PERSISTENT PLACE
ARCHAEOLOGICAL INVESTIGATIONS AT THE LARDER AND SCORPION KNOLL SITES, CLARK COUNTY WETLANDS PARK, NEVADA

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CHAPTER 1
INTRODUCTION

Richard V.N. Ahlstrom

In late 2005–early 2006, HRA, Inc. Conservation Archaeology conducted archaeological investigations at four sites in Clark County Wetlands Park, southern Nevada (Figures 1.1). They included the Larder Site (26CK6146), the Scorpion Knoll Site (26CK6147), 26CK6001, and 26CK6007. The three prehistoric sites in the group, the Larder and Scorpion Knoll sites and 26CK6007, are the subject of this report. The fourth site, 26CK6001, dates to the historical period, and the work that HRA conducted there is discussed in a separate report (Warren and Eskenazi 2007).

The limited excavations that HRA carried out at the three prehistoric sites uncovered the remains of short-term habitation structures (at the Scorpion Knoll Site), storage pits (at the Larder and Scorpion Knoll sites), and hearths or roasting pits (at all three sites). As a group, the sites date to the 2000-year interval from 300 BC to AD 1700. HRA had originally discovered and recorded the sites in 2000–2001 during archaeological surveys of the eastern (26CK6007) and western (Larder and Scorpion Knoll sites) halves of Clark County Wetlands Park (Roberts and Ahlstrom 2000; Woodman et al. 2001). Site 26CK6007 is situated near the eastern end of the park, on the south bank of Las Vegas Wash and in the Northeast ¼ of Section 28, Township 21 South, Range 63 East (Figure 1.2). The Larder and Scorpion Knoll sites lie 4 miles to the west of 26CK6007, near the park’s western end (Figure 1.2). These two sites are located about 100 m apart, on the northeastern side of Las Vegas Wash and in the Southeast ¼ of Section 23, Township 21 South, Range 62 East. The Larder and Scorpion Knoll sites have been determined eligible for the National Register of Historic Places (NRHP) under Criterion D, as contributing properties within the Las Vegas Wash Archaeological District (Mark Slaughter, BOR, personal communication 2004). The third site, 26CK6007, was recommended as eligible for the NRHP in HRA’s survey report (Roberts and Ahlstrom 2000).

As a riparian corridor in an urban area, the Las Vegas Wash is an important ecological resource for Southern Nevada. In response to a ballot measure approved by Nevada residents in 1991, Clark County Parks and Recreation is developing the Clark County Wetlands Park along the wash. In tandem with this project, the Bureau of Reclamation (BOR), Southern Nevada Water Authority (SNWA), and Clark County are involved in efforts to stabilize the wash’s channel, including the construction of up to 22 erosion-control weirs and 7 miles of stream-bank protection. These efforts are intended to improve water quality, increase wetlands habitat, and provide recreational opportunities for outdoor enthusiasts. These park-development and wash-stabilization projects have the potential to impact the park’s cultural-resource sites. Two of the three previously mentioned governmental institutions, the BOR and SNWA, engaged the services of HRA to address these kinds of impacts to the Larder Site, the Scorpion Knoll Site, and 26CK6007. A second goal of the investigations to be conducted at the Larder and Scorpion Knoll sites was to determine the nature and extent of subsurface cultural remains that might be present at the sites. This information could have an influence on the way in which these sites are managed in the future and, in particular, on decisions concerning the development of visitor facilities in the area of Wetlands Park where the sites are located.

The nature of the planned and potential impacts from park-development and wash-stabilization projects varied among the three sites and, therefore, so too did the nature and extent of the archaeological investigations that HRA conducted at these locations. Site 26CK6007 is located within a discrete remnant block of floodplain sediment that lies within the construction footprint of a new weir that will be built to replace an existing, “experimental” weir. For this site, therefore, HRA’s charge was to recover an adequate sample of the site’s information content prior to its destruction—that is, to conduct full data recovery on the
Figure 1.1. Map of Clark County Wetlands Park and environs in the southeastern corner of the Las Vegas Valley.
Figure 1.2. Topographic map showing the project area in relation to the Las Vegas Valley and Lake Mead National Recreation Area.
site. HRA carried out this work in accordance with a treatment plan that was submitted to the SNWA and the BOR in 2003 (Ahlstrom and Roberts 2003) and subsequently approved for implementation by those agencies.

Unlike 26CK6007, the Larder and Scorpion Knoll sites are not threatened with destruction. The Larder Site is, however, located adjacent to a drainage ditch that is slated for upgrading, and both sites are in areas where trails or other facilities for park visitors could be developed in the future. Scorpion Knoll in particular had suffered some recent surface damage from off-road vehicle traffic. Furthermore, it is likely that the surface artifact assemblages on both of these sites will become increasingly vulnerable to unauthorized collection as visitation to this area of the park increases over time. In the case of these two sites, therefore, the goal of HRA’s work was to document more fully their surface manifestations and to determine the extent, character, and significance of their subsurface remains. HRA’s charge, in other words, was to conduct testing, rather than data-recovery investigations, at these two sites. Those investigations followed a treatment plan that HRA submitted in its final form to the BOR and SNWA in 2004 (HRA 2004) and that was later approved by those agencies.

HRA’s investigations recovered valuable data from all three sites. Site 26CK6007 produced a bit of new information on prehistoric use of the wash area, in the form of a small thermal feature and associated ground stone artifact, as well as a small assemblage of flaked stone debitage. These were unexpected finds, not associated with the stratum of dark sediment that had been the basis for the site’s identification as eligible for the NRHP. As for that target stratum, no evidence was encountered to indicate that it was “cultural” or “anthropogenic” rather than natural in origin. The work conducted at the Larder Site had three primary results: it showed that the planned ditch-improvement project was unlikely to impact the site significantly, either on or below the ground surface; it yielded an informative collection of surface artifacts; and most importantly, it revealed the presence below the ground surface of an estimated 400-600 storage pits whose presence was both unanticipated and unprecedented in the archaeological site record from the Las Vegas Valley. As for Scorpion Knoll Site, the testing conducted at this location uncovered the remains of between two and four pit structures, several storage pits similar to those recorded at the Larder Site, and what appears to have been an area used in the pit-roasting of food items. These finds were also unanticipated: there had, in fact, been some belief prior to subsurface testing that HRA’s investigations would encounter so little subsurface evidence as to contradict the site’s identification as an NRHP-eligible property. In sum then, most of the significant archaeological evidence discovered by HRA at the three sites came largely, if not wholly, as a surprise. The work conducted by HRA has, indeed, demonstrated that the Larder and Scorpion Knoll sites occupy one of the most important surviving archaeological localities in the Las Vegas Valley.

An important issue in the prehistory of the Las Vegas Valley concerns the source of the potsherds that are found on many sites in the area. Did they come from vessels that were produced elsewhere and transported to the valley—presumably as whole vessels but also possibly as broken pieces—or from vessels that were in some cases made locally? The project reported in this volume provided an opportunity to conduct initial research toward answering this question. The results of that study, which was conducted by Elizabeth Miksa, are presented in Appendix E.

**RESEARCH ORIENTATION**

Table 1.1 summarizes two chronological sequences that have been developed for the Las Vegas Valley. The two differ in the manner in which they account for the last 2500 years of Native American settlement in the valley. The chronology shown on the left distributes this interval among the Late Archaic, Terminal (Late) Archaic, and Ceramic periods. It recognizes three subperiods—Early, Middle, and Late—within the Ceramic period. This latter breakdown has the advantage of tying the Las Vegas chronology into the Patayan cultural sequence, which applies to the lower Colorado River region (Ahlstrom 2005). The chronology shown on the right in Table 1.1 divides the last 2500 years among the Terminal (Late) Archaic, Early Pithouse, and Late Ceramic periods. This chronology has two advantages over the first. For one thing, its recognition of
Table 1.1. Chronological Sequences for the Las Vegas Valley.

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>SUBPERIODS</th>
<th>DATE RANGE</th>
<th>PERIOD</th>
<th>SUBPERIODS</th>
<th>DATE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paleo-Archaic</td>
<td>Paleoindian</td>
<td>9500–5500 BC</td>
<td>Archaic</td>
<td>Middle</td>
<td>5500 BC–AD 250</td>
</tr>
<tr>
<td></td>
<td>Early Archaic</td>
<td>9500–9000 BC</td>
<td></td>
<td>Late</td>
<td>5500–3000 BC</td>
</tr>
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<td></td>
<td></td>
<td>9200–5500 BC</td>
<td></td>
<td>Terminal</td>
<td>3000 BC–AD 500</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>Archaic</td>
<td>Middle</td>
<td>AD 500–1000</td>
<td></td>
<td>Early Pithouse</td>
<td>AD 400–1100</td>
</tr>
<tr>
<td></td>
<td>Late</td>
<td>AD 1000–1500</td>
<td></td>
<td>Late Ceramic</td>
<td>AD 1100–1900</td>
</tr>
<tr>
<td></td>
<td>Terminal</td>
<td>AD 1500–1850</td>
<td></td>
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<td></td>
<td></td>
<td>AD 1850–1900</td>
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<td>Ceramic</td>
<td>Early</td>
<td>AD 500–1000</td>
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<td>AD 1850–1900</td>
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</tbody>
</table>

Over the past eight years, HRA has developed a framework of research themes and questions appropriate to the investigation of prehistoric and historical period Native American sites in the Las Vegas Valley and, in particular, the Wetlands Park Area (the framework was borrowed originally from Ezzo [1995]). Among the research themes included in the framework are the effective environment, chronology, technology, subsistence, contacts (including the sub-themes of travel, trade, and cultural affiliation), and settlement (Ahlstrom 2005; Ahlstrom et al. 2004; Roberts et al. 2003). An overarching concern of HRA’s research is the extent to which the Wetlands Park Area served as a “desert oasis” in regional settlement systems. It would have played this role during periods when lower Las Vegas Wash supported wetland habitats, including mesquite woodlands and marshes.

HRA’s (2004) research design for the investigation of the Larder and Scorpion Knoll sites included the following statement of research objectives:

- The primary objective of the testing to be conducted at the sites is discovery—to determine the nature and extent of buried cultural deposits—rather than research per se. Nevertheless, the project will produce data that are relevant to a number of research questions that grow out of HRA’s existing research framework. Those questions (which are applicable to 26CK6007 as well), include:

- When does the site date? Can more than a single temporal component be identified? Is there any evidence to suggest how long the site was occupied or used? Can evidence relating to the research questions listed below be related to one or another portion of the site’s occupation span? (Theme of Chronology)
• What kinds of flakeable toolstone were used by the people who lived at or visited the site? Where were these materials obtained—locally or at a distance? What lithic-reduction technologies were employed in the making or maintaining of flaked stone tools at the site? What kinds of tools were produced or used there? What activities might the flaked stone tool assemblage represent? (Theme of Technology)

• What raw materials were used for ground stone tools by the site’s occupants? Were ground stone tools produced at the site or brought there from elsewhere? Were vesicular basalt tools made or maintained at the site? What activities might the ground stone implement assemblage represent? (Theme of Technology)

• What kinds of ceramic vessels were used and discarded at the site—bowls or jars, decorated or undecorated? What can information on vessel form tell us about the activities that were performed at the site? (Theme of Technology)

• What kinds of cultural features are present at the site—hearths, roasting pits, habitation structures? (Theme of Technology)

• What plants and animals were exploited by the site’s inhabitants? Would any of these plants or animals have come from wetland habitats? Is there evidence for the use of corn or other domesticated plants? (Theme of Subsistence)

• What non-local contacts are indicated by the site’s artifact assemblage—potsherds, obsidian, marine shell, and perhaps other material classes? (Theme of Contacts)

• What traditions of ceramic manufacture—Patayan, Paiute, Prehistoric Puebloan, or perhaps other—are represented by the site’s ceramic assemblage. Bearing in mind the limitations of this kind of data, can one reasonably refer the site to a particular archaeological culture? Or the site’s inhabitants to a particular ethnographic culture? (Theme of Contacts)

• What activity sets are represented by the artifacts and features that make up the site’s artifact and feature assemblage? Based on those activities, to what morphological and functional site types can the site be assigned? What role might the site have played in regional settlement systems? What was its place in the pre-modern landscape? (Theme of Settlement) [HRA 2004].

As intimated above and documented below, HRA’s investigations at the Larder and Scorpion Knoll sites contributed primarily to research objectives that fall under the themes of Chronology (involving the identification of multiple periods of site use), Technology (as related to the sites’ populations of storage and habitation features), Subsistence (concerning maize farming by the sites’ inhabitants), and Settlement (focusing on the sites’ special place in local settlement systems).
CHAPTER 2
ENVIRONMENTAL SETTING/GEOARCHAEOLOGY

Judson Finley, William Eckerle, and Sasha Taddie
Western GeoArch Research

PROJECT PURPOSE

Western GeoArch Research carried out geoarchaeological investigations in the Clark County Wetlands Park project area (Figures 1.1 and 2.1) at the request of HRA, Inc., Las Vegas, Nevada. The Southern Nevada Water Authority (SNWA), the Bureau of Reclamation (BOR), and Clark County propose stabilization of eroding segments of Las Vegas Wash that directly impacts several significant historic and prehistoric archaeological sites. The project area is located in the southeastern Las Vegas Valley, east and north of the cities of Las Vegas and Henderson, Nevada, respectively. Fieldwork was conducted on November 29-30, 2005. Three prehistoric sites were investigated: 24CK6007, the Larder Site (24CK6146), and the Scorpion Knoll Site (24CK6147) (Figures 2.2 and 2.3). (A fourth, historic site that was also studied, 26CK6001, is treated in a separate report [Warren and Eskenazi 2007].) The goal of this study is to facilitate management and interpretation of cultural resources in the project area by providing a better understanding of geomorphic, paleoenvironmental, and site-formation history.

The specific objectives of the geoarchaeological investigation are to document the geomorphic, stratigraphic, and soils context of the sites, assess site contextual integrity, and contribute to archaeological knowledge of the region. Description of the stratigraphy and soils at sites allows inference of depositional environment, pedogenic history, and paleoenvironment at these locations. Geomorphological analysis provides evidence of the paleotopography during the span of human occupation and gives a landscape context for the prehistoric activities that took place. Prehistoric activities occurred within an environmental setting that provided the occupants with certain economic opportunities. Paleoenvironmental reconstruction can provide evidence of available biotic resources, as well as information on climatic and environmental trends that humans experienced in the past. Archaeological interpretation requires that natural and cultural site formation processes be discerned, and an earth sciences approach documents these natural processes.

MODERN ENVIRONMENT

Physiography

The Clark County Wetlands Park project area is located in southeastern Nevada within the confines of the Las Vegas urban area in the Lower Las Vegas Valley (Figure 2.4). The project area is part of the Lower Las Vegas Wash, the primary drainage system of the Las Vegas Valley. Lower Las Vegas Wash occupies the southeastern portion of the valley and flows between Frenchman Mountain and the River Mountains before entering Lake Mead and the Colorado River system. Average elevation of the valley floor within the project area is approximately 450 m (1500 ft) above sea level.

The project area is part of the Basin and Range physiographic province (Great Basin subdivision), with the massive Colorado Plateau situated to the east (Thelin and Pike 1991). The Spring Mountains and McCullough Range are major uplifts bounding the valley to the west and south. Numerous mountainous uplifts, including the Sheep and Las Vegas Ranges, lie to the north. The Colorado River Valley, located immediately southeast of the Las Vegas Valley, is one of the principle physiographic features of this region. In addition to the dominant Basin and Range character of the project setting, the Las Vegas Valley also
Figure 2.1. Topographic map of the project area.
Figure 2.2. Topographic map of the project area showing location of 26CK6007.
Figure 2.3. Topographic map of project area showing the location of the Larder (26CK6146) and Scorpion Knoll (26CK6147) sites.
Figure 2.4. Rotated shaded relief map draped with an aerial photograph showing the Clark County Wetland Park project area. Perspective is to the north.
occurs at the intersection of numerous important and diverse physiographic and biotic areas, including the Grand Canyon section of the Colorado Plateau, the Mexican Highlands, and the Mojave and Sonoran Deserts.

Geologic and Geomorphic Context

The Las Vegas Valley is a structural, depositional, and topographic basin typical of most Basin and Range systems. Numerous north-trending ranges form the northern margin of the valley, while the more massive Spring Mountains and McCullough Range circumscribe the valley to the west and south (Figures 2.5 and 2.6). These ranges are composed mostly of Paleozoic sedimentary rocks with minor exposures of Mesozoic and Tertiary rocks. Precambrian granite and schist are exposed on the flanks of Frenchman Mountain on the east side of the Lower Las Vegas Valley. Here, the “Great Unconformity,” made famous by its exposure in the walls of the Grand Canyon, separates 1.7 Ga igneous rocks from the 550 Ma Tapeats Sandstone (Rowland 2006). Regional deposition throughout the Paleozoic was dominated by limestone and dolomite rocks with lesser amounts of marine sandstone and shale. These rocks were thrust-faulted in the Cretaceous during the compressive tectonic regime associated with the Sevier Orogeny (Page et al. 2005). Miocene rocks overlie these earlier rocks and are themselves highly deformed by faulting resulting from Tertiary crustal extension (Bohannon 1984). Evidence for Tertiary volcanism is also prevalent throughout the region with the last major events occurring from 16-12 Ma (USGS 1999). The 5.8 Ma Fortification Basalt is the last known igneous extrusive formation to be deposited in the area. Although of lesser magnitude than 16-12 Ma events, tectonic activity manifest as minor faults in Pliocene and Pleistocene deposits indicates that the region has remained structurally active throughout the Quaternary.

The Quaternary history of the Las Vegas Valley is characterized by periods of sediment deposition and erosion evidencing a landform moving through major phases of dynamic equilibrium (Schumm and Lichty 1965). In the Las Vegas Valley, equilibrium conditions are influenced primarily by climatic conditions determining the competence of Las Vegas Wash (Mackin 1948) and its ability to effectively transport sediment loads from the valley into the Colorado River drainage. Sediments are supplied to the valley floor from alluvial fans forming at the front of the many mountain ranges ringing the valley. Coarse-textured fanglomerates occur near the mountain fronts, but these deposits grade into fine-textured sediments along the valley axis that have subsequently been deposited or transformed in alluvial, lacustrine, paludal, and aeolian environments (Haynes 1967; Quade 1986). A simple, climatic-geomorphic model (Bull 1991) of Quaternary alluviation in the Las Vegas Valley links major climatic cycles (10^3 to 10^4 years) with stream competence (USGS 1999). Valley aggradation occurred during relatively dry interglacial cycles where lower stream volumes in Las Vegas Wash decreased stream competence resulting in net sediment deposition throughout the Las Vegas Valley. Conversely, Las Vegas Wash likely flowed as a perennial stream during wetter glacial periods enhancing its ability to transport sediment loads, increasing stream competence, and resulting in net sediment erosion throughout the Las Vegas Valley. While Schumm (1973) has demonstrated the complex response of alluvial systems to numerous intrinsic thresholds, recent observations of the evolution of Lower Las Vegas Wash shows that increased perennial streamflow results in rapid systemic adjustments via headward erosion of the channel (USGS 1999).

A minimum of three major cycles of aggradation and erosion are marked in the stratigraphic record of the Lower Las Vegas Valley (USGS 1999). The oldest unit, the Las Vegas Wash Gravel, has a basal age constraint of ca. 5.0 Ma placing the initial formation of this deposit in the Plio-Pleistocene Epochs. The Fortification Basalt, deposited ca. 5.8 Ma, underlies Las Vegas Wash Gravel in the Lower Las Vegas Wash and in parts of the Colorado River Valley. Deposition of the gravelly unit ceased approximately 2.0 Ma, and although a specific erosional unconformity cannot be identified in association with the upper surface of this unit, it is likely that a long cycle of erosion occurred prior to resumption of sediment deposition in Las Vegas Valley. The second major Quaternary unit identified in valley deposits is the Chemehuevi alluvium, which is subdivided into two units (Chemehuevi A and B). Chemehuevi A is primarily unconsolidated and
Figure 2.5. Rotated shaded relief map draped with an aerial photograph showing the west half of the Clark County Wetland Park project area and the locations of the Larder (26CK6146) and Scorpion Knoll (26CK6147) sites. Perspective is to the north.
Figure 2.6. Rotated shaded relief map draped with an aerial photograph showing the east half of the Clark County Wetland Park project area, showing the location of Site 26CK6007. Perspective is to the east/northeast.
poorly sorted sandy gravels. A massive, volcanic ash identified as the Lava Creek B tephra occurs within Chemehuevi A alluvium. This ash, associated with a mid-Pleistocene eruption of the Yellowstone caldera, dates initiation of Chemehuevi A deposition prior to 605 Ka. Deposition of this alluvial unit ceased ca. 120 Ka. Chemehuevi B alluvium is generally finer textured than earlier deposits and occurs as sets of fine sand that grade upward into clayey silts (USGS 1999). Chemehuevi A alluvium forms terraces in the Lower Las Vegas Valley at elevations of 20 m (66 ft), 16 m (55 ft), and 5-9 m (19-30 ft) above the modern valley floor. Deposition of Chemehuevi A alluvium ceased ca. 50 Ka, and again a long phase of valley erosion was initiated that lasted until the Late Holocene. By approximately 3000 BP, sediments again were rapidly aggrading in the floodplain of the Lower Las Vegas Wash. Approximately 10 m (30 ft) of sediment accumulated in most of the wash, while upwards of 15 m (50 ft) of sediment accumulated in downstream areas where a deeper basin accommodated sediment aggradation. Sediments were deposited primarily in overbank floodplain settings; however, fine-grained segments of distal alluvial fans are inset with stream alluvium at the confluences of tributary drainages. Previously reported archaeological finds (Ahlstrom 2005), as well as those described in this report, occur in this active geological context.

Sediment deposition continued well into the 1970s, when increased runoff in the Lower Las Vegas Wash due to urban expansion in the Las Vegas Valley caused the stream to again rapidly incise its channel. The junction of Lower Las Vegas Wash and Three Kids Wash exerts an important geomorphic control on the recent erosional history of the Lower Wash. A rise in the underlying bedrock surface in the vicinity of the junction created a subsurface reservoir upstream of Three Kids Wash increasing the spatial extent of wetlands vegetation (USGS 1999). The bedrock rise also forces groundwater flow closer to the surface, increasing flow velocity downstream of the junction. Finally, an alluvial fan emanating from the mouth of Three Kids Wash constrains the Lower Las Vegas Wash channel in that area, further confining channelization, increasing downstream flow velocity, and increasing rates of erosion. Enhancing the potential for erosion at this important junction of the wash is a road culvert that concentrated flow below the culvert, initiating downstream channel incision and formation of a headcut at the culvert. This headcut migrated upstream during subsequent episodes of increased runoff and/or flash floods. Headcut formation first occurred in the Lower Las Vegas Wash at this point in the late 1950s and moved steadily upstream over the next two decades.

In the three decades from ca. 1955 through 1989, mean daily discharge rates in the Lower Wash increased from 0.3 m³/s (1 ft³/s) to approximately 4.5 m³/s (160 ft³/s) (USGS 1999). Flood events, particularly in 1984, saw peak discharge rates exceeding 28 m³/s (1000 ft³/s). Subsequent headward erosion of the Lower Las Vegas Wash resulted in entrenchment of nearly 10 km (6 mi) of the stream channel causing massive damage to roads, bridges, and other public works. One 1984 flood event alone is estimated to have removed 3.9 million m³ (4.3 million yd³) of sediment from the wash (USGS 1999). While recent erosion is exposing significant late Holocene archaeological deposits, it is likewise destroying fragile wetland ecosystems formed since the urbanization of Las Vegas Valley increased runoff rates through the Lower Las Vegas Wash. The recent history of the wash does, however, illustrate the rapid and complex response of desert alluvial systems to increased perennial discharge.

**FORMATION OF THE LOWER LAS VEGAS WASH WETLANDS**

The formation of the Lower Las Vegas Wash wetlands is directly related to urbanization of the Lower Las Vegas Valley, which resulted in dramatically increased discharge rates through the Lower Wash (LVWCAMP 1999). During the first half of the twentieth century, the entire span of Las Vegas Wash carried only ephemeral flow. Aerial photographs from the early 1930s, prior to the completion of Hoover Dam and flooding of the Lake Mead basin, show that Las Vegas Wash was a typical desert wash with no regular flow and little vegetation (LVWCAMP 1999). By 1955, Lower Las Vegas Wash was transformed from an ephemeral to a perennially flowing stream (USGS 1999). According to the 1930s aerial photo, wetlands were associated primarily with springs near the heart of modern metropolitan Las Vegas and in the upstream reaches of Lower Las Vegas Wash. As runoff expanded in the wash resulting from construction of water-treatment
facilities, wetlands expanded downstream. Nutrient-rich waters discharged from the treatment facilities, coupled with shallow groundwater deposits, enhanced wetland expansion. Repeat aerial photographs document major developments in the Clark County Wetlands from 1950 through 1981 (LVWCAMP 1999).

