and fired .45 Colt brass pistol case: A.D. 1873–ca. 1884 (Horn 2005:6 and Ron Peterson Firearms, LLC, personal communication)</td>
</tr>
<tr>
<td>45</td>
<td>Can: Beverage</td>
<td>1</td>
<td>Partially crushed; ~ 4 8/16 × 2 10/16 inches</td>
<td>Double church-key–opened beverage can with machine-applied single side solder and crimped ends; the church key indicates a post A.D. 1935 date+ (Gillio et al. 1980:9 in Horn 2005:5)</td>
</tr>
</tbody>
</table>
Figure 7.1. Top: FS 4, a probable corned-beef food hole-in-cap can; bottom, from left to right: FS 28, two of three pieces of sun-colored amethyst glass, and FS 30, a brown bottle neck finish fragment.
Figure 7.2. Oxidized, hand-forged iron spike with a hook on one end, likely used to hang an oil lamp.
Figure 7.3. A .45 Colt case, manufactured between A.D. 1873 and ca. 1875.

The historical artifact assemblage is quite small and dispersed throughout the work area (see Figure 5.6). There is no temporal or functional patterning evident in the distribution of these artifacts. The cartridge case is partially crushed and out of round, making exact measurements impossible, and has no maker’s mark headstamp. The cartridge case was taken to Ron Peterson Firearms, LLC, in Albuquerque (August 12, 2016), a business that includes the buying and selling of antique firearms. The staff was kind enough to spend several minutes measuring and noting the attributes of the case. The measurements correspond most favorably to a .45 Colt (A.D. 1873–present), and the primer is indented by an older-style, straight conical firing pin used in this caliber only in single-action pistols manufactured between A.D. 1873–1905; the combination of the caliber and pistol type used to fire it narrows the date range to A.D. 1873–1905. Further narrowing the temporal span of this artifact, Horn (2005:6) reports: “In general cartridges with no markings are older varieties, possibly dating prior to the early 1880s”. Given this last temporal indicator, it is likely that this .45 Colt case was manufactured between A.D. 1873 and ca. 1884.

Temporally, with the exception of .45 Colt case, and the J. and G. MEAKIN HANLEY found in the previous investigation, there are no precise datable attributes such as bottle maker’s marks or artifacts with a patent number or embossed/stamped dates of manufacture; however, a majority of the artifacts from the current investigation do share a range of chronology. Ten of the 12 artifacts date from A.D. 1885–1920, with the three sun-colored amethyst shards providing this narrowest date range. One artifact post-dates PB’s chronological site assignment of A.D. 1890–1930. FS 45, a church-key–opened beverage can (the church-key opening is post-A.D. 1935) was found near the southern portion of the work area investigated, roughly 5 m (16 feet) west of the site’s two-track road. It is likely that this chronological outlier was deposited after the initial occupation of the site.

Because 11 of the 12 artifacts pre-date A.D. 1925, the presence of an A.D. 1873–ca. 1884 .45 Colt case, and a J. and G. MEAKIN HANLEY porcelain vessel fragment dating from A.D. 1851–1890 from the previous investigation (Lawrence and Del Frate 2016:20), the assemblage points to a A.D. 1851–1925 occupation; however it should be pointed out that valuable items (represented by
the .45 Colt ammunition, the J. and G. MEAKIN HANLEY porcelain vessel, and the decorative fragments from a possible perfume bottle) tend to be well taken care of and are often used or stored for years after the date of manufacture, and are commonly transported when moving from one residence to another—it is likely that at least the .45 Colt cartridge and porcelain vessel sherd predate the start of this historic-era residence. The porcelain vessel fragment and decorative sun-colored amethyst glass fragments suggest the presence of at least one woman at this residence, and that this site probably hosted a nuclear family.