Climate

The project area is situated in the dry, subtropical latitude zone of western North America (Strahler and Strahler 1994). In general, such areas are characterized by northern extensions of dry, equatorial climates, a cold season influenced by Arctic air masses, and greater vegetational diversity than plant communities existing in dry, tropical zones. The climate of the study area is also characterized as continental with short, mild winters and long, hot summers. January mean maximum and minimum temperatures are -3º C (56º F) and -12º C (32º F) respectively (National Oceanic and Atmospheric Administration 1985). July mean maximum and minimum temperatures are 24º C (104º F) and 9º C (72º F). Average annual precipitation is 36 cm (6 in) with most occurring during the winter months (National Oceanic and Atmospheric Administration 1985).

Soils

Soil development in the project area varies widely from weak to strong, variables directly influenced in the Las Vegas Wash by time, topography, and parent materials (Soil Survey Staff 1999). Mountain soils in the surrounding limestone-rich uplands are primarily Torriorthents and Calciorthids (Figure 2.7). Lower mountain slopes, pediments, and upper bajada surfaces consist of Torriorthents. Soil mantel on the lower bajada consists mostly of Paleorthids and Paleargids. Valley bottom landforms associated with Las Vegas Wash have Torrifluvents, Gypsiorthids, Calciorthids, and Saliorthids. Fluvents are most often associated with the active floodplain and alluvial sediments accumulated during the Late Holocene. Gypsiorthids, Calciorthids, and Saliorthids all show high concentrations of phreatogenic salts, the accumulation of which is a function of parent materials high in sulfates and temperature regimes conducive to high evapotranspiration rates (Buck et al. 2006). Recent studies indicate salt precipitation is also a function of perched water tables and increased subsurface evaporation rates in the Lower Las Vegas Wash (Buck et al. 2006).

Vegetation

Vegetation on the nearby mountains is primarily ponderosa pine forest at high altitudes, juniper-pinyon woodland on the lower mountains, and creosote bush in the basin (Küchler 1966). Bradley and Deacon (1967) defined a number of local biotic communities that occur from the basin to the highest elevations. These include (from lowest to highest elevation): creosote bush, blackbrush, juniper-pinyon, fir-pine, bristlecone pine, and pseudo-alpine. The most widespread community in Las Vegas Wash is the creosote bush community, which occupies the valley floor and lower bajadas. Smaller areas of a saltbush community are also present. Isolated desert marsh and spring communities in other parts of the Wash have a distinctive biota which includes rushes, cattails, willow, and cottonwood trees (Bradley and Deacon 1967). Wetland species such as cattails, rushes, reeds, sedges, and saltcedar are common components of the modern Wetlands Park vegetation community.

Wildlife

Various species of animals that might have been important to Native Americans are present in the Las Vegas Wash area. Presently, the primary game animals are jackrabbit and the desert cottontail rabbit. Mule deer and desert bighorn sheep are present at higher elevations.
Figure 2.7. SSURGO soils map of the Clark County Wetlands Park project area.
PALEOENVIRONMENTAL BACKGROUND

A review of paleoenvironmental data from post-glacial sites in the southeastern Great Basin provides a framework for evaluating stratigraphy and soils in the Wetlands Park project area. Although the prehistoric human subsistence base has always been influenced to varying degrees by climatic and ecological parameters, prehistoric adaptive systems remained flexible. Paleoenvironmental analysis reconstructs environmental conditions and, consequently, is an important component of research projects where a cultural or behavioral ecology approach is emphasized (Butzer 1982; Smith and Winterhalder 1992). Paleoenvironmental change in any part of western North America is intricately tied to global climatic change (Thompson et al. 1993). Modeling late Pleistocene and Holocene climatic change as a response to global changes in atmospheric circulation has become possible in the last 20 years. Below, astronomical theory and mechanisms of climate change are discussed, followed by description of a model designed to predict paleoclimatic conditions. Global circulation model predictions are presented, and then regional and local paleoenvironmental reconstructions of the Late Pleistocene and Holocene are reviewed in light of the model’s predictions. A paleoenvironmental and archaeological correlation chart illustrates trends in cultural chronology and climatic history (Figure 2.8). Dates are given as conventional radiocarbon ages (BP) unless otherwise specified.

Astronomical Theory of Climatic Change

Cyclical alterations in the geometry of the earth's orbit are thought to be a major cause of climate change (Imbrie and Imbrie 1980). Changes in orbital geometry (axial tilt, precession of the equinox, and orbital shape) cause variation in the amount of solar insolation the earth receives, which in turn forces the earth's atmospheric circulation to behave in a predictable manner. An effort is currently underway to retrodict paleoclimates using a general circulation model (Kutzbach and Guetter 1986) and to test the predictions of this model against a worldwide paleoenvironmental data base. Initial results (COHMAP Project Members 1988; Thompson et al. 1993) suggest a close agreement between some of the modeled conditions and the paleoenvironmental record. The model retrodicts the position of the jet stream, positions of cyclonic and anticyclone activity, strength of the summer monsoon over western North America, annual surface temperature, and annual precipitation for the last 18,000 years. Bryson (1994) offers an alternative paleoclimatic model that utilizes earth-sun geometry and effects of volcanic aerosols to predict changes in insolation as well as resultant temperature and precipitation change.

Mechanisms of Climatic Change

Four major causes of global climate change are determined by studies that utilize historical events to test hypothetical problems: changes in atmospheric composition; tectonics; astronomical causes; and industrial activity (Thompson and Turk 1997). Atmospheric climate change results from a change in the carbon cycle and carbon dioxide concentration. When carbon dioxide is removed, the atmosphere cools. Similarly, the atmosphere warms when carbon dioxide is released. Tectonic changes in the configuration of the continents alter continental climate, ocean currents, wind currents, and circulation patterns. Two mechanisms of atmospheric climate change are solar radiation alteration and meteorite impacts. Finally, the historical input of greenhouse gases and other industrial pollutants into the earth’s atmosphere may be causing global warming and/or cooling to occur (Thompson and Turk 1997).

General Circulation Model

On the local level, the correlation of paleoenvironmental-circulation models with paleoenvironmental data is in its infancy. As a result, it is necessary to focus on regional paleoenvironmental data and their relationship to general circulation model predictions. As mentioned before, the general circulation model (COHMAP Project Members 1988) predicts the position of the jet stream, strength of the summer monsoon, positions of cyclonic and anti-cyclonic activity, annual surface temperature, and annual precipitation over the
Figure 2.8. Paleoenvironmental correlation chart showing the age range of climatic events based on select local and regional proxy sources.
course of the last 18,000 years. General circulation models, which were evaluated with respect to present-day conditions, are available for 18,000, 12,000, 9000, and 6000 years ago (COHMAP Project Members 1988). These models are presented below and then compared with regional and local paleoenvironmental reconstructions.

**FULL GLACIAL (18,000 BP)**

The general circulation model at 18,000 BP for the last glacial maximum (Wisconsin, Isotope Stage 2) shows that the jet stream was split around the Laurentide Ice Sheet, with the southern arm depressed far below its present position. This depressed arm of the jet stream might have produced easterly winds, as opposed to the present day westerlies. Seasonality was reduced and summer temperatures decreased. The climate in the American southwest would have been colder and drier than present (COHMAP Project Members 1988).

During full glacial conditions at Chaco Canyon in the San Juan Basin, New Mexico, ponderosa pine, limber pine, and spruce populations expanded and were located in lower altitudinal zones than today (Hall 1990). Upper treeline was depressed almost to the basin floors in the southwest and some of the basins themselves may have been floored by a coniferous forest cover (Wells 1983). This flora distribution suggests that lower elevations had cooler temperatures. Regional paleoenvironmental reconstructions are in agreement with global circulation model predictions. Also at this time, a wide variety of now extinct, Pleistocene megafauna were present (Grayson 1982; Nelson and Madsen 1980) including saber-tooth cat, ground sloth, glyptodont, bison, musk ox, mammoth, horse, camel, and short-faced bear.

**DEGLACIATION (16,000-10,000 BP)**

According to the general circulation model, shortly after 17,000 BP changes in the earth's orbital geometry and axial tilt initiated a trend towards warming and increased seasonality (COHMAP Project Members 1988). By 12,000 BP, the jet stream was no longer split around the much reduced Laurentide Ice Sheet, and westerly winds would have predominated. Increased summer insolation resulted in warmer summer temperatures, although it was still cooler than present. Seasonality was very pronounced. A Pacific subtropical high was present at this time but was too weak to provide much moisture to the area. Likewise, the summer monsoon was not well developed. As a result, dry conditions are thought to have occurred in the American southwest at 12,000 BP (COHMAP Project Members 1988).

From 16,000 to 11,500 BP, regional paleoenvironmental reconstructions are in agreement with global circulation model predictions. High stands occurred in four Great Basin lake systems (Lake Lahontan, Lake Bonneville, Lake Searles, and Lake Russell) between 15,000 and 13,500 BP (Benson et al. 1990). Lake Lahontan in northwestern Nevada was higher at 15,000 BP than at any time since. This was partly due to its proximity to the jet stream, which would have produced cool, frontal storms (Benson et al. 1990; Spaulding and Graumlich 1986). Between 14,000 and 11,500 BP, effective moisture decreased (Benson et al. 1990). Haynes (1990) suggests that a millennium of severe drought occurred between 12,000 and 11,000 BP in some parts of the American west. This drought coincides with the introduction of Clovis peoples and the extinction of 33 large (>40 kg) North American mammal genera (Grayson 1982; Wicander and Monroe 1989). However, paleoenvironmental reconstructions suggest a strengthened monsoon and an increase in summer precipitation in the Sonoran Desert and to a lesser extent the Mojave Desert from 12,000 to 9000 years ago (Spaulding and Graumlich 1986).

A more tightly constrained pluvial event is evident in the northern Basin and Range 11,500 to 10,000 years BP (Benson et al. 1990). This period, coincides with the Younger Dryas climatic event, which reached its maximum extent during the early portion of the Paleo-Archaic cultural period (Jones et al. 2003). Ice core data indicate that the effect of the Younger Dryas was hemisphere-wide (Paterson and Hammer 1987). Benson and Thompson (1987) suggest that the return to a cool and moist climate was a function of jet stream realignments over the Great Basin area. Vegetation changes subsequent to deglaciation were documented in packrat middens
from the southeastern Great Basin by Spaulding (1990:188) who suggested, “Higher elevations supported vegetation that resembled present woodland, while lower elevations supported desert scrub that bore little resemblance to modern thermophilous desert scrub.” Woodland species, displaced altitudinally, were arriving at current woodland sites by 11,700 BP. However, warm desert species did not return until 9600 BP. This migrational lag between the two communities was due to the latitudinal displacement of warm desert species to the south (Spaulding 1990). Springs were active in southern Nevada from 11,800-6300 BP with peak activity at 10,000 BP (Quade et al. 1998). A faunal collection from the northern Mohave Desert suggests that a shift from primarily winter precipitation to a more summer convectional storms (monsoonal flow) probably occurred between 11,000 and 10,100 BP.

**EARLY AND MIDDLE HOLOCENE (10,000-4000 BP)**

The general circulation model predicts that by 9000 BP, post-glacial summer insolation was at a maximum, seasonality was very pronounced, and summer temperatures were generally 2° to 4° C higher than present. The climate was warmer and drier than now. By 6000 BP, summer temperatures were still 2° to 4° C higher, but began to decline in response to decreased summer insolation. Even so, climate was warmer and drier than present, and the American Southwest was subjected to stronger westerlies (COHMAP Project Members 1988).

**EARLY HOLOCENE (10,000-7500 BP)**

Early Holocene regional paleoenvironmental reconstructions indicate warmer temperatures and more effective moisture (Birnie 1995b; Dean et al. 1985; Hall 1990). These conditions generally agree with the COHMAP model prediction of warmer summer temperatures but differ from model predictions of a dry climate. An early Holocene pluvial event is indicated by lake high stands, and other data at the following sites: Adobe Lake, Searles Lake, and Mojave Lake, California; Elena Range, Nevada; Cowboy Cave and Bechan Cave, Utah; Black Mesa and Eastern Grand Canyon, Arizona; San Augustine Plain, Estancia Plain, San Andreas Mountains, and Blackwater Draw, New Mexico (Davis and Sellers 1994). Of the 12 sites, most show an increase in moisture at ca. 10,000 to 8000 BP (Davis and Sellers 1994). Moisture maximum began around 12,000 BP, and lasted until 6000 BP. Plant macrofossils from packrat middens indicate that maximum precipitation occurred in the summer (Davis and Sellers 1994; Spaulding and Graumlich 1986). Additionally, precipitation originated from Pacific westerlies rather than summer monsoons. The last Pleistocene mammal extinctions occurred around 10,000 BP (Grayson 1982), and all of the megafauna disappeared, with the exception of bison. An essentially Holocene vegetation was prevalent by 9000 BP (Mehringer 1985), although many of the associations that comprise present-day plant communities were lacking. In particular, pinyon pine was just beginning to migrate north out of the Mojave Desert, and to expand throughout the Great Basin (Madsen and Rhode 1990; Wells 1983). Packrat evidence suggests that treelines were lower from 9000-10,000 BP (Wells and Berger 1967). The fauna from Pintwater Cave in the northern Mojave Desert indicates that monsoonal precipitation continued a trend begun in the latest Pleistocene with a continuation of monsoonal precipitation (Hockett 2000).

**MIDDLE HOLOCENE (7500-4000 BP)**

During the Altithermal period (~7500 to 4000 BP), temperatures were greater and effective moisture was less than during the Early or Late Holocene (Birnie 1995b). Global circulation model predictions are in agreement with regional paleoenvironmental reconstructions for this time period. Shadscale and sagebrush communities were at their greatest extent and expanded at the expense of grasses and conifers (Mehringer 1985). Human occupation sites were generally limited to lake-edge locations during the period between 8500 and 5500 BP, which Madsen (1982) attributes to restricted resource-procurement opportunities in other ecosytems. In the American Southwest, increased aeolian activity occurred during the Middle Holocene (Altithermal) (Ahlbrandt et al. 1983; Birnie 1995a; Hack 1942; Karlstrom 1988; Wells et al. 1990) creating many dunal landforms above the drainages in Canyonlands National Park (Birnie 1995b:31). The Salt Creek
drainage in Canyonlands may have been a refugium for animals and Archaic people during the Altithermal due
to year-round water availability (Birnie 1995b; see Mead et al. 1992 and Agenbroad and Mead 1992). During
the Mid-to-Late Holocene, extreme aridity, increased aeolian activity, and alluvium accumulation due to
insufficient discharge were documented in Chaco Canyon and the Chaco Dune field from 6000 to 2500 BP
(Hall 1990). Wells et al. (1990) also identified aeolian activity in the Chaco River drainage from 5800 to 2200
BP, but divided the Middle Holocene into two eras of deposition that correspond to aeolian unit ‘Qe2’. From
6000 to 5000 BP the depositional environment was arid, and then moisture increased during the early
Neoglacial (3900-3700 BP). The increase in moisture is based on the identification of parabolic dunes and sand
sheets, two major landform types in the area. The sediments are massive, and few sedimentary structures are
visible due to pedogenesis, bioturbation, and cultural disturbances (Wells et al. 1990). Based on Ahlbrandt’s
comparison of aeolian structures and textures, utilization of texture for the identification of depositional
environment is not feasible due to the fact that sedimentary structures are more indicative of aeolian
environments than textural data alone (Ahlbrandt 1975:72). Thus, the recognition of landforms that are
diagnostic of an increase in moisture is questionable. However, a return to moister conditions around 4000 BP
is indicated by alluvial chronology, Holocene soils, and charcoal radiocarbon dates in southern New Mexico at
the Gardner Spring site (Gile 1975).

Pollen ratios from the La Plata Mountains, western Colorado, reveal high timberline, high summer
temperatures, and increased peat deposition from 4300 to 4000 BP (Petersen 1988). Chadwick and Davis
(1990) demonstrated that rather than increased temperature and moisture, episodic soil development in the
Lahontan basin resulted from interpluvial playa deflation and loess deposition. McFadden et al. (1992)
documented similar episodic soil development at Pluvial Lake Mojave, southern California where onset of
aeolian activity preceded that of other sites in the American Southwest and occurred between 8700 and 6000
BP. High lakesheds were present in the Mojave basin between 6000 and 1000 BP (McFadden et al. 1992).
Springs were relatively inactive in southern Nevada between 6300 and 2300 BP (Quade et al. 1998). The
northern Mojave Desert had become arid by 6800 14C BP (Spaulding 1991).

At Sheep Shelter, a rockshelter in Clear Creek Canyon near the junction of I-15 and I-70 in
southwestern Utah, pollen analysis allowed inference of climatic change (Newman 1993a). An open shrub
environment (i.e., cattail, sagebrush, Cheno-Ams, composites, greasewood, sedge, oak) is suggested to have
been dominant from ~5700 to 5400 BP. Conditions would have been drier than present. A woodland
environment, including pine, birch, juniper, and ephedra, was present from 5400 to 3600 BP, and maximum
woodland development occurred at the site from 5400 to 4000 BP (Newman 1993a). A pollen stratigraphic
record was evaluated from Holt Canyon, which is at the southern end of Mountain Meadows between the Bull
Valley and Pine Valley Mountains in southwestern Utah (Spaulding et al. 1994). Maximum woodland and
some grassland development were documented from 6170 to 4480 BP and are attributed to warmer and wetter
summers. From 4480 to 3800 BP, a trend toward open vegetation representative of a cool, arid climate is
indicated by declining Pinus and increasing Artemisia and grassland taxa.

LATE HOLOCENE (4000 BP-PRESENT)

From 3500 to 2000 BP, Great Basin pluvial lake levels were higher in response to a Neoglacial climate
(Benson et al. 1990; Currey 1991; Oviatt 1988). A reversal of the Middle Holocene expansion of sagebrush
and saltbush communities occurred after 4000 BP (Mehringer 1985). Big game, including deer and mountain
sheep, became more numerous (Grayson 1982). Several periods of cirque glacier activity also occurred in
Great Basin mountain ranges during the last 4000 years (Burke and Birkeland 1983; Davis 1988). These
include the Middle Neoglacial and “Little Ice Age.” A Middle Neoglacial event occurred between 3500 and
1800 BP, with the “Little Ice Age” following from AD 1400 to 1850. The Neoglacial events are characterized
by greater effective moisture (Davis and Elston 1972). At 2800 BP a prominent pollen change occurred at Beef
Pasture in the La Plata Mountains indicating a shift from closed spruce-fir forest to an open meadow (Petersen
1988). Stabilization of and pedogenesis in aeolian deposits may have occurred in Canyonlands during the early
Late Holocene (Birnie 1995b). Ponderosa pine expansion in Chaco Canyon and dune stabilization in Chaco
Dune field from 2500 to 2000 BP suggest less arid conditions (Hall 1990). Deposition of the most recent aeolian unit (Qe3) in Chaco Dune field began around 1900 BP (Wells et al. 1990).

Lowering of the water table and degradation of the main unit (T2) at Upper Grand Gulch, Utah took place around 750 BP, and would have probably caused the Anasazi (Pueblo III) to abandon the site (Agenbroad 1975). Plog et al. (1988) relate the colonization/range expansion of the Virgin River Anasazi in AD 900 to high spatial variability in precipitation, and the abandonment of the area in AD 1150 to environmental degradation and high population levels and densities. The Virgin River Anasazi moved to the uplands in response to an aggrading, semi-saturated valley floor in AD 910 (Plog et al. 1988). From 1000 to 800 BP, increasing pinyon pine frequency at higher altitudes in the San Juan Basin implies a localized change to slightly moister conditions (Hall 1990). Ellis documented a period of erosion around AD 1150, which was “severe by the Classic phase, and continued well after the abandonment” at the NAN Ranch Ruin, a Mimbres pithouse-pueblo site in southwestern New Mexico (Ellis 1990:102). Sub-alpine conifer tree-ring data from the last 1000 years in the southern Sierra Nevada, California, showed that summer temperatures exceeded those of the late 20th century from AD 1100 to 1375, and then were lower than present during the Little Ice Age (Graumlich 1993). Relatively high water tables prevailed in alluvial valleys on the Colorado Plateau between AD 1600 and 1850 (Plog et al. 1988).

Packrat data from the northern Mineral Mountains, Utah, showed that woodland was better developed through most of the Late Holocene than at present (Spaulding et al. 1994). An open woodland environment occurred at 3370 and 2800 BP. By 1220 BP, a transition from an open to a closed-canopy woodland occurred. Arboreal taxa indicative of closed, pinyon-juniper woodland dominate the sample at 580 BP. A general increase in effective moisture occurred from ~3370 to 580 BP as implied by the vegetation changes. Since 580 BP, extreme changes in vegetation have taken place. Sagebrush, rabbitbrush, and bitterbrush are dominant today, whereas juniper has become rare and pinyon locally extinct. At Holt Canyon, cool conditions continued, winter precipitation increased, and woodland expanded from 3800 to 2900 BP. A relatively arid period is inferred from increases in grassland taxa and a decrease in Pinus from 2900 to 2200 BP. The last period of woodland expansion occurred there between 2200 and 850 BP. Cool, dry conditions prevailed from 2210 to 1410 BP, and were followed by cool, moist conditions from 1140 to 850 BP. Extreme environmental degradation occurred at Holt Canyon from 850 BP to present (Spaulding et al. 1994). At a rockshelter in Clear Creek Canyon east of the I-15/I-70 junction (Cave of 100 Hands), climatic inferences are based on a pollen analysis (Newman 1993b). Riparian taxa (i.e., birch and willow) were supported from 1350 to 1250 BP, and flourished from 1250 to 1075 BP. Summer precipitation gave way to increased winter precipitation and cooler temperatures from 1350 to 1075 BP. Warm and wet summers are indicated from 1075 to 825 BP by lower sage to grass ratios. Climate was slightly drier as indicated by riparian community decline, although annual effective moisture was sufficient to allow pinyon-juniper expansion between 1050 and 1025 BP. Woodland expansion occurred between 800 and 650 BP with an increase in winter and then summer precipitation. As effective moisture decreased, from 650 to 450 BP, woodland areas are thought to have retreated. A relatively cool, wet climate was present from 450 to 150 BP, with pinyon-juniper expansion and both summer and winter precipitation (Newman 1993b).

**METHODS**

The primary locations investigated at the three archaeological sites were backhoe trenches. The following methods were used to document the geology and soils.

**General Profiling**

Investigated locations include trenches and auger probes. Exposures are described and representative sections are recorded that include all pertinent stratigraphic and soil horizon information. The methods used for fieldwork and analysis are summarized below. Conventions used for sedimentary descriptions are presented first, followed by pedogenic description terminology.
STRATA DESCRIPTIONS

The deposits in each location are divided into strata based on similarities and differences in texture or sedimentary structure. All strata are designated by a Roman numeral. Since strata often exhibit a range of characteristics due to bedding and facies changes, subdivisions are sometimes used to encompass this variability (e.g. Stratum Ia, Ib, Ic), and the type of variability is specified in the field notes.

Geological descriptive methods used for this investigation generally adhere to Compton (1985). The modified Wentworth Scale (Dietrich et al. 1982) is used throughout. Color terminology follows the Munsell system. Roundness descriptions are those presented by the American Geological Institute (Dietrich et al. 1982). Names for mixtures of sedimentary materials also conform to standards of the American Geological Institute. Sandstone terminology is that presented by Compton (1985), and coarse grained sedimentary rock terminology is from Dietrich et al. (1982). Travis (1955) is followed for all other sediment naming conventions. Unconsolidated equivalents are used throughout, e.g. conglomerate=gravel, sandstone=sand, mudstone=mud.

SOIL HORIZON DESCRIPTIONS

Soil horizons are designated using Birkeland’s (1984) modified system (Soil Survey Staff 1981), where all vertical subdivisions of an individual master horizon are listed before the buried soil subordinate element (b) is added (e.g. Bt1b, Bt2b, Bt3b). The numbering of vertical subdivisions begins with 1 (Soil Survey Staff 1981). The designations following the b (b2, b3, etc.) are reserved for the sequential number of buried soils below (older than) the surface soil. Note that the "b" element, which is used for buried soils, corresponds to Soil Conservation Service usage for designating a buried genetic horizon (Soil Survey Staff 1981).

Another of Birkeland's modifications that was utilized is the " →" (or “>”) symbol, which designates a horizon in a state of major genetic transition. The designation to the left of the → indicates characteristics that formed when the buried soil was a surface soil. On the right of the → is the designation of characteristics that are thought to be the result of post-burial pedogenesis (engulfment) or polygenetic processes (e.g. Ab →Bk).

Soil horizons are described using the conventions prescribed by the Soil Survey Staff (1981) and classified using Soil Taxonomy (Soil Survey Staff 1975). Carbonate stage descriptions follow a six-stage classification (Birkeland 1984).

SOIL DEVELOPMENTAL STAGES

Birkeland (1984; Birkeland et al. 1991) has reviewed the literature on soil chronosequences in the arid and semi-arid western U.S. A general, time dependent sequence of horizon formation can be identified and includes, from youngest to oldest: A (surface organic accumulation); Bw (oxidation or structural development); Bt (clay accumulation) and Bk (calcium carbonate accumulation); and K (very well developed calcium carbonate accumulation) and Bqm (very strongly developed gypsum accumulation). In terms of taxonomic classes this sequence would read as follows (also from youngest to oldest): (1) Orthents; (2) Camborthids; (3) Argids and Calciorthids; and (4) Paleargids and Paleorthids. In this report these soil classes will be referred to by the subjective, but useful, terms of weakly, moderately, well, and very well developed.

Site Formation and Destruction

Burial context integrity is an important factor to consider when evaluating the scientific and cultural resource value of archaeological sites (Table 2.1). General principles involved with the evaluation of context are presented below. The presence of subsurface cultural material is, of itself, an unreliable indicator of burial integrity (Dibble et al. 1997). Various processes can operate to degrade the context of archaeological deposits including: (1) occupation trampling; (2) post-occupational (but preburial) dispersion; (3) burial disturbance; and (4) post-burial turbation (Gifford-Gonzalez et al. 1985).
OCCUPATION TRAMPLING

The magnitude of occupation trampling (treadage and scuffage) varies with respect to substrate texture, occupation traffic intensity (Schiffer 1987), and moisture content (Deal 1985). Experimental studies indicate that an occupation "churn zone" is formed in loose substrates. Well sorted sands produce the thickest churn, or trample, zone, which ranges from 5-16 cm in thickness (Table 2.1) (Gifford-Gonzalez et al. 1985; Stockton 1973). Loamy sand will develop a 3-8 cm trample zone (Villa and Courtin 1983), whereas loams produce "almost no" churn zone (Gifford-Gonzalez et al. 1985). Clayey sediments, likewise, require extremely high levels of traffic or saturation before any churn zone is produced (Eckerle, unpublished field observations). Pedestrian traffic on cobble or larger size clasts will not produce a trample zone at all (Hughes and Lampert 1977).

Table 2.1. Occupation Churn Zone Thickness and Predicted Archaeological Implications.

<table>
<thead>
<tr>
<th>Soil Texture</th>
<th>Common Depositional Environment</th>
<th>Churn Zone (in cm)</th>
<th>Horizontal Scuffing</th>
<th>Ease of Cleaning</th>
<th>Identify Activities</th>
<th>Identify Domestic Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>Eolian dunes, well-sorted fluvial sands</td>
<td>5-16</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Loamy sand</td>
<td>Some slope deposits and alluvium</td>
<td>3-8</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Sandy loam and finer</td>
<td>Overbank deposits, lacustrine deposits, and most slope deposits</td>
<td>&lt;5</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Trample zones can be viewed as both a positive and a negative aspect of site formation. Churn zone development on a soft substrate has the effect of blurring the occupational record of stratified sites (Hughes and Lampert 1977; Villa 1982). The positive aspect of churn zones is that their formation quickly hides artifacts and makes them unavailable for site cleaning and secondary refuse disposal (Schiffer 1987). In addition, items are much easier to lose in soft substrates (Schiffer 1987). As a result there is a higher potential for discriminating areas of high primary-discard (lodges, hearth activity areas, etc.) from those of low primary-discard in soft substrates. Additionally, scuffage (horizontal artifact dispersal due to foot traffic) is minimal on loose substrates because items are less likely to skid.

POST-OCCUPATIONAL DISPERSAL

Post-occupational (but preburial) dispersal can alter the contextual integrity of surface archaeological materials. In general, soft substrates tend to hold onto artifacts after they have settled into the surface (Wandsnider 1988). Additional trampling by animals, slope processes, and eolian movement are the major categories of post-occupational dispersal. However, trampling by animals, even in environments with high populations of hoofed ungulates, is a slow process (Gifford and Behrensmeyer 1976).

Slope wash and colluviation are two common processes that transport surface artifacts. The process of colluviation occurs commonly on relatively steep (>15°) slopes (Rick 1976). Colluviation is gravity driven transport in which heavier and denser materials move further down slope than lighter, less dense items (Rick 1976). Slope wash, on the other hand, involves transport in a sheetflow layer of water during storms (Butzer 1982; Reineck and Singh 1980). It can occur on low-angle slopes, especially if vegetation is sparse and
infiltration levels are low. This type of transport follows hydrodynamic rules in that smaller, less dense material is transported the farthest down slope.

Eolian transport of surface artifacts can occur whenever windshear exceeds the hold of gravity (Bagnold 1941). This can be a major source of dispersal for small artifacts unless they quickly become buried (Wandsnider 1988). Eolian transport is not confined to dune fields but can occur whenever wind conditions are suitable. It is most effective on locations with minimal vegetation cover.

**BURIAL DISPERAL**

Artifact dispersal occurs in most depositional environments (Butzer 1982). An exception to this is eolian silt (loess) environments. Lack of dispersal in loess is the result of low surface wind shear (because vegetation is usually present) and low impact energy of silt particles. Many surface sites on flat, vegetated surfaces are eventually, albeit slowly, buried by silt. Depositional environments can be ranked into two categories of potential burial dispersal. The relatively low energy category includes alluvial overbank, sheetflow (including slope wash), and eolian sand environments. The high energy category includes alluvial channel, debris flow, and colluvial depositional environments. For most water and air entrained sediments, artifact movement is a function of size and density (Gifford and Behrensmeyer 1976). Frison et al. (1988) propose a simple rule-of-thumb for determining the depositional dispersal of buried lithic artifacts. This rule states that any artifacts smaller than the break off point for the coarsest 10 percent of a sediment sample (finer than the 90th percentile) were probably moved during burial.

**POST-BURIAL DISPERAL**

A wide range of processes can act to disperse archaeological residues after burial. Erosion and subsequent redeposition can produce a secondary deposit that contains no contextual integrity (Butzer 1982; Schiffer 1987). Many other dispersal processes are possible (Butzer 1982; Schiffer 1987; Wood and Johnson 1978), including soil formation, animal burrowing, plant growth (including tree tip-out), and turbation from repeated ground freezing (frost heave).

**FIELDWORK RESULTS**

Geology and Geomorphology

The Clark County Wetlands Park is located in the southeastern Las Vegas Valley on the eastern portion of the greater Las Vegas urban area and north of Henderson, Nevada (Figure 2.4). Geologic structures in the Las Vegas Valley are dominated by both compressional and extensional tectonic regimes (Page et al. 2005). Compression associated with the Sevier orogeny initiated during the late Cretaceous while regional crustal extension occurred during the early Tertiary. The net product of structural deformation was uplift of numerous mountain ranges, creation of a deep (>3000 m) structural basin, and formation of a complicated array of localized and widespread faulting (Bell and Smith 1980; Bingler 1977).

Mountain ranges bounding the Las Vegas Valley include the Spring Mountains to the west, Las Vegas and Sheep Ranges to the north, Frenchman Mountain and River Range to the east, and McCullough Range to the south. Most pertinent to the Clark County Wetlands project is the geology of the Frenchman Mountain–Rainbow Gardens area and the northern portion of the River Range (Figures 2.9 and 2.10) (Bell and Smith 1980; Bingler 1977; Castor et al. 2000). Frenchman Mountain is a large, heavily faulted, northeast-trending anticline. The exposed bedrock consists of a thick sequence of Paleozoic through Tertiary sedimentary units unconformably overlying Precambrian rocks composed of gneiss, granite, and schist (Bell and Smith 1980). Bedrock units on Frenchman Mountain generally dip to the southeast (Figure 2.9). The Thumb Formation is a prominent sedimentary stratigraphic unit associated with Rainbow Gardens that is important to the geological history of the Clark County Wetlands Park archaeological sites. Bell and Smith (1980) describe the Thumb
Formation as consisting of continental red-beds and limestone that formed red to pink calcareous siltstone and sandstone, as well as gypsiferous shale and claystone. The Thumb Formation may be an important source of secondary salts found in soils exposed in cutbanks along Lower Las Vegas Wash (Buck et al. 2006).

In contrast to the sedimentary geology of Frenchman Mountain, the River Mountains are predominantly a thick package of pyroclastic debris that includes dacite flows, mudflow breccia, and other pyroclastic deposits (Figure 2.10) (Bell and Smith 1980). In the Wetlands Park project area, volcanic rocks of the River Mountains occur as dark gray to black porphyritic andesite. The River Mountains volcanics are likely part of a large stratovolcano centered on the River Mountains stock in the Boulder Beach Quadrangle, rather than within a caldera specific to the River Mountains themselves (Bell and Smith 1980). Erosion, primarily during the Quaternary and subsequent to uplift, resulted in development of extensive alluvial fans emanating from all mountain fronts (Bull 1991). Multiple coalescing alluvial fans form bajadas, which are prominent landforms utilized by prehistoric Native groups in the lower Las Vegas Valley and Clark County Wetlands project area. Local geology maps (Bell and Smith 1980; Bingler 1977; Castor et al. 2000) identify pediments, erosional surfaces often associated with distal alluvial fans, in parts of the project area.

The three investigated archaeological sites are situated along Las Vegas Wash, a long northwest-southeast trending feature that drains the Las Vegas Valley (Figures 2.5 through 2.7). Quaternary alluvium associated with Las Vegas Wash is the dominant geological deposit found along the valley axis. Quaternary alluvium is thick and contains significant early Paleoindian archaeology in the Thule Springs area (Haynes 1968; Quade 1986). In the Lower Las Vegas Wash and Clark County Wetlands Park area, Quaternary alluvium is relatively young and was deposited primarily within the last 3000 years (USGS 1999). Erosion and exposure of Archaic archaeological deposits is a recent phenomenon of the wash associated with growth of the Las Vegas metropolitan area, which has introduced considerable waste water runoff into the wash.

**Site 26CK6007**

Site 26CK6007 is located in the vicinity of Three Kids Wash, on the south bank of Las Vegas Wash. First documented in 2000, 26CK6007 consists of two prehistoric cultural levels and one apparently noncultural level (Chapter 3) preserved in the alluvium of the Las Vegas Wash floodplain. The 2000 investigations discovered charcoal- and ash-stained sediments in a cutbank of the wash. The subsequent machine excavations reported in Chapter 3 revealed that this was the lowest of three “levels of interest” identified by HRA’s archaeologists. Those investigations did not uncover any evidence to indicate that the previously described charcoal- and ash-stained sediments were, in fact, cultural in origin. Cultural remains in the middle level consisted of a single metate underlying a thermal feature, and in the upper level solely of chipped stone debitage, including one utilized flake.

**Geomorphology**

The dominant landscape classification of 24CK6007 is a valley with local landforms and microlrelief dominated by an alluvial fan (Figure 2.11; Table 2.2) The alluvial fan is that associated with Three Kids Wash as it emanates from the River Mountains. A widespread upper fan surface is present. However, the site is situated in a younger inset fan. The site occupies a toeslope position on a gentle (slope=1°), northwest-trending (aspect=330°) distal fan terminus. This fan slope has a linear shape following the fall line and is convex in the across-slope position. The area is excessively drained due to the dominant sandy substrate, and native shrubs grow on the landform surface.
Figure 2.9. Geologic map of the western half of Clark County Wetlands Park (26CK6146 and 26CK6147) based on the Las Vegas SE Quadrangle geology map (Bingler 1977); Frenchman Mountain extends into the mapped area from the northeast.
Figure 2.10. Geologic map of the eastern half of Clark County Wetlands Park (26CK6007) based on the Henderson Quadrangle geology map (Bell and Smith 1980); the River Mountains extend into the mapped area from the southeast.
Figure 2.11. Schematic cross section of the Lower Las Vegas Wash in the vicinity of 26CK6001 and 26CK6007 illustrating the geomorphic relationships between alluvial fan and axial stream deposits.

Table 2.2. Geomorphology of Site 26CK6007.

<table>
<thead>
<tr>
<th>Location</th>
<th>Landscape 1000m²</th>
<th>Landform 100m²</th>
<th>Microlief 10m²</th>
<th>Slope Aspect</th>
<th>Slope Gradient</th>
<th>Slope Complexity</th>
<th>Slope Shape (fall line / across slope)</th>
<th>Slope Position</th>
<th>Geomorphic Component</th>
<th>Drainage Class</th>
<th>Earth Cover Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK6007</td>
<td>Valley</td>
<td>Alluvial Fan</td>
<td>Alluvial Fan</td>
<td>330°</td>
<td>1°</td>
<td>Simple</td>
<td>Linear/Convex</td>
<td>Toeslope</td>
<td>Alluvial Floodplain</td>
<td>Well Drained</td>
<td>Native Shrubs</td>
</tr>
</tbody>
</table>
Figure 2.12. Schematic plan of 26CK6007 illustrating relative positions of examined stratigraphic localities.
Figure 2.13. Stratigraphic profile of tall cutbank in wall of Las Vegas Wash at 26CK6007.
Figure 2.14. Schematic profile of stratigraphic deposits, 26CK6007.
<table>
<thead>
<tr>
<th>Location ID</th>
<th>WGR Stratum</th>
<th>Client Stratum</th>
<th>Color (Munsell)</th>
<th>Structure</th>
<th>Texture (Folk 1980)</th>
<th>Soil Horizons</th>
<th>Depositional Environment</th>
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<td>Debris Flow</td>
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<tr>
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<td>Debris Flow</td>
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<tr>
<td>Ad</td>
<td>IVd</td>
<td></td>
<td>7.5YR5/4</td>
<td>Bedded</td>
<td>Sandy Gravel</td>
<td>Channel</td>
<td>Holocene</td>
</tr>
</tbody>
</table>
Formation of stratigraphy at 26CK6007 is a function of interaction between the Three Kids Wash alluvial fan and overbank deposition of flood alluvium from Las Vegas Wash. Stratigraphic data were collected from a cutbank in Las Vegas Wash (Figures 2.12 through 2.14) and the excavation exposure (Figure 2.14).

Figure 2.12 illustrates the spatial relationships between these two stratigraphic localities. Because of the stratigraphic complexity imparted by the interacting fan and stream environments, we use lithographic units to describe small-scale variations that are present within individual stratigraphic units illustrated in the profiles (Figure 2.13; Table 2.3). Some lithographic units are repeated within the individual stratigraphic units, while other stratigraphic units consist of a single lithographic unit. Lithographic distinctions are based on bedding characteristics, sediment texture, and depositional environment. Little variation exists within the units except where modified under redoximorphic pedogenic conditions. Table 2.3 also correlates the occurrence of lithographic units within individual stratigraphic units. The depositional history of 26CK6007 can be divided into eight distinct stratigraphic units (Figures 2.12 through 2.14). Strata I-V are exposed in the cutbank profile (Figure 2.13) and are associated with a distributary channel of the younger, inset Three Kids Wash alluvial fan.

The lowest unit in this sequence, Stratum I, is well-sorted and bedded very coarse sand to sandy gravel. In downstream exposures, Stratum I is cemented while in upstream localities Stratum I sediments are stained by manganese as well as cemented. Stratum II consists of an alluvial fan deposit that is brownish gray, parallel, discontinuous, even bedded, sandy fine pebbly gravel interbedded with a slope wash deposit that is very pale brown very fine sandy silt. Stratum III is a massive, pink very fine sandy silt, alluvial overbank deposit. Stratum IV is similar to Stratum I and is bedded sandy gravel that aggraded in an intermittent channel on the fan.

Stratum V consists of four lithographic units (Aa, Ab, Ac, and Ad) that describe small-scale spatial variations of sediment deposition on an alluvial fan surface with lesser contributions from Las Vegas Wash overbank sedimentation. Lateral variation of lithographic units Aa, Ab, Ac, and Ad include massive sandy gravel (Aa), bedded sandy gravel (Ad), massive very fine sand (Ab), or massive silty very fine sand (Ac). Lithographic units Ab, Ac, and Ad have complex architecture, which is typical of the channelized and sheet flow environments on alluvial fan surfaces (Bull 1977). Fine-textured units (Ab and Ac) are laterally discontinuous and often exhibit pinch-out architecture characterizing deposition typical of sheet and rill flow in an otherwise gravel-dominated setting.

Stratum VI consists of lithographic units Aa, Ab, and Ac. These units characterize a fining-upward sequence initiated by high-energy conditions associated with coarse-textured sediments of a debris flow and terminating in fine-grained sediments of a relative low-energy slackwater setting. This surface stabilized for some time resulting in development of a significant pedogenic redoximorphic zone as a result of a high and fluctuating water table. Oxidation near the surface of Stratum II produces distinct rubification (reddening) of the soil near its surface.

Stratum VII consists of a single lithographic unit (Ae) consisting of bedded silts deposited in a slackwater deposit. Architecture of the channel holding the Ae sediments pinches out laterally in directions perpendicular to the strike of the alluvial fan surface, and it is likely that formation of this channel is associated with overbank flooding of Las Vegas Wash. Beds within Stratum II/lithographic unit Ae are capped by what is likely manganese indicating that multiple overbank floods deposited silt in this slackwater setting.

The transition into Stratum VIII marks a shift in the dominant depositional regime from the alluvial fan to stream channel environments. Stratum VIII is dominantly lithographic units Ab and Ac, which are very fine sand and silty fine sand associated with mainstem deposits of Las Vegas Wash. Localized occurrence of lithographic unit Af marks periodic overbank flooding in this environment. The three prehistoric archaeological levels identified at 26CK6007 occur within the massive Stratum VIII deposit.
SOILS

Soil formation at 26CK6007 is limited to pedogenic deposition of gypsum and alteration of iron (Fe$^{2+}$→Fe$^{3+}$) under redoximorphic conditions (Table 2.4). Horizons Cy1, Cy2, and Cy3 are associated with Stratum VIII and encompass the upper 180 cm of the soil profile. These horizons represent pedogenically unmodified sediments excluding accumulation of gypsum crystals, which occurs due to subsurface evaporation of mineral-rich waters (Buck et al. 2006). Formation of a redoximorphic soil zone associated with Stratum VI spans a zone approximately 40 cm thick (181-217 cmbs). This soil zone forms a polygenetic soil sequence in which the redoximorphic features have been engulfed by gypsum crystals. This soil may represent the oxidation of iron-rich parent materials under perched water tables associated with aggradation of the Las Vegas Wash floodplain. Iron-rich parent materials are derived from the extrusive dacite and basalt flows of the River Mountains deposited as alluvial fan deposits in Three Kids Wash.

Site 26CK6146: The Larder Site

The Larder Site (26CK6146) is a prehistoric occupation site located on the north side of Las Vegas Wash. The surface occupation consisting of a dense surface scatter of chipped stone, ground stone, and ceramic artifacts is associated with the Patayan II and III periods, ca. AD 1000-1850. A Gatecliff series projectile point also indicates a likely Middle or Archaic occupation (ca. 7500 -2500 BP). Backhoe trenching of the site exposed as many as 60 subsurface features, many of which are globular- and bell-shaped storage pits. A detailed radiocarbon chronology for 26CK6146 indicates a strong occupational trend ca. 2000 BP with outlying radiocarbon age estimates of ca. 1300 BP and 400 BP (Table 4.3).

GEOMORPHOLOGY

The dominant landscape classification of 24CK6146 is a valley with the local landform and microrelief dominated by an alluvial fan and fan skirt, respectively (Figure 2.15; Table 2.5). The alluvial fan is a large fan that originated on Frenchman Mountain and deposited sediments southward toward Las Vegas Wash. The site occupies a shoulder position on a gentle (slope=2º), east-trending (aspect=80º) sideslope. This hillslope has a convex shape following the fall line and is linear in the across-slope position. The area is somewhat excessively drained due to the dominant sandy substrate, and native shrubs grow on the landform surface.

STRATIGRAPHY

The stratigraphic sequence at 26CK6146 formed through the interaction of distal alluvial fan (bajada), floodplain, and aeolian depositional environments (Figure 2.15). Bajada sediments predominate in the main site area and to the northeast, whereas Las Vegas alluvium occurs to the southwest. More recent, probably latest Prehistoric and early Historic period flooding of Las Vegas Wash has veneered some of the southwest side of the site with overbank alluvium. Fan sedimentation appears to have slowed or ceased after the Middle to earliest Late Holocene (ca. 5000-3000 BP), thus the dominant Late Holocene depositional environment prior to the Historic period is an aeolian sandsheet accumulating on the bajada surface. The sequence is broken into four major stratigraphic units, related to the dominant mode of sediment deposition (Figures 2.16 through 2.19). All subdivisions are based on color and grain-size variations (Table 2.6). Post-depositional modification of sediments via gypsum accumulation has altered the characteristics of the lower stratigraphic units.
### Table 2.4. Horizon Profile Summary Table, Site 26CK6007.

**SITE:** 26CK6007  
**MOISTURE REGIME:** Aridic  
**LOCATION:** South-facing Cutbank (4.4 m)  
**TEMPERATURE REGIME:** Thermic  
**CLASSIFICATION:** Orthent

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Stratum</th>
<th>Depth</th>
<th>Color</th>
<th>Redoximorphic Features</th>
<th>Structure</th>
<th>Texture</th>
<th>Rupture Resistance</th>
<th>HCl Reaction</th>
<th>Concentrations</th>
<th>Surface Features</th>
<th>Boundary</th>
<th>Size</th>
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<td>vsfl</td>
<td>s</td>
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<td>—</td>
<td>m</td>
<td>ifs</td>
<td>s</td>
<td>so</td>
</tr>
</tbody>
</table>

#### DEFINITIONS:

**HORIZON:**  
SCS designation (modified by Birkeland)  

**STRATUM #:**  
Stratum Designation  

**DEPTH:**  
Lower boundary (cm)  

**COLOR:**  
Matrix Moist  
Munsell: moist  
Non-Matrix Moist/Type  
Munsell: moist/  
m - mottle  
m - non-redoximorphic feature  
r - redoximorphic feature  

**REDOXIMORPHIC FEATURES:**  
Kind  
rm - Reduced Matrix  
cld - Clay Depletions  
fed - Iron Depletions  
f3m - Fe+3  
f2m - Fe+2  
mm - Iron/Manganese Masses  

**TEXTURE:**  
Prefixes  
cob - Cobbly  
Modifiers (sand size)  
voa - Very Coarse  
c - Coarse  
m - Medium  
f - Fine  
vf - Very Fine  

**STRENGTH:**  
S - Stickiness  
Dry  
l - Loose, Noncoherent  
s - Soft  
sh - Slightly Hard  
hh - Moderately Hard  
vh - Very Hard  
eh - Extremely Hard  
Stickiness  
s - Nonsticky  
s - Slightly Sticky  
ms - Sticky  
vs - Very Sticky  

**REACTION:**  
ne - Noneffervescent  
v - Very Slightly Effervescent  
s - Slightly Effervescent  
sl - Strongly Effervescent  

**CONCENTRATIONS:**  
Kind  
fdc - Finely Dis. Carbonates  

**BOUNDARY:**  
Distinctness  
v - Very Abrupt  
a - Abrupt  
c - Clear  
g - Gradual  
d - Diffuse  
topography  
s - Smooth  
w - Wavy  
i - Irregular  
b - Broken  

---
Figure 2.15. Schematic cross section of the Lower Las Vegas Wash in the vicinity of 26CK6146 and 26CK6147 illustrating the geomorphic relationships between alluvial fan and axial stream deposits.

Table 2.5. Geomorphology of Site 26CK6146

<table>
<thead>
<tr>
<th>Location</th>
<th>Landscape 1000m²</th>
<th>Landform 100m²</th>
<th>Microrelief 10m²</th>
<th>Slope Aspect</th>
<th>Slope Gradient</th>
<th>Slope Complexity</th>
<th>Slope Shape (fall line / across slope)</th>
<th>Slope Position</th>
<th>Geomorphic Component</th>
<th>Drainage Class</th>
<th>Earth Cover Kind</th>
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<td>26CK6146</td>
<td>Bajada</td>
<td>Alluvial Fan</td>
<td>Fan Skirt</td>
<td>80°</td>
<td>2°</td>
<td>Simple</td>
<td>Convex/Linear</td>
<td>Shoulder</td>
<td>Sideslope</td>
<td>Somewhat Excessively Drained</td>
<td>Native Shrubs</td>
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</tbody>
</table>
Figure 2.16. Stratigraphic profile of Backhoe Trench 230 North, north wall, 0-20 m.
Figure 2.17. Stratigraphic profile of Backhoe Trench 230N, north wall, 20-40 m.
Figure 2.18. Stratigraphic profile of Backhoe Trench 230N, north wall, 40-60 m.
Figure 2.19. Stratigraphic profile of Backhoe Trench 230N, north wall, 60-80 m.
Table 2.6. Strata Characteristics, Site 26CK6146.

<table>
<thead>
<tr>
<th>Location ID</th>
<th>WGR Stratum</th>
<th>Client Stratum</th>
<th>Color (Munsell)</th>
<th>Structure</th>
<th>Texture (Folk 1980)</th>
<th>Soil Horizons</th>
<th>Depositional Environment</th>
<th>Age</th>
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</thead>
<tbody>
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<td>Silt</td>
<td>Oi, A</td>
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<td>Holocene</td>
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<td>Trace Gravelly Very Fine Sand</td>
<td>Aa</td>
<td>Sand Sheet</td>
<td>Holocene</td>
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<td>Bedded</td>
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<td>C</td>
<td>Channel</td>
<td>Pre-3000 BP</td>
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<tr>
<td>26CK6146</td>
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<td>7.5YR5/4</td>
<td>Massive</td>
<td>Silty Very Fine Sand</td>
<td>C</td>
<td>Sheetwash</td>
<td>Pre-3000 BP</td>
<td></td>
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</tbody>
</table>

* Secondary salts and gypsum predominate within a matrix composed of 10-30% mineral
Stratum I includes the upper section of the thick, alluvial fan/bajada sequence associated with the composite fan originating from the flanks of Frenchman Mountain, as well as a set of weakly cemented main stem, Las Vegas Wash alluvial beds that are exposed along the Wash cutbank on the southwest side of the site.