Archival research supplies the last piece of the site chronology. A search of the BLM General Land Office online records shows that the project area is located within a parcel patented to Simon Garcia on December 9, 1892, under the Homestead Entry Act of 1862 (12 Stat. 392). Mr. Garcia patented 159.32 acres of land within Section 5, Township 12 North, Range 25 East (BLM n.d.). Based on artifact and archival research, SWCA’s investigation agrees with PB’s Hispanic cultural affiliation for this site, with a slightly refined date range of ca. A.D. 1890–1930, within the Territorial to Statehood–WWII periods.
CHAPTER 8
SUMMARY AND MANAGEMENT RECOMMENDATIONS
Jim A. Railey

Archaeological investigations at LA 184618 have included both survey-level documentation by PB and a data recovery effort by SWCA. The information collected by these efforts has revealed details about the prehistoric and historic period occupation and activities at the site, and contribute data to this region of northeastern New Mexico, which remains rather poorly known archaeologically.

This chapter summarizes and synthesizes the findings from the site and offers some thoughts on the occupations at the site. The discussion presented here relates back to the issues and questions in the research design (see Chapter 4). Management recommendations are presented at the end of this chapter.

RESEARCH DOMAIN 1: GEOMORPHOLOGY

Although a specialized geomorphic investigation was not carried out as part of the data recovery, the site character and stratigraphy allowed for a rather straightforward interpretation of the site’s geomorphology. The site sits on a remnant of pre-Holocene alluvium that was deposited by ancestral Cuervo Creek, and which in turn lies atop bedrock that is now exposed downslope from the work area, above the edge of the creek’s present-day floodplain. The probable late Pleistocene age of this alluvium is evidenced most clearly by the Stage II calcic horizon, exposed at or just below the present-day ground surface.

RESEARCH DOMAIN 2: NUMBER OF COMPONENTS AND CHRONOLOGICAL AGES OF THE SITE’S OCCUPATIONS

A lack of chronometrically datable archaeological contexts at LA 184618 precludes fully addressing questions related to the number and nature of components present at the site. Based on two diagnostic projectile points, the site was used at least during the Archaic tradition, probably the Middle and/or Late Archaic periods. This is consistent with the absence of Native American pottery. Native American use from other time periods may have also occurred, but there is no evidence for this. The historic period occupation occurred between 1890 and 1930, as evidenced by diagnostic artifacts.

RESEARCH DOMAIN 3: NATURE AND INTENSITY OF THE SITE’S PREHISTORIC OCCUPATIONS

Native American activity at LA 184618 was very ephemeral, involving one or more very small-scale, short-term occupations. Artifact diversity is very low at the site, including a small number of cores and debitage, two projectile points, a mano, and a few other flaked stone tools. Moreover, there are no preserved features at the site associated with the prehistoric component, which may be partially attributable to taphonomic factors, but probably also the ephemeral nature of the site’s use by its Native American visitors.
The historic period occupation was residential, involving a farmhouse now marked by a rubble feature within the site but well south of the work area. It appears to have lasted only a few decades, and was part of the rural settlement of the area by a sparse local population.

**Research Domain 4: Subsistence Practices and Paleoenvironments**

Like many of the earth’s more marginal grasslands, central New Mexico has experienced desertification in recent times, especially since the late nineteenth century. Overgrazing by livestock, and lowering of water tables through well drilling and massive extraction of groundwater, has led not only to considerable removal of grass cover, but also to the carving of arroyos into the bottoms of stream channels and other areas underlain by comparatively soft sediment. LA 184618 was likely an attractive location due to the adjacent Cuervo Creek, which almost certainly provided both water and a riparian biome that probably included willows, cattails, and other useful species not found in the surrounding, high-plains desert landscape. The presence of surface water and wetland species would have been key resources enriching the local resource base and providing wild foods that attracted hunter-gatherers to this location.

The current data recovery effort did not reveal any contexts containing charred plant remains, leaving us nothing to say about evidence for specific plant food items or fuelwoods utilized at the site. The only faunal remains recovered were small fragments of mussel shell, but we do not know with which component these are associated.

**Research Domain 5: Lithic Technology**

As described in Chapter 6, a thorough analysis of the entire lithic assemblage from LA 184618 was carried out as part of the current investigation. The debitage assemblage was quantitatively compared with four others from Archaic sites investigated by SWCA. This analysis showed that the prehistoric occupants of LA 184618 relied primarily on locally occurring orthoquartzite and that most of their flint-knapping activities at this site involved expedient core reduction. Chert and chalcedony found at LA 184618 are probably nonlocal (but perhaps not-too-distant) materials that likely originated from sedimentary rocks and/or volcanic outcrops. The closest primary sources of volcanic materials to the site are located 36 km north of the site.