The sequence is subdivided into five units that refer to specific depositional loci of the fan surface (i.e., channel versus sheetwash) and post-depositional modification via gypsum accumulation. Sediments deposited in distributary channels (Stratum Ib) generally have a coarser texture representing the gravel fraction, while those deposited as sheetflow have finer textures (Stratum Ia). When modified by gypsum accumulation, these strata are designated Ic and Id (coarse and fine textured parent, respectively). Stratum Ie refers to the sequence of compact and weakly cemented alluvial sediments exposed in the Wash on the southwest side site. These include bedded sands, silts, and channel gravels, the latter derived from reworking fan deposits from the fan toe. The relationship of this alluvial sediment to the fan toe was not completely resolved but a hypothesized relationship is presented in the surface profile. The upper part of Stratum I, like Stratum Ic and Id, exhibits gypsum crystals that formed through interclast crystal growth that has displaced and disassociated the original sedimentary grains. The Gatecliff or Elko series projectile point may be associated with these sediments marking the minimal age of sediment deposition at ca. 3000 BP.

Stratum II consists of a lower bed of evaporite formation (gypsum, Stratum IIa) followed by initiation of aeolian deposition in the sandsheet environment. The oldest sandsheet deposit (Stratum IIb) is gravelly very fine sand with a coarse-textured fraction likely bioturbated upwards from the underlying alluvial fan sediments. Stratum III is primarily an aeolian sandsheet with only trace quantities of gravel. Variations within Stratum III are based on the predominant grain size of the sand component (i.e., medium fine versus very fine sands). Both Stratum IIb and III may have a sheetwash component derived from upslope fans sediments. Late Holocene stabilization of Stratum II sands resulted in pedogenesis and A horizon development. The gravel in Stratum II is derived from slope wash additions as well as clasts bioturbated into the aeolian sand.

A thin layer of historic period Las Vegas Wash overbank alluvium caps the 26CK6146 stratigraphic sequence on the western margin of the site. While sediment textures indicated a general fining-upward sequence (silty very fine sand-silty sand-silt), soil formation within the subunits indicates periodic surface stabilization punctuated by overbank flooding and sedimentation. Stratum IVa is a buried A horizon (Ayb) with accumulated salts inherited from, or formed alongside, the Stratum IVb (Cy horizon) salts. The silty cap of the stratigraphic deposit (Stratum IVc) is an Oi/A horizon with undecomposed organic matter remaining within the soil surface.

SOILS

The dominant soil-forming process documented at the Larder Site is strong gypsic and or salic horizon in the fine-grained component of Stratum I. The documented soil profile (Table 2.7) has A-Bt-2Bk-2Cyz horizonation that describes a single soil (the petrocalcic soil) forming across a lithological discontinuity (Stratum III to Stratum I). The A horizon indicates surface stabilization and humification of organic materials, while the poorly formed Bt horizon likely indicates translocation and accumulation of clays inherited from the fine-grained component of the aeolian sandsheet. In some locations this Bt horizon is better characterized as a Bw horizon since it sometimes lacks pedogenic clay but expresses structural development similar to the Bt horizon. Soil carbonates contributing to the 2Bk horizon also may be inherited from the aeolian parent material. Carbonates have accumulated in the 2Bk horizon as masses up to 3 cm in size and occupying as much as 5% of the soil volume. Pedogenic modification of the Stratum I parent (2Cyz) is dominated by accumulation of gypsum and/or salt crystals, which occupy as much as 50% of the soil volume forming a salic or gypsic horizon (Figure 2.20). The strong gypsic/salic horizon probably formed during a period of higher water table when phreatogenic capillary pumping was dominant and formed a Gypsic Aquisalid or similar soil. Salt accumulation in Strata I and II suggests that a high water table existed for a time after their deposition.
Table 2.7. Horizon Profile Summary Table, Site 26CK6146.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Stratum</th>
<th>Depth</th>
<th>Color</th>
<th>Redoximorphic Features</th>
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<td>5</td>
<td>7.5yr5/4</td>
<td>——</td>
<td>0</td>
<td>m</td>
<td>lvfs</td>
<td>s</td>
<td>so</td>
<td>ve</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Bt</td>
<td>IIIa</td>
<td>13</td>
<td>7.5yr5/4</td>
<td>——</td>
<td>0</td>
<td>m</td>
<td>vfsil</td>
<td>sh</td>
<td>ss</td>
<td>ve</td>
<td>gyz</td>
<td>1</td>
</tr>
<tr>
<td>2Bk</td>
<td>Ib</td>
<td>37</td>
<td>7.5yr5/4</td>
<td>——</td>
<td>0</td>
<td>m</td>
<td>lvfs</td>
<td>s</td>
<td>so</td>
<td>ve</td>
<td>cam</td>
<td>5</td>
</tr>
<tr>
<td>2Cyz</td>
<td>la</td>
<td>95</td>
<td>7.5yr7/2</td>
<td>——</td>
<td>0</td>
<td>m</td>
<td>lvfs</td>
<td>s</td>
<td>so</td>
<td>ve</td>
<td>gyz</td>
<td>50</td>
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**DEFINITIONS:**
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<tr>
<th>HORIZON:</th>
<th>SCS designation</th>
<th>STRATUM #:</th>
<th>Stratum Designation</th>
<th>DEPTH:</th>
<th>Lower boundary (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOR:</td>
<td>Matrix Moist</td>
<td>m - mottle</td>
<td>m - non-redoximorphic feature</td>
<td>r - redoximorphic feature</td>
<td></td>
</tr>
<tr>
<td>REDOXIMORPHIC FEATURES:</td>
<td>Kind: rmx - Reduced Matrix</td>
<td>cd - Clay Depletions</td>
<td>f3m - Fe³⁺</td>
<td>f2m - Fe²⁺</td>
<td>ffm - Iron/Manganese Masses</td>
</tr>
<tr>
<td>TEXTURE:</td>
<td>Prefixes: cob - Cobbly</td>
<td>Prefixes (sand size): vco - Very Coarse</td>
<td>Munsell: moist/</td>
<td>m - moist</td>
<td>m - moist</td>
</tr>
<tr>
<td>STRUCTURE:</td>
<td>Grade: m - Massive</td>
<td>Size: f - Fine</td>
<td>f - Fine</td>
<td>f - Fine</td>
<td>f - Fine</td>
</tr>
<tr>
<td>RUPTURE RESISTANCE:</td>
<td>Dry: l - Loose, Noncoherent</td>
<td>s - Soft</td>
<td>sh - Slightly Hard</td>
<td>mh - Moderately Hard</td>
<td>ha - Hard</td>
</tr>
<tr>
<td>REACTION:</td>
<td>ne - Noneffervescent</td>
<td>vs - Very Slightly Effervescent</td>
<td>sl - Slightly Effervescent</td>
<td>sl - Slightly Effervescent</td>
<td>ve - Violently Effervescent</td>
</tr>
<tr>
<td>Boundary:</td>
<td>Distinctness: v - Very Abrupt</td>
<td>c - Clear</td>
<td>g - Gradual</td>
<td>d - Diffuse</td>
<td>Topography: s - Smooth</td>
</tr>
<tr>
<td>Quantity:</td>
<td>% by Area</td>
<td>% by Area</td>
<td>% by Area</td>
<td>% by Area</td>
<td>Size: 1 - &lt; 2 mm</td>
</tr>
</tbody>
</table>
Figure 2.20. Close up photograph of gypsum crystals forming in Stratum I, 26CK6146.
The soil of the Larder Site may have been one of the key natural features drawing prehistoric foragers to construct extensive bell-shaped storage features on this landform due to the dessicant potential of the salts (Chapter 4).

Site 26CK6147: Scorpion Knoll

Data collection at the Scorpion Knoll Site began in 2001 with initial documentation of a small artifact scatter of 25 artifacts covering an area of approximately 250 m². Data recovery followed a similar plan as that for the nearby Larder Site (26CK6146) with six east-west oriented backhoe trenches excavated to assess potential for preservation of buried features similar to the Larder Site. Eight features were identified in the excavations. Two of these are pit structures, two are depressions identified as possible pit structures, while the remaining four are storage or roasting pits. The Scorpion Knoll Site provides important settlement data supplementing the unique subsistence data presented by the Larder Site.

GEOMORPHOLOGY

Due to their spatial proximity, Scorpion Knoll and the Larder Site share many of the same geomorphic characteristics (Figure 2.16). The dominant landscape classification of Scorpion Knoll is a bajada with the local landform and microlrelief dominated by an alluvial fan and fan skirt, respectively (Table 2.8). This is the same, large alluvial fan on which the Larder Site is positioned (Figure 2.16). The fan originated on Frenchman Mountain and deposited sediments southward toward Las Vegas Wash. The site occupies a shoulder position on a gentle (slope=1º), west-trending (aspect=250º) hillslope crest. This hillslope has a linear shape following both the fall line and across-slope position. The area is excessively drained due to the dominant sandy substrate, and native shrubs grow on the landform surface. Interestingly, the valley cross-section illustrated in Figure 2.15, which is based on a 5 m digital elevation model (DEM), shows a small levee or terrace remnant intersecting the bajada/alluvial fan skirt. It is likely that this remnant landform is composed of fine-textured sediments, >3000 BP, that form the Late Holocene fill of Las Vegas Wash.

STRATIGRAPHY

Four distinct stratigraphic units were identified in backhoe trenches at the Scorpion Knoll site (Figures 2.21 and 2.22, Table 2.9). Each of these units represents distinct depositional environments evidencing significant changes in the mode of sediment deposition since the late Pleistocene. Stratum I is massive sandy gravel associated with the mainstem channel of Las Vegas Wash. Stratum II evidences the distal margin of alluvial fan deposition where sediments trend towards finer textures. Both Strata I and II were heavily modified by post-depositional formation of gypsum crystals. Like the stratigraphic sequence at the Larder Site, Stratum III is an aeolian sandsheet deposited on the stabilized surface of the distal alluvial fan. Subunit variations within Stratum III are based on pedogenesis, where Stratum IIIb shows accumulations of organic matter in an A horizon at the stabilized sandsheet surface. Trace amounts of gravel in Strata IIIa and IIIb are likely inherited from the surface of the alluvial fan. Stratum IV at Scorpion Knoll evidences aggradation of Las Vegas Wash with alluvium and changes in the position of the mainstem channel. Strata IVa and IVb are pedogenically unmodified channel deposits. While Stratum IVa is massive, Stratum IVb has laminated bedding, which may be derived from either small-scale overbank flooding in a near-channel environment or as upper flow regime planar beds associated with shallow, relatively high velocity channel margins (Boggs 2001). Stratum IVc is massive silty very fine sands deposited via overbank flooding. Stratum IV has been only slightly modified by pedogenesis via accumulation of organic matter in the surface layers.

SOILS

The dominant soil-forming process at the Scorpion Knoll site (Table 2.10) is the secondary accumulation of carbonates and gypsum in the parent material (C) horizons of alluvial fan and sandsheet sediments. Carbonates are common in the upper portion of Stratum IIb forming masses that encompass
approximately 30% of the soil volume. Gypsum crystals increase with depth encompassing approximately 90% of the soil volume in the lower portions of Stratum IIa. Gypsum is a common component of alluvial fan soils in Las Vegas Wash that is inherited from Paleozoic parent materials exposed on Frenchman Mountain. Gypsic Aquisalids formed during a period when relatively high and perched water tables increased phreatogenic capillary pumping of salts and subsurface evaporation rates leading to crystallization of gypsum or other secondary salts.
Table 2.8. Geomorphology of Site 26CK6147.

<table>
<thead>
<tr>
<th>Location ID</th>
<th>Location</th>
<th>Landscape 1000m²</th>
<th>Landform 100m²</th>
<th>Microrelief 10m²</th>
<th>Slope Aspect</th>
<th>Slope Gradient</th>
<th>Slope Complexity</th>
<th>Slope Shape (fall line / across slope)</th>
<th>Slope Position</th>
<th>Geomorphic Component</th>
<th>Drainage Class</th>
<th>Earth Cover Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>24CK6147</td>
<td>Bajada</td>
<td>Alluvial Fan</td>
<td>Fan Skirt</td>
<td>250°</td>
<td>Complex</td>
<td>1°</td>
<td>Complex</td>
<td>Linear/Linear</td>
<td>Shoulder</td>
<td>Crest</td>
<td>Excessively Drained</td>
<td>Native Shrubs</td>
</tr>
</tbody>
</table>

Table 2.9. Strata Characteristics, Site 26CK6147.

<table>
<thead>
<tr>
<th>Location ID</th>
<th>WGR Stratum</th>
<th>Client Stratum</th>
<th>Color (Munsell)</th>
<th>Structure</th>
<th>Texture (Folk 1980)</th>
<th>Soil Horizons</th>
<th>Depositional Environment</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK6147</td>
<td>IVc</td>
<td>—</td>
<td>10YR5/4</td>
<td>Massive</td>
<td>Silty Very Fine Sand</td>
<td>Oi, A, C</td>
<td>Overbank</td>
<td>Holocene</td>
</tr>
<tr>
<td>26CK6147</td>
<td>IVb</td>
<td>—</td>
<td>10YR5/6</td>
<td>Laminated</td>
<td>Very Fine Sand</td>
<td>C</td>
<td>Channel Marginal</td>
<td>Holocene</td>
</tr>
<tr>
<td>26CK6147</td>
<td>IVa</td>
<td>—</td>
<td>10YR5/4</td>
<td>Massive</td>
<td>Silty Very Fine Sand</td>
<td>C</td>
<td>Channel Marginal</td>
<td>Holocene</td>
</tr>
<tr>
<td>26CK6147</td>
<td>IIIb</td>
<td>—</td>
<td>7.5Y5/2</td>
<td>Massive</td>
<td>Trace Gravelly Very Fine Sand</td>
<td>Aa, Bkyz</td>
<td>Sand Sheet</td>
<td>Holocene</td>
</tr>
<tr>
<td>26CK6147</td>
<td>IIIa</td>
<td>upper</td>
<td>7.5YR5/6</td>
<td>Massive</td>
<td>Trace Gravelly Very Fine Sand</td>
<td>Bkyz</td>
<td>Sand Sheet</td>
<td>Holocene</td>
</tr>
<tr>
<td>26CK6147</td>
<td>II</td>
<td>—</td>
<td>7.5Y8/2</td>
<td>Massive</td>
<td>see notes</td>
<td>Cyz</td>
<td>Alluvial Fan</td>
<td>Pleistocene</td>
</tr>
<tr>
<td>26CK6147</td>
<td>I</td>
<td>—</td>
<td>10YR/6/4</td>
<td>Massive</td>
<td>Sandy Gravel</td>
<td>Ckyz</td>
<td>Channel</td>
<td>Pleistocene</td>
</tr>
</tbody>
</table>
Figure 2.21. Stratigraphic profile of Backhoe Trench 485, south wall, 0-20 m
Figure 2.22. Stratigraphic profile of Backhoe Trench 485, south wall, 20-40 m
Table 2.10. Horizon Profile Summary Table, Site 26CK6147.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Stratum</th>
<th>Depth</th>
<th>Color</th>
<th>Redoximorphic Features</th>
<th>Structure</th>
<th>Texture</th>
<th>Rupture Resistance</th>
<th>HCl Reaction</th>
<th>Concentrations</th>
<th>Surface Features</th>
<th>Boundary</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>IIIa</td>
<td>14</td>
<td>10yr/6/6</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>—</td>
<td>—</td>
<td>30</td>
<td>—</td>
<td>a</td>
<td>i</td>
</tr>
<tr>
<td>Ckzy</td>
<td>IIB</td>
<td>60</td>
<td>10yr/6/4</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>—</td>
<td>1</td>
<td>30</td>
<td>—</td>
<td>c</td>
<td>w</td>
</tr>
<tr>
<td>Ckzy</td>
<td>IIa</td>
<td>95</td>
<td>10yr/6/3</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>—</td>
<td>1</td>
<td>30</td>
<td>—</td>
<td>c</td>
<td>w</td>
</tr>
<tr>
<td>Czy</td>
<td>IIa</td>
<td>110</td>
<td>10yr/7/3</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>—</td>
<td>1</td>
<td>30</td>
<td>—</td>
<td>c</td>
<td>w</td>
</tr>
</tbody>
</table>

**DEFINITIONS:**
- **HORIZON:**
  - SCS designation (modified by Birkeland)
- **STRATUM #:**
  - Stratum Designation
- **DEPTH:**
  - Lower boundary (cm)
- **COLOR:**
  - Matrix Moist
  - Munsell: moist
  - Non-Matrix Moist/Type
  - Munsell: moist/
  - m - mottle
  - n - non-redoximorphic feature
  - r - redoximorphic feature
- **REDOXIMORPHIC FEATURES:**
  - Kind
  - Reduced Matrix
  - Clay Depletions
  - Iron Depletions
  - Fe(III) - Fe(II)
  - Ferrim - Iron/Manganese Masses
  - Mef - Manganese Films
  - ferr - ferrimorganils
  - Quantity % by Area
- **STRUCTURE:**
  - Grade
  - m - Massive
  - sg - Single Grain
  - 0 - Lacks Structure
  - 1 - Weak
  - 2 - Moderate
  - 3 - Strong
  - Size
  - vf - Very Fine
  - f - Fine
  - m - Medium
  - c - Coarse
  - vc - Very Coarse
  - ec - Extremely Coarse
  - Type
  - gr - Granular
  - abk - Angular Blocky
  - sbk - Subangular Blocky
  - pl - Platey
  - pr - Prismatic
  - col - Columnar
  - sg - Single Grain
  - m - Massive
- **TEXTURE:**
  - Prefixes
  - cob - Cobbly
  - g - Gravelly
  - Modifiers (sand size)
  - vco - Very Coarse
  - co - Coarse
  - m - Medium
  - f - Fine
  - vf - Very Fine
  - Stems
  - s - Sand
  - ls - Loamy Sand
  - sl - Sandy Loam
  - l - Loam
  - si - Silt
  - sic - Silty Clay
  - c - Clay
- **RUPTURE RESISTANCE:**
  - Dry
  - l - Loose, Noncoherent
  - s - Soft
  - sh - Slightly Hard
  - mh - Moderately Hard
  - ha - Hard
  - vh - Very Hard
  - eh - Extremely Hard
  - Stickiness
  - so - Nonsticky
  - ss - Slightly Sticky
  - ms - Sticky
  - vs - Very Sticky
- **REACTION:**
  - ne - Noneffervescent
  - vs - Very Slightly Effervescent
  - sl - Slightly Effervescent
  - st - Strongly Effervescent
  - ve - Violently Effervescent
- **CONCENTRATIONS:**
  - Kind
  - fdc - Finely Dis. Carbonates
  - fds - Finely Dis. Salts
  - cam - Carbonate Masses
  - gym - Gypsum Masses
  - gxy - Gypsum Crystals
  - can - Carbonate Nodules
  - Quantity % by Area
  - Size
  - 1 - < 2 mm
  - 2 - 2 to < 5 mm
  - 3 - 5 to < 20 mm
  - 4 - 20 to < 76 mm
  - 5 - > 76 mm

**SURFACE FEATURES:**
- Kind
  - caf - Carbonate Coats
  - sif - Silica
  - clf - Clay Films
  - brf - Clay Bridging
  - gbf - Gibbsite
  - mfs - Mang. and Ferriargillans
  - osf - Organoargillans
  - oaf - Organoargillans
  - snf - Sand Coats
  - sf - Silt Coats
  - sfl - Skeletans
  - Amount % by Area
  - Distinctness v - Very Abrupt
  - a - Abrupt
  - c - Clear
  - g - Gradual
  - d - Diffuse
  - Topography
  - s - Smooth
  - w - Wavy
  - ir - Irregular
  - br - Broken
CHAPTER 3
ARCHAEOLOGICAL INVESTIGATIONS AT 26CK6007

Richard V.N. Ahlstrom

Site 26CK6007 is located on the south bank of Las Vegas Wash toward the eastern end of Clark County Wetlands Park (Figures 1.2, 2.1, 2.2, 2.4, 2.6, 2.7, and 2.10). Finley and colleagues (Chapter 2) describe the site’s setting as follows: “The dominant landscape classification of 24CK6007 is a valley with local landforms and microrelief dominated by an alluvial fan (Figure 2.11; Table 2.2) The alluvial fan is that associated with Three Kids Wash as it emanates from the River Mountains. A widespread upper fan surface is present. However, the site is situated in a younger inset fan. The site occupies a toeslope position on a gentle (slope=1°), northwest-trending (aspect=330°) distal fan terminus. This fan slope has a linear shape following the fall line and is convex in the across-slope position. The area is excessively drained due to the dominant sandy substrate, and native shrubs grow on the landform surface.”

HRA first recorded 26CK6007 in 2000–2001 during a survey of the eastern half of Wetlands Park. As described in HRA’s survey report, “The site consists of several charcoal and ash lenses, of varying widths and thicknesses, exposed in a cutbank in alluvial sediments near Las Vegas Wash. No artifacts were identified in the face of the exposure. The site is located near Site 26CK1474, where deeply buried cultural deposits were investigated in the 1970s…. It is possible that Site 26CK6007 represents an extension of [that site]” (Roberts and Ahlstrom 2000:180). HRA also recognized that the lenses might not warrant identification as an archaeological site: “In the absence of artifacts and features, we were not able to conclusively identify these charcoal and ash lenses as cultural in origin…. We recommend additional investigation of this site by a geomorphologist” (Roberts and Ahlstrom 2000:182).

Figures 2.12, 3.1, and 3.2 show the location of 26CK6007 within a small, remnant block of alluvial sediment that is bounded on the north by the vertical southern cutbank of Las Vegas Wash’s modern (post-1975) arroyo. The block is bounded on the south by a large pit that was excavated during construction of Magic Way, a dirt road that runs along the southern edge of the area shown in Figure 3.1. The site was originally discovered in the nearly vertical northern wall of this pit. The pit serves as the terminus for a wash that flows from south to north through a culvert that passes below Magic Way. Oddly enough, there is no connection between this lower end of the wash and the nearby Las Vegas Wash. Instead, water that has come down the wash simply collects in the pit, where it gradually evaporates. Because of this lack of an outflow, there was a possibility that floodwaters from the wash might some day fill the pit, breach the “dam” formed by the sediment block that contained 26CK6007, and destroy what remained of the site.

Based on HRA’s recommendation, the SNWA asked geoarchaeologist Craig Young (2001) to reexamine the charcoal and ash lenses that HRA had recorded as 26CK6007. He came to a more positive conclusion concerning the site’s status than had HRA: “Site 26CK6007 consists of a discrete charcoal feature exposed in the upper alluvium of the Las Vegas Wash terrace…. The deposit is exposed in a construction or borrow cut adjacent to the south side arroyo of the main wash, but it is not exposed in the arroyo profile itself. The charcoal feature is confined to a discrete deposit approximately 2-meters wide. Within the 2-meter lens, the deposit shows locally intense burning with bright-hued ash and strong iron oxidation. Although artifacts were not located within or near the exposed deposit, the discrete charcoal feature is in similar stratigraphic position as archaeological contexts discovered during recent testing efforts. It is probable that the feature has a cultural origin and is likely associated with, though stratigraphically younger than, the sites in the vicinity of the confluence of Las Vegas Wash and Three Kids Wash” (Young 2001).
Figure 3.1. Survey map of Site 26CK6007 (Roberts and Ahlstrom 2000:Figure 4.89).
TREATMENT PLAN AND FIELDWORK PROCEDURES

The SNWA asked HRA to investigate the subsurface deposits at 26CK6007 based on the fact that the site is located within the construction footprint of a new erosion-control structure, or “weir,” that is to be built at this location. HRA’s work at the site was therefore geared to obtaining an adequate sample of the site’s information potential prior to its destruction. HRA’s treatment plan and procedure for 26CK6007 included three steps. First, the project geoarchaeologist examined and recorded the cutbank where the “site” deposits had been observed, both to describe the deposits’ geological setting and to help in assessing their cultural vs. non-cultural origin. The results of that work are described in Chapter 2.

Second, a backhoe’s front-end loader was employed to remove 1.5-2.0 m of overburden from the block of alluvium containing the site deposits, so as to provide access to those sediments for hand excavation. The deposits were located 3+ m above the base of the cutbank in which they were exposed. As a safety measure, the sediment that was removed from above the site deposits was moved to the base of the cutbank, where it was used to build-up a “bench” that reduced the effective height of the exposed cutbank to less than 2 m (Figure 3.2). An additional safety concern was the presence of the Las Vegas Wash arroyo on the north side of the sediment block. Here the site deposits were located at a level 6+ m above the base of the arroyo’s nearly vertical south wall. To avoid any collapse of this cutbank, during either machine or hand excavation, a 3-m wide buffer was left undisturbed on this side of the sediment block. As a result of this safety measure, the machine-excavated portion of the site was restricted to an area that measured only 4-5 m.

Figure 3.2. Photograph of Site 26CK6007, following machine excavation.
Table 3.1. Hand-Excavated Units at Site 26CK6007.

<table>
<thead>
<tr>
<th>Coordinates (SW Corner)</th>
<th>Size (m)</th>
<th>Excavation Levels Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>8N 10E</td>
<td>0.50×2.00 (east-west)</td>
<td>X</td>
</tr>
<tr>
<td>7N 11E</td>
<td>1.00×1.00 (approx.)</td>
<td>X</td>
</tr>
<tr>
<td>10N 12E</td>
<td>1.00×1.00</td>
<td>X X X</td>
</tr>
<tr>
<td>8N 13E (E½)</td>
<td>0.50×1.00</td>
<td>X</td>
</tr>
<tr>
<td>7N 13E (N½)</td>
<td>0.50×1.00 (approx.)</td>
<td>X</td>
</tr>
<tr>
<td>10N 14E</td>
<td>1.00×1.00</td>
<td>X X X</td>
</tr>
<tr>
<td>7N 17E</td>
<td>1.00×1.00</td>
<td>X</td>
</tr>
</tbody>
</table>

wide, that is, from north to south. Its east-west length, in the area of the targeted deposits, was about 10 m. Although the north side of the sediment block could not be easily accessed, the natural cutbank was examined, from a distance of about 5 m, for evidence of cultural deposits. No such evidence was observed.

The procedure in using the front-end loader was to rapidly remove the first meter of sediment and then to slow down the excavation in order to watch for cultural deposits. Not long after this change of pace, an area of slightly darkened sediment was encountered in the northern half of the machine-excavated area (discussed below in the section on the “Upper Level”). Work with the front-end loader was halted in the location of this stain, but was resumed with the backhoe in the south-central portion of the machine-excavated area. That excavation was soon interrupted as well, when the hoe scraped over a rock that seemed out of place within the floodplain alluvial sediment. Exploratory hand excavation showed that this rock was probably a ground stone artifact (discussed below in the section on the “Middle Level”). This finding left only a narrow strip running along the southern edge of the excavation area where digging with the backhoe was continued to provide ready access to the charcoal and ash-stained sediment that was the original target of our investigations at the site. This excavation was halted some 10-15 cm above that sediment layer (discussed below in the section on the “Lower Level”). The machine work thus resulted in the creation of surfaces at three different levels, which stepped down from north to south (Figure 3.3). These three machine-cut surfaces were located at depths of 10-25 cm, 37-44 cm, and 60-69 cm below datum.

The third step in the investigation of 26CK6007 consisted of the hand excavation of units originating at each of the three previously described levels (Figure 3.4). These units were defined with reference to an arbitrary datum point that was established in the northwestern section of the excavation area and assigned the coordinates of 10 m north and 10 m east (10N 10E). An arbitrary vertical datum (0 m) was established at this location as well. In all, seven units with a total surface area of approximately 6 m² were excavated by hand at the site (Table 3.1). The units ranged in depth from 20 to 90 cm.

**GEOMORPHIC SETTING AND NATURAL STRATIFICATION OF SEDIMENTS**

The project geoarchaeologists divided the depositional history of the sediments exposed in and around 26CK6007 into eight stratigraphic units (Chapter 2; Figure 2.13 and 2.14). All three of the “levels of interest” that HRA investigated at the site lay within the uppermost of these units, Stratum VIII: “The transition into Stratum VIII marks a shift in the dominant depositional regime from the alluvial fan to stream channel environments. Stratum VIII is dominantly lithographic units Ab and Ac, which are very fine sand and silty fine sand associated with mainstem deposits of Las Vegas Wash. Localized occurrence of lithographic unit Af marks periodic overbank flooding in this environment” (Chapter 2; also Figure 2.14).
LEVELS OF INTEREST

HRA’s investigation of 26CK6007 led to the identification of three “levels of interest” within the site (Figures 3.5 and 3.6). The upper and middle levels yielded modest evidence of prehistoric activity on the Las Vegas Wash floodplain. The lower level consisted of the gray sediment layer that was the impetus for HRA’s excavations at the site. As discussed below, a cultural origin could not be confirmed for this deposit.

Lower Level

The lowest level of interest to our investigations consisted of the gray-to-black stratum that, as previously noted, was the intended focus of our excavations at the site (Figures 3.7 and 3.8). There had always been some question as to the “cultural” origin of this layer of sediment, and our excavations uncovered no evidence to suggest that human activity was involved in its creation. We dug through the layer at four locations, in each case involving a unit or units with a total surface area of approximately 1 m². Data from four units, 7N 11E, 7N 13E (N½), 8N 13E (E½), and 7N 17E, showed that the deposit extended over a distance of 3+ m from west to east and that it sloped up gradually in that same direction. Data from Units 7N 13E (N½) and 8N 13E (E½) indicated that the deposit extended about 1.5 m northward from the face of the cutbank where it was exposed in profile. This observation was supported by the fact that the deposit was not observed further to the north, in Unit 10N 12E. The layer did not yield any artifacts, and it did appear to have consisted of structural fill. It looked instead to be a natural deposit laid down in a low spot on the floodplain where marsh or “wet meadow” vegetation flourished for a time.
Figure 3.4. Map of Site 26CK6007, showing boundaries (dashed lines) between machine-excavation levels (compare to view in Figure 3.3).
A sample of unidentified charred material recovered from lower-level deposits was submitted to Beta Analytic for radiocarbon dating. It produced a date with a two-sigma calibrated range of AD 970–1200 (Sample 26CK6007-2; Beta-230254; Table 3.2; Appendix A).

**Middle Level**

During excavation below the uppermost level of interest, the teeth of the backhoe bucket scraped across the surface of a sizeable rock. Fortunately, the rock was not disturbed, and some of the sediment

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Figure 3.5. Profile sketch through Site 26CK6007, showing upper, middle, and lower “levels of interest” (see Figure 3.4 for location of profile).

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Figure 3.6. Composite east-west profile of Site 26CK6007, showing upper, middle, and lower “levels of interest.”
Figure 3.7. Photograph of the lower “level of interest,” east wall of Unit 8N 13E, Site 26CK6007.

Figure 3.8. Profile drawing of the lower “level of interest”—the “dark ashy sandy silts”—in the east wall of Units 7N 13E and 8N 13E, Site 26CK6007 (see Figure 3.4 for location of profile).
Table 3.2. Radiocarbon Dates from Site 26CK6007.

<table>
<thead>
<tr>
<th>Sample Context</th>
<th>Sample Data</th>
<th>Radiocarbon Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit</td>
<td>Depth (bd)</td>
</tr>
<tr>
<td>10N 12E</td>
<td>.15-.20 cm</td>
<td>9 1</td>
</tr>
<tr>
<td>8N 13E</td>
<td>.80-.90 cm</td>
<td>19 2</td>
</tr>
</tbody>
</table>

lying above it was also left in place. Subsequent hand excavation showed the rock to be a slab (or block) metate with a small informal hearth or firepit lying immediately above it. This combination of artifact and hearth was labeled Feature 1.

**FEATURE 1**

The feature consisted of a small hearth overlying an inverted slab metate (Figure 3.9). Excavation and examination of profiles around the feature indicated that it was not located within a structure. The hearth was oval and measured about 60 cm long by 35 cm wide. It had a maximum depth of about 8 cm.

The southeastern edge of the hearth was removed by the backhoe. What remained of the feature for hand excavation was best preserved along the profile exposed by the backhoe’s bucket (Figures 3.9 and 3.10). Beginning a few centimeters back from this profile and extending northward from there, the firepit had been disturbed, presumably by burrowing animals. Perhaps the presence of the metate immediately below the portion of the hearth exposed in the profile discouraged the animals from continuing their digging.

![Figure 3.9. Photograph of Feature 1 profile, Site 26CK6007. Note the backhoe “tooth marks” cut into the surface of the metate.](image-url)
into this section of the feature. The profile showed the hearth pit as containing three primary fill strata: a bottom layer of gray to black, fine-grained sediment that contained a piece of burned bone but no obvious pieces of charcoal, a thin but distinct lens of white clay with some silt, and a layer of very fine sand and silt that filled the upper portion of the pit but also extended beyond its boundaries. The clay layer was about one centimeter thick in the profile, but to the north, at the center of the pit, it expanded into a “blob” of sediment that was up to 10 cm thick. The two upper strata—the clay lens and the sand and silt layer—appeared to be natural sediment that was deposited in the feature after it was abandoned.

The metate was lying face down and pitched up along its long axis, such that it was situated beneath the hearth along the feature’s well-preserved profile (Figure 3.9 and 3.10), but also next to the feature’s deepest, central area (Figure 3.4). The spatial relationship between the metate and the firepit is difficult to explain in behavioral terms. There was no evidence to indicate that the metate had been placed in a pit that had been dug into the floodplain sediment. The stratigraphic evidence indicated instead that it had been lying on the surface floodplain and then been covered by alluvial deposits. How, then, did it happen that a firepit was built on top of this artifact? Given the scarcity of cultural remains within the sediment column, the superpositioning between the two could hardly have been coincidental. The most reasonable explanation would seem to be that the individuals who made the firepit purposely placed it on top of a metate that they knew to be buried, or mostly buried, at this location. If this interpretation is correct, it follows that Feature 1 related to two episodes of human activity on the floodplain, one involving the use of the metate and the other the construction and use of the hearth. The latter feature may have been used only once. Finally,

![Figure 3.10. Profile drawing of Feature 1, Site 26CK6007 (see Figure 3.4 for location of profile).](image)
although this scenario seems to make sense of the stratigraphic situation, it begs the original question of why a hearth would have been built over a metate.

Contents

The fill within the hearth contained a fragment of burned animal bone. A soil sample collected from feature fill located directly beneath the metate produced an uninformative sample of just 14 pollen grains (114 grains/g). These data do not contribute to the interpretation of either the hearth or the metate. The metate consisted of an angular block of hard, nonfriable rock that measured 30-36 cm long, 18-24 cm wide, and 4-9 cm thick. It was ground smooth on one side—the bottom side as the metate lay in the ground.

Radiocarbon Dating

Feature 1 was not dated directly, but radiocarbon dates from samples collected below and above the feature—i.e., from the lower and upper “levels of interest”—bracket the feature’s period of use (Table 3.2). These dates indicate that the hearth and associated metate were emplaced sometime between AD 970 and 1400.

Setting

At the time of its use, Feature 1 would have been located on the floodplain of Las Vegas Wash, some unknown distance from the wash channel. Though certainly incomplete, the available evidence suggests that it was an isolated feature. It may have been located within a couple meters of a small wash that ran across the surface of the floodplain. Evidence of such a wash was found in Unit 10N 12E, at about the same level (i.e., within a couple centimeters) as the top of the hearth. This evidence consisted of a 60-cm-wide by 5-cm-thick “channel” deposit of manganese “clumps,” very coarse sand, and small granules.

Upper Level

The upper level of interest was identified in the northern half of the machine-excavated area, some 20 cm above the level of Feature 1. Machine scraping was halted in this area when a patch of sediment that was slightly darker than the overlying alluvium was encountered. This area of dark sediment was initially scraped with shovel and trowel to test the possibility that it represented the fill within a pit structure. The level containing the dark sediment was also examined in a profile that was exposed when machine excavation continued immediately to the south. Neither the plan nor profile views of the area produced any evidence suggesting that a pit structure was present. Subsequently, Units 10N 12E and 10N 14E were excavated into the stained sediment in search of artifacts and features. The layer of sediment was not as distinct in the walls of the units and it had been in plan view. It was recorded in the west wall of Unit 10N 12E as a 20-30 cm thick layer of light brownish gray (10YR 6/2) silt with inclusions of caliche granules, flecks and small clumps of manganese-stained sediment, as well as small fragments of charcoal. Though no features were discovered, a small flaked stone artifact assemblage was recovered. Relevant levels in Unit 10N 14E produced 25 flakes (including one utilized flake), and those in Unit 10N 12E yielded another six flakes.

A sample of charcoal from upper-level deposits (FN 9; Figure 3.6) was submitted to Beta Analytic for radiocarbon dating. It produced a date with a two-sigma calibrated range of AD 1270–1400 (Sample 26CK6007-1; Beta-230253; Table 3.2; Appendix A).

CONCLUSION

Machine and hand excavation uncovered evidence from three “levels of interest” located within the block of sediment that contained Site 26CK6007. The lowest of the three levels consisted of a layer of dark gray sediment and adjacent, light-colored sediment. We were unable to recover any evidence confirming that the dark sediment was cultural in origin. It appears instead to be a natural deposit, produced in a low spot on
the floodplain that, for a time, supported a growth of marsh or wet-meadow vegetation. A radiocarbon date on charred material from the dark gray sediment suggests that this material was deposited sometime between the late AD 900s and the close of the 1100s. The middle level produced evidence of two related episodes of human activity on the floodplain. The earlier episode involved the use of a slab or block metate, which was turned upside down following its final use, and the later episode involved the construction and use, perhaps only once, of a small hearth. These events appear to have occurred sometime between the late AD 900s and the end of the 1300s. Finally, the uppermost level yielded a small assemblage of flaked stone debitage, but no evidence of cultural features. The density of artifacts was low, and it may be that the deposit represented the outer edge of what was once a more extensive site. If such a site had existed, it would have been destroyed by the recent down-cutting by Las Vegas Wash, by the construction of Magic Way, or by these two events in tandem. A radiocarbon date produced from a sample of charcoal suggests that the sediments containing the upper-level artifacts were deposited sometime between the late AD 1200s and the end of the following century.
CHAPTER 4
ARCHAEOLOGICAL INVESTIGATIONS AT THE LARDER SITE
(26CK6146)

Richard V.N. Ahlstrom

The Larder Site, 26CK6146, was recorded in 2001 as an extensive (85×300 m) artifact scatter that, by Wetlands Park standards, was rich in both the number and variety of artifacts that were present. The assemblage consisted of several thousand pieces of flaked stone debitage, three projectile points (including a possible Gatecliff point), four bifaces, three fragmentary ground stone artifacts (portions of a basin metate and two manos) made from vesicular basalt, numerous small pieces of vesicular basalt (interpreted as possible byproducts of on-site production or maintenance of ground stone implements), and at least 11 potsherds (Woodman et al. 2001). The sherds included four Topoc Buff, four desert Topoc Buff, and one each of Las Vegas Buff, unidentified buff, and a buff ware–brown ware intergrade (Seymour 2001). The presence of Topoc Buff suggested that the site was inhabited during the Patayan II-III period, that is, between AD 1000 and 1850. The possible Gatecliff point indicated that the site may also have been used much earlier, during the Middle Archaic period or between around 5500 and 3000 BC. It was recognized that these were broad dates that might represent only portions of the site’s overall period of use.

The Larder Site is located at the northwestern end of Clark County Wetlands Park (Figures 1.2, 2.1, 2.3 through 2.5, 2.7, 2.9, and 4.1), on a long, low, north-south-oriented rise or “interfluve” that lies between a deeply incised channel of Las Vegas Wash on the west and a deeply excavated ditch on the east and south (Figure 4.2). The channel cuts through consolidated floodplain sediment (Figure 4.3). The ditch

Figure 4.1. Photograph taken during the excavation of a backhoe trench at the Larder Site.
Figure 4.2. Map of the Larder Site, showing the location of surface archaeological evidence, including point-located artifacts, collection units, and possible eroded pit features.
Figure 4.3. Photograph looking south along the incised channel of Las Vegas Wash, which forms the western boundary of the Larder Site.
is a modern construction that follows the course of a natural drainage along the southeastern and southern edges of the site. The interfluve on which the site is located lies at the toe of an alluvial fan that originates several miles to the northeast in the foothills of Frenchman Mountain (Figure 2.15). The interfluve rises to its greatest height along its north-south axis and, particularly within the southern half of the site, slopes down distinctly along its east and west sides. As discussed below, the Larder Site is located primarily along the crest and west (Las Vegas Wash) side of this landform. The surface of the interfluve supports a relatively dense cover of small desert shrubs, forbs, and grasses. Small trees, predominantly catclaw acacia, grow along shallow ephemeral drainages in the interfluve’s southeastern corner. A dense stand of tamarisks flanked the ditch on the eastern side of the site when it was first recorded in 2001. These trees had been cleared away by 2005 when HRA began the fieldwork session that is the subject of this report.

**TESTING PLAN**

HRA’s investigation of the Larder Site had management and research goals that were both general and specific in nature. A specific management goal was to determine if the site extends to the eastern edge of the landform, or “interfluve,” on which it is located. Does it, in other words, reach to the bank of the ditch that runs along this side of the site? If it does, a planned project to upgrade and remodel the ditch could have a direct impact on the fabric of the site. A second specific management goal, with definite research implications, was to collect artifacts from the surface of the site that are likely to disappear as visitation to this corner of Wetlands Park increases over time. A general management and research goal of HRA’s investigations was to determine the nature and extent of subsurface archaeological deposits on the site. A more specific research goal was to interpret those deposits—chronologically, functionally, and in the context of Las Vegas Valley’s settlement history.

Several pieces of evidence suggested that buried culture deposits and features would be found at the Larder Site. These included the site’s large size, its location adjacent to Las Vegas Wash, the size of the surface artifact assemblage, and the fact that this assemblage incorporated formal flaked stone and ground stone tools, as well as potsherds. The presence of this combination of traits makes the Larder Site similar to a group of sites located several miles downstream, at the confluence of Las Vegas Wash and another of its major tributaries, Three Kids Wash. Sites in that area have been proven to possess substantial buried cultural deposits that incorporate the remains of hearths and habitation structures, including at least one buried pit house (Ahlstrom 2005; Ahlstrom and Roberts 2001b; Roberts and Ahlstrom 2000). The remains of that structure were found almost 2 m below the historic floodplain of Las Vegas Wash, and other cultural deposits in the area have been identified at depths of more than 6 m.

The treatment plan that HRA (2004) prepared to guide its investigation of the Larder Site included several steps. As detailed in the plan,

1) Artifact concentrations, formal flaked and ground stone tools, potsherds, and soil staining or other surface evidence of cultural features will be identified and pin-flagged. This will accomplished by a team of archaeologists walking at close intervals (≤5 m) back and forth across the site.

2) A sample of the surface artifact assemblage, consisting in the first place of formal flaked stone and ground stone tools and tool fragments, as well as potsherds, will be collected. These kinds of surface artifacts are most likely to contribute to the site’s chronological and functional interpretation. They are also the most likely to be removed by unauthorized collectors of artifacts. Other artifact classes known to be present on the site, such as flaked stone debitage and possible waste flakes from the production or maintenance of ground stone tools, have less potential to contribute to the goals of the testing project. A small sample of these artifacts will be collected from areas with high artifact densities.
3) Surface evidence of features will be explored through the excavation, by hand, of small test units (0.5×1.0, 1.0×1.0, and 0.5×2.0 m). The purpose of this work will be to locate and characterize buried archaeological features, and excavation of individual units will be halted when these goals have been accomplished. We anticipate digging units in this manner with a total, combined surface area of 10-15 m². This total includes additional hand-excavated units described below (5).

4) Backhoe trenching will provide a more extensive search for buried cultural deposits. Trenches will be excavated in areas with high densities of surface artifacts and in or adjacent to areas where features are suspected (on the basis of surface evidence or hand testing) or known (on the basis of hand testing) to exist. Other areas of the land form on which the site is located—that is, the space between roughly parallel drainages—will be explored through the excavation of a patterned array of backhoe trenches. (Slightly more than the area within the existing site boundary will be included on the chance that the site’s surface artifact assemblage is not entirely representative of its subsurface manifestation.) Initially, this array will consist of trench alignments laid out at 40-m intervals. Individual trench alignments will be excavated in “skip trenches” (for example, dig 20 m, skip 20 m, dig 20 m, and so on). Some longer, continuous trenches may also be excavated if requested by the project geomorphologist. Additional trenches will be excavated at 20-m intervals in areas indicated by the results of surface recordation, excavation of units by hand, and backhoe trenching. We anticipate digging 300-400 m of 4½-5-foot deep trenches in this manner.

5) As necessary, hand units like those described earlier (3) will be excavated adjacent to backhoe trenches to provide information to characterize cultural deposits and features exposed in trench walls.

6) The project geomorphologist will examine the excavated backhoe trenches and provide guidance concerning the possible presence of more deeply buried alluvial deposits that could contain cultural remains. On the one hand, the previously mentioned investigations in the area of Three Kids Wash raise the possibility of such deposits on 26CK6146. On the other hand, our observation of well-cemented alluvial deposits exposed in the adjacent banks of a current channel of Las Vegas Wash suggests that deep deposits may not be present on the site. To whatever extent alluvial sediments that may contain cultural materials are present at depths greater than 4½-5 feet, an effort will be made to investigate those deposits. This will involve the stepping back of the walls of some segments of the trenches that have already been excavated. This will be attempted only in areas where the upper 5 feet of sediment is devoid of cultural materials—the purpose here being to avoid additional damage to known cultural deposits. In this manner, it should be possible to test some areas of the site to a depth of almost 10 feet, or 3 m.

7) Samples for flotation and subsequent macrobotanical analysis, pollen analysis, radiocarbon dating, and so on will be collected from suitable contexts during the excavation of hand units and possibly from the walls of backhoe trenches. This sampling will be conducted at a scale appropriate to a testing project—balancing the goals of obtaining the data necessary to characterize the site’s subsurface deposits and features, of not “wasting” sample materials that might not be duplicated during later excavations at the site, and of not impacting the site more than necessary to achieve the goals of testing [HRA 2004].

This treatment plan was implemented as described, with some modifications. To begin with, no hand units were excavated prior to backhoe trenching, because surface evidence did not provide a clear enough basis for the placement of units. As a result, all but one of the excavated hand units were laid out over features, or
possible features, that had already been identified in the walls of the backhoe trenches. These units covered a combined total area of almost 8 m², or slightly less than the proposed range of 10-15 m². Excavation of the units led to the identification, and either total or, in most cases, partial excavation of 13 features. This represented a fairly small sample (less than 25 percent) of the 60 or so features that we were able to identify in the walls of the trenches. To make up for this fact, we collected samples—as appropriate, for radiocarbon, macrofloral, and pollen analysis—from the trench-wall profiles of almost every feature that was not excavated by hand. This kind of sampling, then, played a larger role in the investigation than had been anticipated in the original testing plan. As for backhoe trenching, the final total of 762 m exceeded the proposed range of 300-400 m. This greater amount of trenching was necessary to determine if buried cultural deposits approached the ditch that runs along the east side of the site. In fact, the evidence from machine excavation, combined with that from surface recordation, demonstrated that much of this portion of the interfluve on which the site is located lies outside the site’s boundaries. The same is true for an area that had originally been included in the site at its northern end. Finally, it did not prove necessary to dig any extra-deep, stepped-back trenches. For one thing, the geomorphological setting of the site is such that no cultural deposits would be expected below the depth that could be reached with “simple” trenches. For another, there was no evidence in the trenches for cultural features or deposits originating at depths greater than 50 cm below the ground surface. Most features, in fact, originated within 20-30 cm of the surface, at the contact between an upper, bioturbated “organic” soil and the underlying “mineral” soil. From this perspective, the archaeological site was essentially a “near-surface” phenomenon.

The treatment plan did not specify how a grid system would be established on the site. In practice, our use of a portable GPS unit made it possible to establish the site grid on the local UTM grid (North American Datum 1927, Zone 11). A point at the southwestern edge of the Larder Site, at 80N 500E on the site grid, was equivalent to 3996980N 678500E on the UTM grid. As a first step in fieldwork, we drove wooden stakes into the ground at 20 m intervals across this site grid. Point-located artifacts were “measured in” by stretching tapes from these known points. Feature locations were also initially recorded in this way. At the end of fieldwork, however, we used the GPS instrument to determine the precise locations of the backhoe trenches, the excavated features, and the features that were recorded and sampled in the walls of the trenches.

SURFACE COLLECTION AND RECORDATION

Figure 4.2 compiles the archaeological evidence that we obtained from the surface of the Larder Site. That evidence consists primarily of collected artifacts, including point-located potsherds and formal flaked stone and ground stone tools, as well as systematic collections of artifacts from 14 5×5-m units. Blocks of either two or four of these units were placed in five areas on the site with greater than average surface-artifact densities. Also shown in the figure are several possible pit features that were exposed on the western edge of the site, along the bank of Las Vegas Wash.

BACKHOE TRENCHING

Eighteen backhoe trenches with a combined length of 762 m were excavated at the site (Figure 4.4, Table 4.1). The trenches were oriented east-west and were designated with reference to their idealized northing (90N, 110N, and so on). Discontinuous or “skip” trenches located on the same northing were given a secondary label of “A” (to the west) or “B” (to the east). The trenches varied in length from 8 to 108 m (Table 4.1) and had average depths of 1.1 m (3½ ft) and widths of 0.6 m (2 ft). Immediately after each trench was excavated, its walls were faced by hand with shovel or trowel. Definite and possible
Figure 4.4. Map of the Larder Site, showing backhoe trenches and recorded subsurface features.
Table 4.1. Summary of Backhoe Trenches and Associated Features at the Larder Site.