By several measures, the assemblage is most similar to that from the Leland site. Based on the debitage and patterns observed in the assemblage, it appears that lithic reduction at LA 184618 was embedded in a subsistence-settlement strategy involving residential and/or logistical mobility. In general, the artifact assemblage is small and of low density, suggesting the site hosted only small, short-term occupations. Moreover, the assemblage’s low diversity suggests a limited range of activities. A single mano (outside the work area) suggests food processing and preparation using ground stone milling tools may have been carried out, and the two projectile points (also outside the work area) evidence hunting and/or self-defense.
ARCHAIC HUNTER-GATHERERS AT LA 184618

The Archaic period people who encamped at this site were probably highly mobile hunter-gatherers, who relied on what most of us today would consider bush-survival skills. Living in a world without metal, these hunter-gatherers depended heavily on making and using a variety of ground and flaked stone tools. Thus, they needed access to suitable types of stone, not all of which were present within the local area. Quartzites of varying grade were available nearby, and were used for both expedient and formal tools (the latter including at least two bifacial projectile points). But finer materials, such as chert and chalcedony, apparently had to be brought to the site from some distance.

Typical of residentially mobile foragers, the occupants of LA 184618 likely spent the year moving between multiple campsites scattered throughout their territories. Through mobility, these hunter-gatherers were able to wrest a living by collecting food at various places, obtaining information about the current status of various resources (and the activities of other people) across the landscape, and do it all in an energetically efficient manner by moving themselves to available sources of foods rather than vice-versa. From campsites such as LA 184618, hunter-gatherers fanned out to collect food from the surrounding landscape. Hunter-gatherers typically venture no more than 10 km (6 miles) from the camp in a given day, and usually less than that (Kelly 1995).

SUMMARY OF EFFORT

Data recovery at LA 184618 has fulfilled the objectives of the approved treatment plan and successfully mitigated impacts from the proposed undertaking. The surface of the work area was fully collected, and hand excavation units, backhoe trenching, and machine scraping found no features and recovered very few artifacts. The investigations allowed for a geomorphic assessment of subsurface soil development and approximate ages of the sediments. Analysis of the lithic and historical artifact assemblages shed some light on past human occupations and activities at the site, and contribute new (albeit limited) information on this part of New Mexico, which remains poorly known archaeologically.

ELIGIBILITY STATUS

LA 184618 was previously determined eligible to the NRHP under Criterion D (HPD Log No. 103582). Data recovery investigations indicate the site’s prehistoric component does not contribute to the site’s significance, however. Although some knowledge was gained about Native American activity at the site, the information potential is extremely limited, and the findings did not exceed what could have been learned from detailed, survey-level recordation. The historic component, on the other hand, has significant data potential, especially with respect to the Feature 1 rubble mound, which is outside the work area of the current project. Further investigations in and around Feature 1 could yield significant information about historic period settlement and rural life in this part of New Mexico. Therefore, it is recommended that the site’s NRHP eligibility under Criterion D be maintained.
MANAGEMENT RECOMMENDATIONS

SWCA recommends that no further investigations at the site are necessary as part of this undertaking. Investigations within the work area maximized the information potential within this portion of the site, and little or nothing more would be learned from additional data recovery here. Upon approval of this data recovery report, all collected materials and records will be submitted for curation to the Museum of New Mexico’s Museum of Indian Arts and Culture, and curation will constitute final fulfillment of the data recovery obligations.
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APPENDIX A.
LA 184618 LOCATIONAL INFORMATION
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The public disclosure of the location of archaeological sites on state and private lands is prohibited by § 18-11.1 NMSA 1978. The public disclosure of the location of archaeological sites on federal lands is prohibited by 36 CFR 296.18.

(4 NMAC 10.15.2J.[1])
APPENDIX B.
DEBITAGE DATA
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<th>Property Name</th>
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