<table>
<thead>
<tr>
<th>Trench</th>
<th>Length</th>
<th>No. of Features</th>
<th>Feature Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>90N</td>
<td>32 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>110N-A</td>
<td>47 m</td>
<td>12</td>
<td>1, 2A, 2B, 3-11</td>
</tr>
<tr>
<td>110N-B</td>
<td>8 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>130N-A</td>
<td>47 m</td>
<td>3</td>
<td>12-14</td>
</tr>
<tr>
<td>130N-B</td>
<td>22.5 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>150N-A</td>
<td>63 m</td>
<td>10</td>
<td>15-24</td>
</tr>
<tr>
<td>150N-B</td>
<td>15.5 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>170N-A</td>
<td>61 m</td>
<td>8</td>
<td>25-30, 56, 59</td>
</tr>
<tr>
<td>170N-B</td>
<td>43.5 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>190N</td>
<td>94.5 m</td>
<td>13</td>
<td>31, 32, 34-38, 40, 41A, 41B, 41C, 42, 57</td>
</tr>
<tr>
<td>210N-A</td>
<td>33 m</td>
<td>2</td>
<td>43, 44</td>
</tr>
<tr>
<td>210N-B</td>
<td>9.5 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>230N</td>
<td>108 m</td>
<td>7</td>
<td>45-49, 60, 61</td>
</tr>
<tr>
<td>250N</td>
<td>49.5 m</td>
<td>5</td>
<td>50-54</td>
</tr>
<tr>
<td>257.5N</td>
<td>19.5</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>290N</td>
<td>66 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>310N</td>
<td>33.5 m</td>
<td>3</td>
<td>55A, 55B, 58</td>
</tr>
<tr>
<td>340N</td>
<td>8.5</td>
<td>0</td>
<td>–</td>
</tr>
</tbody>
</table>

features that were observed in the walls of the trenches were pin-flagged, with the final inventory of numbered features emerging only after multiple examinations of the trench walls.

SETTING OF SITE BOUNDARIES

Evidence collected on the distribution of surface artifacts and buried cultural features (Figures 4.2 and 4.4) provides a solid basis for locating the boundaries of the Larder Site (Figure 4.2). In areas where trenches were excavated, there was generally good agreement between the two data sets. The “fixing” of the site boundary is particularly important for the eastern side of the site. As previously discussed, there are plans to reconstruct the man-made ditch that parallels the site on this side. The newly acquired evidence indicates that, if proper precautions are taken, this construction project can be carried out without significant impact to the site.

GEOMORPHIC SETTING AND NATURAL STRATIFICATION OF SEDIMENTS

As discussed by the project geoarcheologists in Chapter 2, the Larder Site is located at the lower end of an alluvial fan that originates to the north on Frenchman Mountain. Deposition of the alluvial-fan sediments “appears to have slowed or ceased [on the site] after the Middle to earliest Late Holocene (ca. 5000-3000 BP).” Most of the pit features that HRA’s field crew identified on the site had been excavated into the uppermost half meter or so of the alluvial-fan sediment. Following the end of fan sedimentation and, specifically, during the late Holocene but prior to the Historical period, the on-site depositional environment changed to that of “an aeolian sandsheet accumulating on the bajada surface.” Finally, what was “probably latest Prehistoric and early
Historic period flooding of Las Vegas Wash...veneered some of the southwest side of the site with overbank alluvium.” Several of the site’s pit features either definitely or possibly originated within the upper, sandsheet deposits; however, the vast majority of features appeared instead to have been covered by these sediments. In other words, the contact between the sandsheet deposits and the underlying alluvial-fan sediments served as the “discovery level” for most of the features. It is important to note, however, that both the sandsheet deposits and, in the southwest portion of the site, the overbank alluvium, have undergone substantial bioturbation. It is possible, therefore, that more features originated in these upper sediments than we could identify.

For the purposes of archaeological recordation, HRA’s field crew identified three soil horizons in the walls of the backhoe trenches that were excavated across the site. The units were defined in consultation with the project’s geoarchaeologist, William Eckerle. They included, from the surface to the bottom of the trenches, an A, a Bw, and a Cy horizon (Figure 4.5). These units represent a simplified version of the sequence of soil horizons described by Eckerle and his colleagues in Chapter 2. The A soil horizon formed predominantly within the previously mentioned sandsheet deposit, whereas the Bw and Cy horizons occur within the underlying alluvial-fan sediment. The upper portion, at least, of the A horizon as it is identified in the present chapter corresponds to the A horizon described in Chapter 2. Skipping to the bottom of the

![Figure 4.5. Photograph of Feature 35 in the north wall of Backhoe Trench 190N at the Larder Site, showing the three soil horizons identified during the archaeological recording of features: A, a dark gray layer located immediately below ground surface; Bw, a light brown to white layer; and Cy, a gray layer extending to the bottom of the trench.](image-url)
sequence, the Cy horizon referenced in the present chapter is more or less equivalent to the 2Cyz horizon discussed in Chapter 2. This leaves the middle of the sequence, referred to in the current chapter as the Bw horizon and in Chapter 2 as the Bt and 2Bk horizons, to be considered. The Bw horizon corresponds, for the most part, to those two other units. The Bw horizon was, however, the most difficult to identify of the three soil horizons that were included in the archaeological descriptions of the trench-wall profiles. In some locations, this soil horizon appeared not to be present at all. For these reasons, it is difficult to know the exact relationship between the Bw horizon that was identified by members of the archaeological field crew and the Bt and 2Bk horizons that are reported in Chapter 2.

FEATURE IDENTIFICATION

HRA’s field crew initially assigned numbers to 61 features that were observed in the walls of the backhoe trenches. Two of these features (Nos. 33 and 39) were subsequently rejected as probably not being “cultural” in origin, whereas three others were subdivided into two or three separate features (Nos. 2A and 2B; 41A, 41B, and 41C; and 55A and 55B). With these revisions, the total comes to 63 archaeological features that were recorded in the walls of the backhoe trenches. Information on the distribution of the features among the recorded trenches appears in Table 4.1.

As discussed below, we have interpreted most of the 63 identified features as probable storage pits. In most cases, the fill within these pits could be readily distinguished from the adjacent, undisturbed sediment of the Bw and Cy soil horizons (Figure 4.5). Two other categories of features were more difficult to identify and interpret. One of these involved the three features that were interpreted as probable or possible hearths (Features 2A, 2B, and 45). It proved difficult to distinguish these small, shallow features from natural irregularities in the contact between the A and underlying Bw soil horizons (Figure 4.6). Those natural irregularities appeared to be the result of bioturbation within the A horizon, most likely involving the burrowing of small animals. Ideally, the discrete, neatly curving profiles of man-made features would have contrasted with the jagged, un-patterned ups-and-downs that would have been produced by animal burrowing and perhaps other natural processes acting on the contact between the two soil horizons. In fact, however, the distinction was difficult to make, because these processes had also impacted the purported cultural features. Another difficulty concerned the interpretation of layers or patches of charcoal-stained

Figure 4.6. Photograph of the south wall of a backhoe trench in the north-central portion of the Larder Site, showing the typical irregular contact between the A and Bw soil horizons.
sediment that were observed in the profiles of the three identified hearths. The presence of these deposits played an important role in the identification of these as cultural features. Evidence of this kind might be misleading, however, given that deposits of charcoal-stained sediment were also observed in contexts that appeared to be natural in origin. The clearest case of this kind involved what was probably the charred stem of a small tree that was bisected by the backhoe (Figure 4.7). To address this difficulty in identification, we applied a somewhat less stringent standard to the recognition of hearths than of other kinds of pit features—with the understanding that one or more of these features might not, in fact, be “man-made.”

We hoped that evidence from excavation, including the results of pollen and flotation analyses, would strengthen the argument that the three features were indeed hearths. This is exactly what happened in the case of Feature 45. Excavation showed the feature to be nearly circular in plan view—which would be more typical of a cultural feature than of an animal burrow. A flotation sample that included almost all of the feature’s limited quantity of charcoal-stained fill was found to contain the charred remains of eight seeds that were probably screwbean. A ninth seed was identified as “cf. *Prosopis*”—this being the genus that includes both screwbean and mesquite trees. These two kinds of evidence—one relating to the shape of the feature and the other to the presence within it of plant materials that are known to have been important food items for Indian peoples—clinches the argument that Feature 45 represented the remains of a prehistoric hearth.

Figure 4.7. Photograph of a probable charred plant stem exposed in the wall of a backhoe trench at the Larder Site.
The second category of features that presented difficulties of interpretation consisted of broad, shallow dips or depressions in the contact between the A and Bw soil horizons (Features 13, 41A, and 54). These depressions measured from 2 m to 4 m in width and from 10 cm to 30 cm in depth and possessed relatively level bases or “floors.” We initially thought that these might represent ephemeral surface structures, similar to those that were identified at Scorpion Knoll (Chapter 5). Our hand testing of two of the depressions, Feature 41A and Feature 54, did not, however, produce any specific evidence in support of this interpretation. For any common class of archaeological feature, it is reasonable to expect a range of variability in feature condition. At the “positive” end of this range of variability, there should be at least a few “good”—i.e., readily recognizable—examples of the feature type. No such examples of readily identifiable habitation structures were identified at the Larder Site. Our data from testing suggest, therefore, that structures of this kind are rare at the Larder Site, both in relation to pit features and, probably, in absolute numbers as well.

This may not, however, be the final word on the presence or absence of habitation structures at the Larder Site. It is possible that these structures are more common than our sample of backhoe trenches would suggest, but that our methods were ill-suited to their detection. This might be true, in particular, for structures whose remains were “floating” in the bioturbated A horizon. Perhaps broad-scale mechanical stripping would provide a better means for recognizing the outlines of structures of this kind than our procedure of searching for structures in the walls of backhoe trenches and then conducting small-scale hand excavation of suspicious “depressions” that could be observed at the contact between the A and Bw soil horizons.

At a more general level, it is worth noting that the A horizon on the Larder Site resembled the plow zones that occur on archaeological sites in many parts of the world. As in the case of many sites covered by a plow zone, we were unable, for the most part, to identify cultural features as originating within this upper soil zone. In almost all cases, cultural resources were identified where they intruded into the Bw and Cy soil horizons. In other words, they were visible only where they cut into the “mineral soil” that underlies the “organic,” culturally modified soil that is found at and immediately below the ground surface. This was true in spite of the fact that, wherever the A horizon was excavated by hand, it was found to contain at least a few artifacts distributed at different levels within the horizon. This fact, combined with evidence that the site was in use as recently as 400-500 years ago, suggests that the A horizon was present, or at least in the process of formation, during the time of the site’s occupation. Based on this varied evidence, it seems reasonable to characterize the Larder Site’s A horizon as a “natural plow zone.”

**HAND EXCAVATION AND PROFILE RECORDATION**

As specified in the treatment plan, a number of archaeological features at the site were excavated, or partially excavated, by hand. In all cases, these investigations began with the laying out of an appropriately sized rectangular unit on the ground surface adjacent to the wall of the backhoe trench where the feature had been detected (Figure 4.8). Levels were excavated within this unit until the feature had been outlined in plan view. From this point on, either the whole feature or a specific portion of it became the unit of excavation. In addition to this work on features, one unit was excavated adjacent to a backhoe-trench wall in a location where a feature had not been identified. This unit was investigated to provide an excavated sample of the A horizon. All fill that was excavated by hand was screened through ⅛-inch mesh, except for that reserved for pollen and flotation analysis. Only a relatively small number of artifacts and specimens, consisting of flaked and ground stone tools, pieces of flaked stone debitage, potsherds, fragments of nonhuman bone, and fragments of charcoal or other charred material, were obtained from the hand-excavated units. Samples of soil for pollen analysis, soil for flotation processing and macrobotanical analysis, and of charred material for radiocarbon dating were collected from appropriate contexts throughout the hand-excavated units. The hand excavations were documented in plan and profile drawings, photographs, and notes.

The remaining, unexcavated features that we observed in the walls of the backhoe trenches were photographed, and almost all of them were also recorded in profile drawings. In accord with the testing plan, we collected pollen and flotation samples from most of the features. In many cases, two or more samples of a
particular kind were collected from a single feature. The samples were removed by trowel from the walls of the backhoe trenches, and their locations were recorded on the profile drawings. The general strategy was to obtain samples from each of the major stratigraphic fill units that could be distinguished within a feature. In the case of flotation samples, the collecting was focused on sediment that obviously contained fragments of charred material. In a number of cases, there was sufficient charcoal and charcoal-bearing sediment to permit the collection of separate flotation and C14 samples from particular stratigraphic contexts.

Pollen samples were taken from different levels within a feature; however, a special effort was made to collect samples from a feature’s floor, lower walls, and lowest 0-3 cm of fill. Most of the investigated features appear to have been storage pits, and it was anticipated that these “basal” samples would provide the best evidence of plants that had been placed in the pits—either for storage or as linings for stored goods. Material from the floor and lower fill was combined in these pollen samples, because the procedure of removing sediment from the walls of the backhoe-trenches did not generally expose a large enough area of a feature’s floor to collect an adequate amount of material from that context alone. In a number of cases, the bottom 1-3 cm of fill within a pit feature had a distinctive “ashy” look, which reinforced the idea that these materials were more likely to be directly associated with the use of the feature.

Figure 4.8. Photograph of archaeologist Vanessa French excavating Feature 51 at the Larder Site.

than the overlying fill. (The likely source of this ashy fill is discussed below.) Typically, the mid-to-upper fill within a pit feature gave the appearance of having washed, blown, or been thrown in after the feature had been abandoned, that is, after the removal of whatever had been stored within it. This kind of context produced
most, though not all, of the flotation samples that were collected from the features. The charred plant remains that we extracted from these samples could have originated from the materials that were stored within a pit feature, or they might instead represent the population of charred materials that resided in the sediments that surrounded the feature at the time of its abandonment. It is important, therefore, that the relationship between any charred plant remains that were extracted from one of these samples and the actual use of the feature be assessed on a case-by-case basis.

**FEATURE SUMMARY AND ANALYSIS**

Table 4.2 provides summary data on the 63 cultural features that HRA recorded in backhoe trenches at the Larder Site. These features can be divided into four primary morphological/functional types: depression, hearth, roasting pit, and storage pit. In most cases, it was possible to accurately measure the size of a feature—in the wall of a backhoe trench in which the feature was exposed. In the case of excavated features, the dimensions of the whole feature could be measured or at closely estimated. These width and depth measurements are plotted, by feature type, in Figure 4.9.

**Depressions, Hearths, and Roasting Pits**

Depressions, hearths, and roasting pits represent minor categories that together account for only seven of the 63 identified features. As discussed in detail earlier, depressions consisted of 2-4 m wide, 10-30 cm deep “dips” in the contact between the A and Bw soil horizons (Figure 4.9). These depressions were identified as features based on the idea that they might represent the remains of ephemeral habitation structures. Excavation in two of the features (Nos. 41A and 54) failed to produce any good evidence in support of this hypothesis. Alternatively, it is possible that the features represented “borrow-pits” that were excavated to gain access to sediment of the Bw soil horizon.

Hearths are shallow, basin-shaped depressions filled at least in part with layers or lenses of charcoal-stained sediment. All three of the hearths included in the feature inventory (Features 2A, 2B, and 45) were at least partially excavated. They ranged in diameter from 20 to 40 cm and in depth from 5 to 10 cm (Figure 4.9; the three smallest of the plotted thermal features). As was discussed in some detail earlier, the labeling of these features as hearths or, indeed, as cultural features is in some cases open to question.

Only a single small roasting pit was identified in the backhoe trenches. Like the hearths, this pit feature contained charcoal-stained sediment; it also had a floor that was slightly oxidized. Together, these two pieces of evidence supported the pit’s assignment to a general functional category of “thermal features.” The feature also contained a number of fist-size and smaller burned rocks, which was the primary basis for its more specific classification as a roasting pit. The feature measured 85 cm wide by 20 cm deep (Figure 4.9; the largest of the plotted thermal features).

**Storage Pits**

Fifty-six of the cultural features identified in the backhoe trenches at the Larder Site were pits that, with a few exceptions discussed below, did not produce evidence of burning “in place.” These features varied greatly in size, with widths ranging from 0.15 to 1.99 m and depths from 0.13 to 0.90 m (Figures 4.9 and 4.10). We infer that these features were used primarily for storage, specifically of foodstuffs. This interpretation is based on several lines of evidence. First, the regularity in shape exhibited by most of the features suggests that they were not the byproduct of an activity, such as the removal of soil for some other use, but were instead constructed to serve a particular function. (They did not, in other words, look like borrow pits.) Second, the features’ walls and rims did not show the kind of oxidation, nor did their contents include the kinds of ashy and charcoal-stained sediment or burned rocks that would warrant their identification as “thermal features”—that is, as hearths or roasting pits. Third, the pollen and flotation samples that were analyzed from a number of these features produced evidence in support of the idea that they were used to store a variety of plant foods.
Table 4.2. Summary of Features Recorded at the Larder Site.

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<th>Feature</th>
<th>Trench Location</th>
<th>Trench Wall(s)</th>
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<th>East</th>
<th>Treatment</th>
<th>Type</th>
<th>Shape</th>
<th>Width</th>
<th>Depth</th>
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<td>0.35</td>
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Notes:  
1. ex=feature excavated or tested; pro=feature profile recorded and sampled in backhoe-trench wall  
2. For excavated or tested features, dimensions were measured or estimated for the whole feature; for features recorded in the trench walls, dimensions apply to the feature profile  
3. mBS=meters below ground surface  
4. Represents a subjective judgment as to the quality of observations on feature shape, width, and depth:  
   ++ applies to features that were excavated or tested or that were recorded in both trench walls: whole-feature dimensions were reasonably clear  
   + applies to features that were recorded in one trench wall: profile dimensions were reasonably clear  
   – applies to features that were excavated or tested or that were recorded in one trench wall: one or more of the whole-feature or profile dimensions were obscured  

Nor did any of the pits contain evidence that would point to some other use—such as human remains that could indicate either a primary or secondary function as a burial pit. Finally, the pits came in sizes and shapes consistent with those of features that have been interpreted as storage pits in many other archaeological contexts. A simple classification scheme was devised to describe and categorize the variability in these feature shapes.
CLASSIFICATION OF PIT SHAPES

Four primary shapes could be distinguished among the 56 features that were identified as storage pits (Figures 4.11-4.14). It is important to emphasize that these represent the shapes of features in profile, since that is the only kind of morphological data available for most of the features. The shapes are described by the contact between the fill located within the feature and the natural substrate located outside it. That

Figure 4.9. Size distribution of features, by type, at the Larder Site.

Figure 4.10. Size distribution of storage pits at the Larder Site.
Figure 4.11. Photograph of a bowl-shaped storage pit, Feature 9, in the south wall of Backhoe Trench 110N at the Larder Site.

Figure 4.12. Photograph of a basin-shaped storage pit, Feature 20, in the north wall of Backhoe Trench 150N at the Larder Site.
Figure 4.13. Photograph of bell-shaped storage pit, Feature 12, in the north wall of Backhoe Trench 130N at the Larder Site.

Figure 4.14. Photograph of globular storage pit, Feature 51, in the south wall of Backhoe Trench 250N at the Larder Site.
substrate consists of the Bw soil horizon, the Bw and Cy horizons, and, rarely, the Cy horizon alone. In order of prevalence, the four shape categories are bowl (n=23), bell (n=11), basin (n=10), and globular (n=2) pits. The majority of features (n=46) could be readily assigned to one or another of these categories. The remainder (n=10) exhibited characteristics of two of the shape types. The four primary categories can be described as follows:

**Bowl-shaped pits** have more-or-less evenly curving, convex (viewed from inside the pit) profile shapes. From one end of the feature profile to the other, the wall of the pit slopes down gradually to a lowest point and then gradually upward to the opposite edge of the feature (Figure 4.11).

**Basin-shaped pits** have more-or-less steeply sloping sides and level floors. The most important characteristic that distinguishes them from bowl-shaped pits is the existence of an angular intersection between the sides and floor of the feature (Figure 4.12).

**Bell-shaped pits** have a complex profile shape. The bottom portion of the pit has a curving, convex profile, like a bowl-shaped pit. The curve is much tighter, however, and turns inward as one extends up the sides of the feature. Then the profile turns outward again, producing a shape analogous to the re-curved rims of some ceramic jars. This inward and then outward curve could also be described as a constriction in the walls of the pit (Figure 4.13).

**Globular pits** resemble the bottom portions of bell-shaped pits. That is, their profiles describe a relatively tight curve that bends inward as it extends up the sides of the pit. They differ from bell-shaped pits, however, in that the sides do not then curve outward above a constriction. The form is similar to that of ceramic seed jars found on Ancestral Puebloan sites in the Four Corners Region of the American Southwest (Figure 4.14).

**Mixed-shape pits** share characteristics of two of the primary shape categories. Six of the 10 features assigned to this category are partly bowl shaped, six are partly basin shaped, six are partly globular in shape, and two are partly bell shaped. The most interesting of the mixed-shape categories is the one that includes pits that are partly globular. This category is as common as the others, even though globular pits per se are relatively rare: as noted above, they account for only two of the 46 pits that could be assigned to one of the four primary shape categories. This would suggest that the globular shape may have been more popular than the data on assignments to those four categories would indicate.

**ANALYSIS OF PIT SHAPES AND SIZES**

As previously noted, the two measurements of pit width and pit depth could be readily determined for almost all of the features that were identified at the site. Two characteristics of these values are relevant to their use for studying variability in the size of storage pits. First, the present analysis makes use of the maximum width and depth measurement for each feature. Second, most of the measurements apply specifically to a feature’s dimensions as revealed in the wall of a backhoe trench. It is assumed that most of the pits were more-or-less circular in plan view. Therefore, unless the backhoe trench happened to cut a feature exactly in half, its measured dimensions will be less than its actual dimensions. There is another measurement that, although not used here, could also prove useful for comparing the sizes of different features. This would be a measurement of a feature’s actual size, in two dimensions, in the wall of the backhoe trench—that is, its “profile area.”

Figure 4.15 plots the investigated storage pits by their size (width and depth) and shape (bowl, bell, basin, and other). Trend lines have been added to aid in comparing the size distributions of the different categories. These trend lines suggest that, for features with widths of less than 0.80 m, there is no basis for distinguishing the three categories of bowl, bell, and basin-shaped pits on the basis of their width and depth values. The situation is different, however, for features with widths in excess of 0.80 m. At these larger sizes, the distributions of bowl and basin-shaped pits continue to be indistinguishable from one another. The distribution of bell-shaped pits, on the other hand, diverges from the other categories. That is, for widths between 0.80 m and 1.10 m (the largest value in our sample), bell-shaped pits tend to be deeper than other
kinds of pits. The difference is on the order of 15-30 cm. Based on this finding, the size data were re-plotted to contrast the size distribution of bell-shaped pits with that of all other pits combined (except mixed-category pits that are partially bell shaped) (Figure 4.16). The large bell-shaped pits (with widths greater than 0.80 m) are, in volume, among the largest pits recorded at the site.

Figure 4.15. Size distribution of storage pits, by profile shape and with trend lines added, at the Larder Site.

Figure 4.16. Size distribution of storage pits, comparing bell and other shapes, with trend lines added, at the Larder Site.
FEATURE FILL AND EVIDENCE OF FIRE

Most of the fill in the investigated storage pits had the appearance of material that had blown, washed, or been thrown into the pits after their contents had been removed. If so, it follows that the items incorporated in the fill—artifacts, charred plant remains, pollen grains, and so on—are less a reflection of what was stored in the pits than of the materials that resided on the surface of the site when the pits were opened for the last time. This conclusion has several implications for the interpretation of the recovered items. In the case of nonperishable artifacts (primarily flaked stone debitage and potsherds), their relative scarcity in the excavated and sampled feature fill is consistent with their relatively low surface densities across most of the site. In neither context do the artifacts appear to reflect the disposal of refuse from intensive habitation. As for the charred plant remains recovered from the storage pits, two issues need to be addressed concerning these specimens. First, there is the question of how and where these materials were burned. The storage pits themselves did not exhibit evidence of fire (except in limited but important circumstances to be discussed shortly), and only a couple of thermal features where the routine charring of plant materials would have occurred have been identified on the site. It could be that the charcoal and other burned plant remains came from small hearths that were located on the ground surface and that have not been preserved in recognizable form.

This interpretation would be consistent with the characterization of the site’s A horizon as a “natural plow zone.” It would also explain the presence of small, scattered pieces of charcoal in some A horizon exposures where features could not be identified. From this perspective, the several possible hearths that were recorded in the trench-wall profiles would represent lucky, though imperfect survivors of a once more numerous class of archaeological features. The hearths in question could have had an important function, relative to the site’s use for the storing of foodstuffs. That is, the features could have been used to parch seeds and other plant parts in preparation for their placement in the storage pits. This activity would produce fuel-wood charcoal as well as charred seeds. A related activity (discussed below) would have been the building of fires to produce hot coals to be thrown into the pits to assist in drying them out in preparation for use.

This discussion concerning the relationship between a pit’s contents and its function should not be taken as meaning that none of the artifacts and samples removed from a feature were involved in its use. For one thing, it is likely that some fraction of the contents were left in a pit when it was cleaned out, mixed for example with discarded lining material. For another, the fill in some pits exhibited stratigraphic breaks or transitions between higher-level and lower lower-contents. In these cases, the lower fill was almost certainly more closely related to feature use than the upper fill. The most distinctive of these stratigraphic situations involved a layer or patch of sediment found on the floor of a number of pits (Features 8, 14, 21, 23, 27, 30, 38, 42, 55A, and 61) that was ashy, charcoal laden, or both. In most cases, this layer was only 1-3 cm thick, but in one pit (Feature 38) it measured 8-10 cm. In another of these pits (Feature 55A), a small area of the floor underlying an ashy patch was faintly orange in color, as if from minimal oxidation. Two other storage pits (Features 12 and 60) did not contain this layer of ashy or charcoal-laden sediment, but did have lightly burned floors. In one case (Feature 60), a portion of the floor that was exposed during profile sampling exhibited a faint “oranging” similar to that in the previously mentioned feature. The other example involved an excavated storage pit (Feature 12) that had several gray, burned-looking patches on its floor. It is suggested here that the ashy and charcoal-laden sediment, along with the evidence for slight burning on the floors of a few features, resulted from the use of fire to dry the pits in preparation for their use to store foodstuffs. This could have involved the building of small fires on the floors of the pits or, alternatively, the throwing into the pits of burning sticks or hot coals from fires set nearby on the ground surface. Fires of this kind might not have required much if any preparation of a formal fire pit or hearth—which would be consistent with the previously discussed scarcity of thermal features observed in the walls of the backhoe trenches. We will return to the subject of these fires in the following section.
THE GYPSUM CONNECTION

Many of the storage pits (23 of 56=41%) had been dug through the Bw soil horizon and either to, or into, the Cy horizon. In order to reach the Cy horizon, these pits have greater depths, on average, than the population of pits as a whole (46 cm as compared to 35 cm). They also, therefore, tend to have greater volumes than the other pits. As was mentioned earlier, the Cy horizon referenced in this chapter is equivalent to the 2Cyz horizon described by the project geoarchaeologists in Chapter 2. They note that “Pedogenic modification of the Stratum I parent (2Cyz) is dominated by accumulation of gypsum and/or salt crystals, which occupy as much as 50% of the soil volume forming a salic or gypsic horizon (Figure 2.20).” Anhydrite (CaSO4), the anhydrous or “dried-out” form of gypsum (CaSO4·2H2O), is an effective desiccant that, under controlled laboratory conditions, can adsorb up to 10% of its weight in water vapor (Sorbent Systems 2006). The presence of salts in the 2Cyz horizon would add further to the sediment’s dessicating properties.

Two anecdotal observations attest to the desiccant potential of the Larder Site’s Cy horizon. First, continued exposure to this sediment, from working in the backhoe trenches, could result in uncomfortable drying of the skin. Second, direct evidence of the water-absorbing capacity of the Cy horizon was observed in the floor and sides of an excavated storage pit (Feature 12). Within a day following the fresh exposure of this sediment to the air, its surface was covered with a mineral “fuzz” that was produced as its dry or anhydrous components drew moisture, i.e., water, from the air.

The presence of this desiccating sediment may help to explain why the remains of so many storage pits, dating over such a long period of time, are to be found at the Larder Site. We hypothesize that the gypsum-rich sediment of the Cy soil horizon acted as a desiccant to draw moisture from foodstuffs stored in pits that either reached or penetrated into this soil unit. Heating of at least some of the pits prior to their use would have contributed to this effect, by driving moisture from the sediment that was exposed in the walls of the pit. This would explain the presence, discussed above, of ashy sediment immediately above the floors and burned patches on the floors of a number of the storage pits. This desiccant quality of the gypsum-rich sediment would have resulted in lower rates of loss through spoilage and, thus, higher rates of success in the subterranean storage of foodstuffs at the Larder Site than in other locations. The gypsum crystals incorporated in the Cy horizon (Figure 2.20) may have had a secondary benefit as well: their presence may have discouraged animals from burrowing into this sediment layer and, thus, would offer some protection to the features from this source of damage. People who used the site could have discovered its advantages for pit storage over time and, having done so, would have favored it for this activity. This knowledge would have been passed down from generation to generation, making the site a “persistent place” (Schlanger 1992) on the landscape of the southeastern Las Vegas Valley.

Depth of Features below Ground Surface

The discovery level for most of the recorded features was at the contact between A and Bw soil horizons. Some features may have originated at a higher level, within the A horizon, but because of the bioturbated state of that soil layer, this proved difficult to demonstrate. The one clear case involved a small roasting pit, Feature 55B; though the feature’s floor intruded a few centimeters into the Bw horizon, it was located primarily in the A horizon. Two other possible examples were two storage pits, Features 4 and 32. Evidence from a photograph of Feature 4 and from probing of Feature 32 during sample collection suggests that these pits may have originated in the A horizon. Except in the case of these three features, a measurement of the depth of a feature below the present ground surface can also serve as a measurement of the thickness of the A horizon overlying the feature. Figure 4.17 plots the distribution of these depth values, in 2 cm increments. The distribution is normal, though skewed to the right, that is, in the direction of values greater than the modal value of 17-18 cm below ground surface. The skewing pushes the median depth to 19-20 cm and the mean depth to 21-22 cm. It should be noted that the high end of the distribution includes three anomalous values that are not simply a function of the thickness of the A horizon over the recorded features. Two of these values (35-36 cm and 37-38 cm) were associated with storage pits, Features 41B and 41C, that
were located beneath other features. Feature 41B was built over 41C, and then Feature 41A was created over 41B. Prior to these impacts, the upper portions of the two storage pits were probably located at depths comparable to Feature 41A, or approximately 15 cm below ground surface. The third anomalous depth value, of 45-46 cm, came from Feature 14, a storage pit that, unlike any of the other recorded features, originated at the contact between the Bw and Cy horizons rather than that between A and Bw horizons. Significantly, this deeply buried pit yielded one of the two oldest radiocarbon dates obtained from features at the Larder Site (see the discussion of Chronology below).

### Estimated Number of Features Present

Backhoe trenching exposed a sample of the buried cultural features that are present at the Larder Site. It is not a random sample, since the individual trenches were spaced at regular intervals across the site. Nevertheless, the sample can be considered reasonably representative of the site’s total population of features. And it can, on that basis, be used to estimate of the total size of the site’s feature population. Over most of the site area, the backhoe trenches were spaced at 20 m intervals from one another. For purposes of estimation, it is most useful to think of each trench as running down the center of its own 20-m-wide strip of the site. Each trench provided a sample of the features that are buried within that strip. How large was this sample, that is, what sample rate or sample percent does the trench represent? The first step in answering this question is to determine the amount of each strip that is located within its backhoe trench. The backhoe trenches were 60 cm wide and, thus, represented a 3% sample (.60m/20m=.03) of the surface area within their 20-m-wide strips of the site. One could use this value of 3% to estimate the number of features present on the site from the number recorded in the backhoe trenches. The resulting estimate

![Figure 4.17. Distribution of feature depths below ground surface at the Larder Site.](image)
would, however, be unrealistically high. This is because a backhoe trench’s effective width for finding buried features is greater than its measured width. The reason for this difference is that a backhoe trench provides information not only on the presence of features within its 60-cm width, but for some distance beyond or behind its walls. That information pertains specifically to the features that are profiled in the trench walls and that extend into the undisturbed sediment located beyond the walls. The width of this additional search area is a function of the size of the cultural features that are the object of the estimation procedure.

Most of the buried features identified at the Larder Site were storage pits, so this class of features provides the most appropriate target for estimation. Figure 4.10 shows the distribution of profile widths for features of this kind. As discussed earlier, the distribution is skewed somewhat to the left, relative to the “true” diameters of the features that are included in the plot. With this caveat in mind, it can be noted that most of the features that were measured in the backhoe trench walls had diameters of less than 1.00 m. The same is true of the excavated features, which had diameters of 0.70, 0.85, 0.85, 0.90, 1.00, and 1.45 m. For present purposes, then, a diameter of 1.00 m will be assigned to the “typical” pit feature. (This is a conservative choice: a smaller and, perhaps, more realistic value would result in a smaller effective trench width and, by extension, a higher estimated feature population.) It should also be noted that this typical feature is more or less circular in shape.

In principle, our typical pit feature could extend up to 1.00 m back from the backhoe-trench wall in which its profile was exposed. This is, however, an unrealistically high figure to use in revising the effective width of the backhoe trenches, for at least two reasons. First, there is a minimum amount of a pit that needs to be present in the backhoe-trench wall for it to be recognized as a cultural feature. Again, we can turn to Figure 4.10 to see that few pits were identified with diameters of less than 50 cm, and only one had a diameter of less than 20 cm. Given the number of features identified, and the fact that the backhoe trenches “hit” the individual features at random, one might expect a greater representation of these smaller width values. Based on these observations, the minimum value for feature recognition is set, for present purposes, at 20 cm. In other words, at least that much of a pit’s diameter would have to have been removed by the backhoe for the feature to be identified in the backhoe trench wall. This calculation reduces to 80 cm the width of the area located beyond the backhoe-trench wall about which the trench can provide information. There is, in addition, a second reason to reduce further this value of 80 cm. It has to do with the fact that, although the backhoe trench does provide information on pits that are located within 80 cm of its two side walls, it does not provide complete information on those features. Specifically, it does not include information on the presence of features that come within 80 cm of the trench wall but do not actually intersect it. A complex calculation could no doubt be derived to take this factor into account. For present purposes, the 80 cm figure will be divided in half, to 40 cm.

Based on these calculations, one arrives at an effective backhoe trench width (relative to the search for storage pits) of 1.4 m. This includes the 60 cm width of the trench itself, along with a 40-cm wide band on either side of the trench. This effective trench width, together the 20-m trench interval, produces a sampling rate of 7% (1.4 m/20 m=.07) for the trenches that were excavated at the Larder Site. From this value, one can estimate that there are 800 storage pit features on the site (56 known features/.07=800 features), or 744 more features than were recorded by HRA. A more conservative approach would be to use the previously discussed, 80-cm-wide band on either side of the trench. This would give an effective trench width of 2.2 m (60+80+80 cm=2.2 m), a sampling rate of 11% (2.2 m/20 m=.11), and an estimated total population of 509 features (56/.11=509).

Throughout this discussion, an attempt has been made to produce relatively conservative—that is, low but robust—estimates of the Larder Site’s population of buried storage pits. One additional factor that further reinforces the conservative nature of these estimates should be mentioned. A key element in the calculations is the count of storage pits that were identified in the walls of the excavated backhoe trenches: the larger this figure, the larger the estimate of features present on the site. This value underestimates the number of features that were, in fact, impacted by the backhoe trenches. This is because it does not include an unknown number of relatively small storage pits that were hit head-on by the backhoe trenches. Features with diameters of up to 60-70 cm could have been destroyed in this manner, either entirely or to such an extent as to render the portion
remaining in and behind the backhoe-trench wall unrecognizable as a cultural feature. Although the number of these sacrificed features is probably small, their likely existence does add a bit to the conservative quality of the estimation procedure.

The purpose of these calculations is not to arrive at an exact estimate, but to argue that hundreds of storage pits—500 to 800 or more—are almost certainly present on the site. That fact, combined with the lack of evidence for substantial habitation, was the reason for naming 26CK6146 the “Larder Site.” Webster’s Ninth New Collegiate Dictionary (1986:p. 674) defines a larder as “a place where food is stored.”

In spite of their estimated abundance, these storage features do not cover a large area of the site. The “typical” pit feature with a diameter of 1.00 m has a surface area \((\pi r^2)\) of 0.785 m\(^2\). A minimum value for the area of the site is 20,000 m\(^2\). Based on these numbers, a total population of 500 features would account for 2% of the total site area \((500 \times 0.785 \text{ m}^2/20,000 \text{ m}^2 = 0.019)\), and 800 features would account for about 3% of that area \((800 \times 0.785 \text{ m}^2/20,000 \text{ m}^2 = 0.031)\).

ARTIFACTS

HRA’s investigations at the Larder Site resulted in the recovery of 1170 artifacts, including 1116 flaked stone artifacts, 45 potsherds, 8 ground stone fragments, and a possible pendant or other ornament. The flaked stone and ceramic artifacts are discussed in detail in Chapters 6 and 7, the ground stone artifacts below. The possible ornament came from fill in Feature 47. In addition to these artifacts, two small pieces of turquoise or a related mineral were recovered, one on the ground surface (194N 493E) and the other from Feature 12.

*Ground Stone.* Suzanne Eskenazi analyzed the site’s eight ground stone artifacts (Table C.1). Six of these items were recovered during surface collection; the other two artifacts came from an excavation unit (148.5N 499E). Five of the ground stone artifacts are mano fragments, two are metate fragments, and one is classified as a fragment of unknown type because of its small size. Six of the eight artifacts (including four mano fragments and two metate fragments) are basalt, one (the unclassified fragment) is made of a conglomerate rock, and one (a mano fragment) is sandstone.

CHRONOLOGY

HRA’s investigations at the Larder Site yielded four kinds of evidence that contribute to the chronological placement of the site and of the archaeological features that it contains. This evidence involves the stratification of natural sediments, the super-positioning and clustering of features, the recovery of artifacts with known periods of use, and radiocarbon dates. Artifacts that are useful for dating were found on and, to a lesser extent, beneath the ground surface; the other three kinds of evidence came entirely from subsurface contexts.

*Stratification of Natural Sediments*

All but four of the cultural features recorded on the site appeared to originate at the contact between the A and Bw soil horizons. This evidence could indicate that many of these features were used and abandoned before the sediment in which the A horizon formed was deposited on the site. (As discussed by the project geoarchaeologists in Chapter 2, that sediment was a sand-sheet deposit identified as Stratum III in the site’s stratigraphic sequence.) Alternatively, it could be that many of the features originally extended upward into the A horizon, but evidence of this fact was obscured by bioturbation within this soil horizon. It is difficult to choose between these two scenarios, either in assessing their relative importance for the site’s history or in interpreting the individual cultural features that we recorded on the site. Three of those features did, in fact, either definitely (Feature 55B) or possibly (Features 4 and 32) originate within the A horizon. Stratigraphic evidence showed that the definite case, Feature 55B, was younger than Feature 55A. *That* feature yielded a radiocarbon date of AD 640–760, indicating that Feature 55B was created sometime after AD 640. This
evidence suggests, in turn, that A horizon sediment was being deposited on the site during the second half of its occupation span (350 BC–AD 1600, as indicated by radiocarbon dates that are discussed below). When that process of deposition began is, however, unknown. It is possible that it began in earnest sometime after the beginning of documented site use. In other words, many of the recorded features may originate at the contact between the A and Bw soil horizons because that was the approximate location of the ground surface at the time of their construction and use.

As noted, four of the features that we recorded on the site did not conform to the rule of originating at the contact between the A and Bw horizons. Three of those features have already been mentioned, as originating within the A horizon. The fourth exception, Feature 14, appears to have originated lower down, at the contact between the Bw and Cy horizons. The evidence indicates that this storage pit was built and used before the deposition of the overlying Bw sediment. This would make Feature 14 older, in stratigraphic terms, than any of the other features identified on the site. Significantly, this feature also produced one of the site’s three oldest radiocarbon dates (360–90 BC). As discussed in greater detail below (in the description of Feature 14), this evidence indicates that at least some of the alluvial-fan sediment in which the Bw horizon has formed was deposited after 400 BC. This sediment appears to be equivalent to the Stratum 1a or Stratum 1b material identified on the site by the project’s geoarchaeologists (Chapter 2). These two stratigraphic units are subdivisions of Stratum 1, which “includes the upper section of the thick, alluvial fan/bajada sequence associated with the composite fan originating from the flanks of Frenchman Mountain.” The data from Feature 14 indicate, then, that the uppermost portion of this alluvial fan sediment was deposited sometime after 400 BC.

Features 47 and 52 produced radiocarbon dates that are about as old as the date from Feature 14 (i.e., 350–50 BC and 360–50 BC). Both of these features originated at the contact between the A and Bw soil horizons and penetrated into the latter. In other words, they were constructed after deposition of the sediment in which the Bw horizon developed. As in the case of Feature 14, that sediment probably belongs to either Stratum 1a or Stratum 1b in the site’s stratigraphic sequence. The two features were located some distance north of Feature 14—100 m in the case of Feature 47 and 120 m in the case of Feature 52. At these distances, it is perhaps unsafe to assume that the Bw sediment in all three locations resulted from a single depositional event. If they do represent a single event, however, the dates from the three features indicate that it occurred between 400 and 50 BC.

Super-Positioning and Clustering of Features

We identified three sequences of super-positioned features on the site. One sequence included two storage pits, Features 21 and 22. Feature 21 intersected and, thus, postdated Feature 22. A second sequence included a storage pit, Feature 55A, and a small roasting pit, Feature 55B. The roasting pit intersected and partially overlay the storage pit, indicating that it was the more recent of the two features. The third sequence included two storage pits, Features 41B and 41C, and a depression, Feature 41A. The depression overlay and thus postdated one of the storage pits, Feature 41B. That feature, in turn, intersected and therefore postdated the other storage pit, Feature 41C.

Some degree of spatial clustering can be seen among the cultural features that were exposed in the walls of the backhoe trenches (Figure 4.4). Some of the clusters could include features that were in use at the same time, or nearly the same time. Alternatively, the clustering could be a function of the random, i.e., independent, placement of features over time. The relative scarcity of superimposed features suggests that the first of these two explanations may have some validity. In other words, some of the features may have been intentionally placed near to one another and, thus, represent distinct temporal components within the site’s overall occupational history.

Artifacts

Two categories of artifacts contribute to the Larder Site’s temporal placement, projectile points and
potsherds. Four complete or partial dart points and three complete or partial arrow points were found at the site (Table 6.3). The dart points were all in the Elko Series and included two Elko Eared points and two Elko Corner-notched points. One of the Elko Corner-notched points came from a subsurface context, specifically from a depth of ca. 25 cm in A horizon sediment within Excavation Unit 148.5N 499E. The other three points were collected from the ground surface.

Elko Series points came into use during the Early Archaic period (5500–3000 BC), were in vogue throughout the Late Archaic (3000 BC–AD 500), and may have continued to be produced during the first few centuries of the Early Ceramic period (AD 500–1200) (Jennings 1986:Figure 3). Because of the length of this interval of use, the four Elko points contribute little to our dating of the Larder Site. At best, they provide chronological evidence that is consistent with radiocarbon dates (discussed below) that indicate a major period of site use during the post-350 BC portion of the Late Archaic period. They also raise the possibility that the site was visited at an earlier time than the radiocarbon dates would indicate, that is, during either the Middle Archaic period or the pre-350 BC portion of the Late Archaic period. (One of the Elko Eared points was identified in the field as a Gatecliff point. This type dates to almost the same interval as points in the Elko Series, except that it appears to have fallen out of use by the early centuries BC. This alternate typing of the point would, therefore, add a bit of weight to the idea that the site was visited prior to 350 BC.)

The three arrow points included one Cottonwood Triangular and two Desert Side-notched points. One of the Desert Side-notched points was recovered during excavation of A horizon sediment overlying a storage pit, Feature 12. The other two arrow points were surface artifacts. Cottonwood Triangular and Desert Side-notched points together make up a “late” complex of arrow points that can be contrasted with an “early” complex consisting of Rose Spring points. This late arrow-point complex and, in particular, the Desert Side-notched point can be dated to the period after AD 1200 or 1300. Cottonwood points may, on the other hand, have appeared somewhat earlier, that is, by around AD 1000. Both kinds of points probably continued in use into the AD 1800s. Archaeologists defined the two point complexes on the basis of data from outside the Las Vegas Valley (Eighmey 1998:706; Geib 1996), but recent research conducted in Clark County Wetlands Park indicates that they are valid in this locality as well (Ahlstrom 2005:318-320).

The presence of the arrow points is consistent with radiocarbon dates from two storage pits that indicate the Larder Site was in use sometime between AD 1400 and 1600. One of these pits was Feature 12. As previously noted, we recovered a Desert Side-notched point during excavation of the A horizon sediment overlying this storage-pit feature. It hardly seems likely that the agreement between the dating of this point type (AD 1200/1300–ca. 1850) and the feature’s radiocarbon date (AD 1400–1460) is coincidental. We would argue instead that the point was probably left at this location by the people who made and used the feature. This is a useful observation, given the previous characterization of the A horizon as a “natural plow zone.” In spite of its churned-up nature, this soil horizon has the potential to yield evidence relevant to the interpretation of the features that lie beneath it.

Potsherds represent the second category of artifacts that contribute to our dating of the Larder Site. The site’s ceramic assemblage consists of 45 potsherds, including five Pueblo sherds and 40 Patayan sherds (Chapter 7). The Pueblo sherds represent two pottery types, North Creek Gray and Moapa Brown. The three North Creek Gray sherds are associated with a Feature 41A, a “depression” that could conceivably represent the remains of an ephemeral structure—though our testing failed to uncover any evidence that would support this interpretation. These sherds of North Creek Gray could date to any time “within the span of Pueblo pottery in southern Nevada, about AD 500–1250” (Chapter 7). The two Moapa Brown sherds were found on the ground surface near the northern end of the site—that is, in the portion of the site closest to Scorpion Knoll. Lyneis assigned the sherds to this type within Moapa Gray Ware based on the darkness of the clay from which they were made. She states further that “The dark gray clay in the sherds…suggests that they are from the early part of Moapa Gray Ware’s span.” How “early” this “early part” of the ware’s date range might have been has not been determined. As in the case of the projectile points, the Pueblo potsherds found at the Larder Site provide dating evidence that is consistent with the record of radiocarbon dates.
Thirty-six of the 40 Patayan potsherds that we recovered from the site were collected from the ground surface. The other four sherds came from subsurface contexts. One of these sherds was found in the backdirt from Backhoe Trench 170N. Another sherd came from the fill in Feature 41A, which, as discussed earlier, also contained three North Creek Gray potsherds. The other two sherds were found in the bottom fill of a storage pit, Feature 31. That feature also yielded a two-sigma calibrated radiocarbon date of AD 900–1040, from a sample consisting of a charred screwbean seed or fruit and two fragments of mesquite seed pods (Chapter 4).

Patayan pottery has been found at a number of sites in the Las Vegas Valley that have also yielded post-AD 1000 radiocarbon dates. Examples include Site 26CK4908, a rockshelter and roasting-mound site situated at the base of the Spring Mountains on the western side of the valley (Blair et al. 2000; Seymour 2000), the Berger Site, located on Duck Creek toward southern end of the valley (Seymour 1997), and 26CK1139, a rockshelter located in Clark County Wetlands Park, a couple miles downstream from the Larder Site in the southeastern corner of the valley (Ahlstrom 2005; Seymour 2005). In most cases, the association between the potsherds and the dates leaves something to be desired, but the data are sufficiently consistent from site to site to leave little doubt that Patayan ceramics were present in the Las Vegas Valley from not long after AD 1000 to sometime after AD 1700. The previously mentioned radiocarbon date from Feature 31 at the Larder Site strengthens the argument that Patayan pottery was in use in the valley by the early AD 1000s and, possibly, the 900s. Finally, like the evidence from projectile points and Pueblo sherds, that from Patayan pottery is consistent with the site's radiocarbon dates, which will be discussed next.

**Radiocarbon Dates**

Samples for radiocarbon dating were submitted to Beta Analytic for radiocarbon dating in several batches. The first “batch” included a single sample consisting of two charred seeds that had been identified as probably mesquite. The second set of samples was sent for dating before any other botanical analysis had been completed. As a result, it included samples that consisted of unidentified charcoal and other unidentified charred material. Dates from these samples revealed the length of the Larder Site’s use history. Subsequent selection of third and fourth batches of samples for dating focused on annual plant parts, including seeds and seed-bearing structures (leguminous seed pods and, in one case, maize cob fragments).

We obtained 12 radiocarbon dates from as many pit features at the Larder Site (Table 4.3 and Figure 4.18). The date ranges fall in three distinct time intervals, which can be compared to the sequence of periods shown in Table 1.1. (As defined here, the intervals reflect some “rounding-off” of the outer one or two decades of some individual date ranges.) The earliest of the three intervals, from 350 BC to AD 250, falls toward the end of the Late Archaic period (3000 BC–AD 500), including the Terminal Archaic subperiod (AD 1–500). This interval accounts for eight (three-quarters) of the site’s 12 radiocarbon dates. Four of these dates are from charcoal, and four are from annual plant parts, including seeds, seed pods, and a maize cob. The charcoal dates are less desirable than those from annual plant parts, because they are likely to include an unmeasurable, though perhaps estimable amount of error from what is known as the “old wood problem.” The three earliest dates in the group fall in the narrower interval of 350–50 BC. As mentioned earlier, one of these dates came from Feature 14. This date, together with stratigraphic evidence from the feature, indicates that at least some of the alluvial fan sediment that is to be found over much of the site area was deposited after 400 BC.

The second of the three intervals lasts from AD 650 to 1050 and corresponds to the middle portion of the Early Ceramic period (AD 500–1200). It includes two of the site’s 12 dates. One of the dated samples consisted of charcoal and the other of seed pods and a seed from screwbean and mesquite. (The latter date, from Feature 31, was also mentioned above in the context of chronological data from Patayan potsherds.) This interval of AD 650–1050 also includes all four of the radiocarbon dates from the nearby Scorpion Knoll Site.

The third interval in the distribution of radiocarbon dates extends from AD 1400 to 1600 and corresponds to the middle portion of the Late Ceramic period (AD 1200–1800). Like the preceding interval, this one includes just two dates. Both are from samples consisting of annual plant parts, specifically seeds and seed pods.
Conclusion

The primary evidence for dating events at the Larder Site comes from a suite of 12 radiocarbon dates. As a group, the dates document three distinct periods of site use: 350 BC–AD 250, AD 650–1050, and AD 1400–1600. Other lines of evidence, particularly involving projectile points and potsherds, fit comfortably within this chronological framework. These artifact classes also raise the possibility of site use during intervals other than those indicated by the radiocarbon dates. The supporting evidence is not particularly convincing, however, and it provides little basis for going beyond the site chronology provided by the radiocarbon dates.

Several of the radiocarbon dates, taken in combination with other lines of evidence, support additional chronological interpretations. Radiocarbon and stratigraphic evidence from three storage pits (Features 14, 47, and 52) suggests that the latest episode or episodes of alluvial-fan sediment deposition occurred on the site between 400 and 50 BC. One of the storage pits that we recorded on the site (Feature 14) was constructed and used before this depositional event; the rest of the recorded pit features post-dated it. An unknown number of these features were probably in use during a period when the top of the alluvial-fan deposit formed the ground surface over much of the site. Later on, additional sediment was deposited on the surface of the site as a “sand sheet.” Over time, an A soil horizon formed within this sediment. Visitors to the site continued to construct pit features there as the sand sheet accumulated and the A horizon took shape. Evidence from a pair of features (Nos. 55A and 55B) indicates that the process of sediment deposition was still underway in the period after AD 640. Another radiocarbon date, from a storage pit (Feature 31) that also contained two potsherds,

In another instance, a storage pit (Feature 31) produced radiocarbon and ceramic evidence that contributes to the dating of a ceramic ware in the Las Vegas Valley. The evidence, consisting of a radiocarbon date and two potsherds, supports the inference that Patayan ceramics appeared in the valley by the early AD 1000s and, possibly, by the early 900s.

Table 4.3. Radiocarbon Dates from the Larder Site.

<table>
<thead>
<tr>
<th>No.</th>
<th>Trench</th>
<th>Type</th>
<th>Pit Shape</th>
<th>Dated Feature</th>
<th>Dated Sample</th>
<th>Radiocarbon Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>130N</td>
<td>pit</td>
<td>bell</td>
<td>159 1</td>
<td>213430 seed</td>
<td>490±40 AD 1400-1460</td>
</tr>
<tr>
<td>14</td>
<td>130N</td>
<td>pit</td>
<td>bowl/basin</td>
<td>323 7</td>
<td>230255 seed pod</td>
<td>2160±40 360-90 BC</td>
</tr>
<tr>
<td>18</td>
<td>150N</td>
<td>pit</td>
<td>basin</td>
<td>166 2</td>
<td>217139 charcoal</td>
<td>1880±50 AD 30-240</td>
</tr>
<tr>
<td>27</td>
<td>170N</td>
<td>pit</td>
<td>bell</td>
<td>356 3</td>
<td>217140 charcoal</td>
<td>2060±50 190 BC-AD 50</td>
</tr>
<tr>
<td>30</td>
<td>170N</td>
<td>pit</td>
<td>basin</td>
<td>365 8</td>
<td>230256 seed &amp; pod</td>
<td>420±40 AD 1430-1620</td>
</tr>
<tr>
<td>31</td>
<td>190N</td>
<td>pit</td>
<td>basin</td>
<td>370 9</td>
<td>230257 seed &amp; pod</td>
<td>1030±40 AD 900-1040</td>
</tr>
<tr>
<td>45</td>
<td>230N</td>
<td>hearth</td>
<td>–</td>
<td>271 10</td>
<td>230258 seed</td>
<td>1850±40 AD 70-250</td>
</tr>
<tr>
<td>47</td>
<td>230N</td>
<td>pit</td>
<td>bowl</td>
<td>288 11</td>
<td>230259 maize cob</td>
<td>2130±40 350-50 BC</td>
</tr>
<tr>
<td>49</td>
<td>230N</td>
<td>pit</td>
<td>bell</td>
<td>238 4</td>
<td>217141 charcoal</td>
<td>1920±40 AD 10-150</td>
</tr>
<tr>
<td>51</td>
<td>250N</td>
<td>pit</td>
<td>globular</td>
<td>263 5</td>
<td>217142 charcoal</td>
<td>1990±50 100 BC-AD 100</td>
</tr>
<tr>
<td>52</td>
<td>250N</td>
<td>pit</td>
<td>bowl</td>
<td>426 12</td>
<td>232634 seed &amp; pod</td>
<td>2140±40 360-50 BC</td>
</tr>
<tr>
<td>55A</td>
<td>310N</td>
<td>pit</td>
<td>bowl</td>
<td>438 6</td>
<td>217143 charcoal</td>
<td>1350±40 AD 640-760</td>
</tr>
</tbody>
</table>

Note: Samples consisting of seeds, seed pods, and charcoal produced 13C/12C ratios of -24.1‰ to -28.2‰; the dated maize sample produced a ratio of -10.5‰ (Appendix A)
UNIT AND FEATURE DESCRIPTIONS

Twelve of the 63 identified features recorded on the Larder Site were subjected to formal excavation, whereas the other 51 were recorded and sampled in the walls of the backhoe trenches. This section of the report describes the 12 excavated features, along with 12 additional features that were recorded in the trench walls and that produced interpretable results from pollen, macrobotanical, or chronological analyses. Also included is Feature 29 that, although it was not excavated and did not produce useful analytical data, was probably the largest of all the pits recorded at the site. To begin with, however, the section describes the excavation of a unit that was not associated with any of the identified features. It ends with a description of several pit features that we tentatively identified on the basis of surface evidence observed along the western edge of the site.

Unit 148.5N 499E

This 1×1-m unit was excavated through the A horizon to provide evidence on the vertical distribution of artifacts in a location where the horizon did not overlie an archaeological feature. The unit was placed on the south side of Backhoe Trench 150N, with its southwest corner at grid location 148.5N 499E. Two versions of the A horizon, labeled A₁ and A₂, could be distinguished in the trench profile. A₁ was about 20-22 cm thick, brown to dark brown in color (7.5YR 4/2), and moderately compacted. A₂ was 12-20 cm thick, somewhat lighter in color than A₁, i.e., brown (7.5YR 5/2), and lightly compacted. It incorporated flecks of a light material presumed to be gypsum, along with numerous flecks of charcoal. A distinct Bw horizon was not

Figure 4.18. Distribution of two-sigma calibrated radiocarbon dates from the Larder and Scorpion Knoll sites (data from Tables 4.4 and 5.3).
observed at this location, and thus the A horizon lay directly on top of the Cy horizon. The unit was excavated in 5-cm levels (Level 1 was 3-10 cm thick). The contact between the A and Cy horizons was irregular: Cy-like material was first encountered in the southwest corner of the unit at the bottom of Level 4, ca. 20 cm below ground surface; the Cy horizon was identified across the unit in the bottom portion of Level 8, at an average depth of 40 cm below ground surface. Although it is impossible to be precise, it would appear that Levels 1-3 were located primarily in the A1 horizon and Levels 5-8 in the A2 horizon. A ninth level was dug into the Cy horizon, to check for the presence of artifacts but also to provide a “clean” context for the collection of pollen samples.

CONTENTS

All eight of the excavated levels contained pieces of flaked stone debitage. Counts were highest from the fourth through sixth levels: Level 1 (n=3), Level 2 (n=3), Level 3 (n=7), Level 4 (n=19), Level 5 (n=32), Level 6 (n=20), Level 7 (n=10), and Level 8 (n=9). Level 3 also contained a middle-stage biface fragment of chert and a late-stage biface fragment of quartzite, and Level 5 yielded a base fragment from an Elko Corner-notched point made of chert (FN 202; Table 6.3). The latter artifact came from ca. 25 cm below ground surface. Ground stone artifacts were found in Level 4 (an unclassified fragment of conglomerate) and Level 7 (a fragment of a sandstone mano).

CHRONOLOGY

The fragmentary Elko corner-notched point recovered from Unit 148.5N 499E could date to the Middle Archaic (5500–3000 BC), the Late Archaic (3000 BC–AD 500), or even the beginning of the Early Ceramic period (AD 500–1200) and thus provides little useful information on site chronology.

Feature 1

Feature 1, which was recorded in the south wall of Backhoe Trench 110N, is tentatively identified as a bowl-shaped pit that had been severely damaged by burrowing animals (Figures 4.4 and 4.19). It was one of the first features excavated, and we concluded at the time that it was probably a natural product of this burrowing activity. Subsequent experience working with many other features on the site, along with the repeated examination of hundreds of meters of backhoe-trench walls, supports a rethinking of this interpretation. In its size and shape, Feature 1 more closely resembled the many pit features that were excavated or recorded in profile on the site than the numerous natural irregularities in the contact between the A and By horizons that could also be seen in the walls of the backhoe trenches.

Assuming that Feature 1 was cultural in origin, it consisted of a basin-shaped pit that originated at the contact between the A and Cy horizons—a Bw horizon was not identified at this location. In profile, the feature measured 0.70 m wide by 0.35 m deep. The fill above and within the feature was recorded in profile as
consisting of slightly different versions of the A horizon, with colors varying from dark grayish brown above the feature (A1, 10 YR 4/2) to dark brown (A2, 7.5 YR 3/2) and brown (A3, 7.5 YR 5/3) within it. More significant for the interpretation of the feature’s origin is the inclusion of charcoal smears (A2) and pieces (A3) in the fill, but not in the overlying sediment (A1). Also noteworthy in this regard was the presence of thin bands and lenses of sediment (A4, A5, and A6) that lay on top of the major fill layers and that gave the appearance of having washed or blown into an abandoned and mostly filled-in pit. Both the charcoal inclusions and thin deposits of inward-sloping sediment are consistent with the idea that this was indeed a pit feature and not simply a product of animal burrowing.

Excavation showed that the pit extended no more than 15 cm into the wall of the trench. Digging began with a 0.5×1.0-m unit (109.3N 499.1E) that ran along the edge of the backhoe trench. Excavation proceeded in 5-cm levels. The outline of the feature could be traced at the bottom of Level 3, about 15 cm below ground surface. Levels 4-7 were dug within the feature or, to be precise, within the area of rodent disturbance that included but also extended beyond the bounds of the original feature. If this was a cultural feature, its fill and walls had certainly been much disturbed by burrowing animals.

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The A horizon sediment that overlay the feature (Levels 1-3) produced a small assemblage of flaked stone debitage (n=10). The fill within the feature yielded some additional flakes (n=11). The interpretive significance of these artifacts is open to question, for two reasons. First, there is the possibility that Feature 1 was not, in fact, of human origin. Second, the extent of disturbance to the feature from burrowing animals casts doubt on the association between the artifacts and the feature’s “original” fill.
Features 2A, 2B, and 2C

Feature 2 consisted of two possible hearths (Features 2A and 2B) located behind the north wall of Backhoe Trench 110N (Figure 4.4). Both of these features were discovered during the excavation of a small (0.25×0.50 m) unit that had been placed over two other stains—Feature 2C and an unlabeled stain—that had been recorded in the wall of the backhoe trench. Feature 2A was encountered slightly above Feature 2C, at a depth of 25-30 cm below ground surface. It consisted of a shallow (2-3 cm thick), 20-cm diameter basin that was filled with a thin layer of black, charcoal stained sediment. At the wall of the backhoe trench, this fill intersected the top portion of the Feature 2C stain. A possible use surface could be seen on the northwest side of the basin, extending some 10 cm from the feature’s edge. As noted, Feature 2A was tentatively identified as a shallow hearth.

Exploration of the east side of Feature 2A uncovered the curved edge of a pit, labeled Feature 2B, that was set back from the trench wall and that had a point of origin located 35-40 cm below the ground surface. The small portion of this pit that was exposed in the northeastern corner of the excavation unit had a steeply sloping wall and was at least 15 cm deep. It was probably continuous with the unlabeled stain that was recorded in the wall of the backhoe trench—it would have been necessary to extend the excavation unit further to the east to demonstrate that this was indeed the case. The excavated portion of the pit contained black, charcoal-stained sediment. This fill is the primary basis for suggesting that the feature was a hearth—a deep hearth, as compared to Feature 2A.

Feature 2C consisted of a small (20 cm long by 8 cm deep) dark, bowl-shaped stain that was recorded in the wall of the backhoe trench. When excavated, this patch of charcoal-stained sediment was shown to extend only 1 cm into the trench wall. Feature 2C may also have been a hearth—too little of it was preserved, however, to warrant inclusion in the list of identified, even tentatively identified, features.

If Features 2A, 2B, and possibly 2C were in fact the remains of hearths, then the evidence would indicate the existence of a small activity area where features of this kind were built and used on two or more occasions. No artifacts were recovered during the investigation of Feature 2.

Feature 7

Feature 7 consisted of a bowl-shaped storage pit that was visible in the north wall of Backhoe Trench 110N (Figures 4.4 and 4.20). It was part of a small cluster of pits that also included Features 6, 8, and 9. Feature 7 originated at the contact between the A and Bw soil horizons, had a profile width of 1.00 m, and was 35 cm deep. The stratigraphic break between the floor of this feature and the underlying Bw horizon was particularly distinct. There appeared to have been some mixing of the upper fill within the feature and the overlying A horizon material, but overall, the two were distinct. The fill within the pit was light brown to pink in color (7.5 YR 6/4-7/4, wet) and contained numerous scattered fragments of charcoal. No artifacts were visible in the cross-section of the feature that was exposed in the wall of the backhoe trench, and none were observed during the collection of pollen, flotation, and radiocarbon samples from the trench wall.

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Both a pollen and a flotation sample from Feature 7 were submitted for processing and analysis. The pollen sample (FN 312) came from the floor and bottom 2-3 cm of feature fill. It contained pollen representative of the kinds of plants that grow on and around the Larder Site today. The pollen profile did not, in other words, produce any recognizable evidence relating to activities carried out by the site’s former inhabitants. The sample also contained a quantity of tamarisk (Tamarix) pollen, which can be considered a contaminant in the context of a feature dating to the prehistoric or early historical period. The flotation sample (FN 309) was collected from the central portion of feature fill. It was found to contain five charred mesquite pod fragments and 11 charred seed fragments identified as probably mesquite. The sample also contained “cf. Prosopis” charcoal, probably from fuelwood.
Feature 12

Feature 12 consisted of a circular, bell-shaped pit that was identified in the north wall of Backhoe Trench 130N (Figures 4.4, 4.13, and 4.21). It had been dug through the Bw horizon into the Cy horizon, and there was no evidence to indicate that it had originated in the overlying A horizon. The A horizon soil that overlay the feature was excavated as a 0.5×1.0-m unit, in two 10-cm levels and one 5-cm level (Levels 1-3). The third level was terminated once the feature had been defined in plan view and the fill within it had been positively identified. From this point, the pit itself became the unit of excavation. This fill was excavated in five 10-cm levels (Levels 1-5).

The pit was circular, with an estimated rim diameter of 75-85 cm, flex point diameter of 75-85 cm, bell diameter of 90-100 cm, and maximum depth of 60-65 cm. Several gray patches, measuring up to 5 cm across, were noted on the floor of the feature—their gray color contrasted with the off-white color of the Cy horizon in this portion of Trench 130N. It is hypothesized that these gray patches represented locations where burning sticks, or firebrands, had been thrown into the pit to dry it out in preparation for use.

Figure 4.20. Photograph of Feature 7 in the north wall of Backhoe Trench 110N at the Larder Site.
The fill within the pit was essentially continuous with the material of the overlying A horizon. The fill was recorded in the trench wall as pinkish gray in color (7.5 yr 6/2) and, upon excavation, was found to contain dark brown patches as well—perhaps a result, at least in part, of increased soil moisture in these locations. The fill consisted of sandy silt with inclusions of caliche “flecks,” chunks of charcoal measuring up to 2 cm across, some pieces of flaked stone debitage, and fragments of nonhuman bone. The most abundant flakes, as well as the largest chunks of charcoal and most if not all of the “cultural” bone, came from the fourth level of feature fill. Trowel scraping of the feature’s floor uncovered two charred seeds. There was considerable evidence of animal burrowing in the walls of the pit within the Cy horizon, and some evidence as well in the floor of the pit (Figure 4.21) and the lowest 10 cm of feature fill (A2). This fill had a softer texture and contained more abundant flecks of caliche than the overlying (A1) sediment.

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A projectile point, some pieces of flaked stone debitage and animal bone, and a mineral specimen were recovered during the excavation of Feature 12. The A horizon produced a Desert Side-notched point (Level 2; FN 131; Table 6.3) and eight pieces of flaked stone debitage (four flakes each from Levels 2 and 3). Level 2 also contained an unburned cranial fragment from a small unidentified rodent. Feature fill contained 18 flakes, a small fragment of turquoise or related mineral (from Level 2), and a small quantity of unburned animal bone. This included 44 bones and bone fragments from a small juvenile rodent, three black-tailed jackrabbit bones,
and three unidentified bones that may also have been from a black-tailed jackrabbit. The rodent bones were found in the upper level of feature fill and were almost certainly from an animal that had died in its burrow. The definite and possible black-tailed jackrabbit bones came from deep in feature fill (Level 4). Those definitely from this animal included two femurs and a cranial fragment; the possible candidates included three cranial fragments. These bones could come from a rabbit that died a natural death, or from one that was consumed by the site’s inhabitants.

Two charred seeds were recovered from the floor of the feature during excavation. One of these was identified by Richard Holloway (personal communication, 2006) as being from a member of the legume (Fabaceae) family, probably mesquite (Prosopis) but possibly Acacia. The second seed was already fractured when collected, and it had disintegrated in transit before Holloway could examine it. It was clear to the feature’s excavator (Richard Ahlstrom), however, that this seed was of the same type as the identified seed.

Both a pollen sample and a flotation sample were analyzed from Feature 12. The pollen sample (FN 156) was collected from the floor and lowest 2-3 cm of feature fill (i.e., from the bottom portion of Level 5). The sample produced pollen evidence suggesting that maize, a member of the mint family, and possibly prickly pear cactus were processed, stored, or perhaps discarded in this pit feature. The flotation sample (FN 153) also came from the lowest level of fill (Level 5). This sample contained evidence for the processing of mesquite seed pods, including several charred endocarp fragments, two charred seeds, and several charred seed fragments. Also present was minimal evidence, in the form of a single charred seed, for the processing of screwbean seed pods. Charcoal recovered from the sample indicated the use of acacia and mesquite wood as fuel.

**CHRONOLOGY**

The Desert Side-notched point recovered from the A horizon probably post-dates AD 1100 or 1300. The seed and seed fragments analyzed by Holloway were submitted to Beta Analytic for radiocarbon dating. The sample returned a date with a two-sigma calibrated range of AD 1400–1460 (Sample 26CK6146-1; Beta-213430; Table 4.3; Appendix A). The projectile-point and radiocarbon dates are good in agreement with one another.

**Feature 14**

Feature 14 was recorded in both the north and south walls of Backhoe Trench 130N (Figure 4.4), though our recording and collecting efforts focused on the feature as it was preserved in the north wall. This was the only feature outline observed at the site that could be identified, at least tentatively, as having originated at the contact between the Bw and Cy soil horizons. Four soil horizons are visible in the photograph of the feature that is included here as Figure 4.22: (1) the gray surface A-horizon, (2) the underlying, light-brown Bw horizon, (3) the buff-colored Cy horizon that lies below the Bw material, and (4) the light gray feature fill (anthropogenic A horizon) that is contained within the pit outline. Several details visible in this photograph support the assertion that Feature 14 was located below the Bw horizon. First, the fill within the pit is covered by the Bw sediment. Second, this Bw material is formed in sediment that occurs as a continuous deposit over the top of the pit and of the Cy horizon into which the pit was excavated. There does, in fact, appear to be a vertical break on the left side of the pit that extends upward through the Bw sediment. This break continues down the left side of the pit and, on that basis, is interpreted here as representing a dessication crack, krotovina, or seismic fault in the sediment column rather than an edge to the pit feature. Third, there is a darkened zone extending outward from the presumed right-hand edge of the feature, between the underlying Cy and overlying Bw horizons. An arrow has been added to Figure 4.22 to show the location of this zone of darkened soil. It could represent the occupation surface that was associated with the feature (William Eckerle, personal communication 2006).
Assuming that this is the correct interpretation of the evidence, the feature consisted of a bowl- or basin-shaped pit with a profile width of 85 cm and depth of 60 cm. The A horizon above the feature consisted of light brown (7.5YR 6/3) sand and silt with small pebbles and evidence of root activity. The Bw horizon over the feature was very pale brown (10YR 7/3) sand and silt with pebbles. The fill within the feature did not present any evidence of layering and was interspersed with fragments of charcoal; the pieces were larger in the lower than in the upper portion of the fill. Also, there was a 2-3 cm band of ashy sediment lying above the floor of the feature. No artifacts were observed in the feature profile or the sediment that was collected from the wall of the trench as flotation samples.

The feature profile observed in the south wall of the trench was narrower than that in the north wall and less regular in shape. It can be described as roughly conical, with a step on one side. This feature profile did, however, extend to as great a depth as the profile in the north wall—almost to the bottom of the backhoe trench. As in the case of the north trench profile, the feature fill in this profile contained pieces of charcoal.

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A pollen sample (FN 327) collected from the floor and the thin, overlying layer of ashy sediment produced evidence suggesting that maize and possibly prickly pear cactus were stored in the pit. A flotation sample (FN 323) taken from the upper portion of the fill within the feature was found to contain a single charred fragment of a seed pod, identified as “probably mesquite.”
**CHRONOLOGY**

We submitted the charred seed pod fragment from the flotation sample (FN 323) to Beta Analytic for radiocarbon dating. The sample produced a date with a two-sigma calibrated range of 360–90 BC (Sample 26CK6146-7; Beta-230255; Table 4.3; Appendix A).

**DISCUSSION**

As discussed earlier, the A, Bw, and Cy horizons that HRA’s archaeologists recorded in the field are only an approximation of the soil units identified in Chapter 2 by the project’s geoarchaeologists. Those researchers also defined a sequence of stratigraphic units for the Larder Site. Although HRA’s field crew did not make use of this stratigraphic framework, the available evidence from Feature 14 suggests a correlation, in this specific case, between the two schemes. It would appear that the Bw soil horizon described earlier as overlying this storage pit is equivalent to Stratum Ia or Stratum Ib in the stratigraphic sequence. Like the Bw horizon depicted in Figure 4.22, both of these strata are brown in color. Both are also part of Stratum 1, which “includes the upper section of the thick, alluvial fan/bajada sequence associated with the composite fan originating from the flanks of Frenchman Mountain” (Chapter 2). Stratum 1a includes “finer” sediments that were deposited as sheetflow, whereas Stratum 1b consists of “coarser” sediments deposited in distributary channels. The earlier description of the Bw horizon as consisting of sand and silt with pebbles suggests that the sediment may represent Stratum 1a. Whether the sediment is better labeled as Stratum 1a or 1b, the radiocarbon date that we obtained from the feature suggests that this material was deposited sometime after 400 BC.

**Feature 18**

Feature 18 was a circular or oblong, basin-shaped pit with steeply sloping sides and a generally flat bottom (Figure 4.23). The feature, which was recognized in the south wall of Backhoe Trench 150N (Figure 4.4), was overlain by A-horizon sediment and had been dug into the Cy horizon—an intervening Bw horizon was not identified at this location. Only the western half of what remained of the feature—i.e., its southwestern quadrant—was excavated. The excavation began as a 1×1, but once the outline of the pit had been identified, the feature itself became the unit of excavation. Both the 1×1 and the feature per se were dug predominantly in 5-cm levels (Level 1, located at the ground surface, was 9-13 cm thick). The pit outline was revealed in Excavation Levels 2 and 3, at 10-15 cm below ground surface. An additional eight levels were excavated within the outline of the feature (Level 11, at the bottom, was only 2 cm thick.)

This pit feature had an estimated diameter of 1.40 m (or 1.55 m if the entire “rim flare” is included) and a measured depth of 38-45 cm. The wall and floor were unprepared and produced no evidence of burning. The fill within the feature was distinctly lighter in color than overlying A horizon and consisted of sand and silt interspersed with numerous small pieces of charcoal. The fill appeared to be “massive” (i.e., undifferentiated) in nature, with two exceptions. First, the material within one or more linear burrows was darker gray than the rest—i.e., more like the overlying A horizon—and second, some of the fill in the upper 20 cm of the pit was lighter than the rest.
Figure 4.23. Photographs of Feature 18 in the south wall of Backhoe Trench 150N at the Larder Site: (top) during and (bottom) following excavation.
Some flakes and several fragments of animal bone were recovered during the excavation of Feature 18. The excavation levels overlying the feature contained seven pieces of flaked stone debitage (four from Level 1 and three from Level 2), and the feature fill produced another nine flakes. The animal bone, also from feature fill, included one bone from an unidentified small mammal and five bone fragments from an unidentified small rodent. There is little reason to think that any of these remains came from animals that were procured by the site’s residents. The rodent bones in particular may have come from one or more animals that died natural deaths in their burrows.

A pollen sample (FN 173) and a flotation sample (FN 164) that were both collected from the bottom several centimeters of feature fill (Level 11) were submitted for processing and analysis. A low-magnification scan of the pollen slide revealed the presence of clumps of Cheno-am pollen, along with one grain each of maize and non-Opuntia cactus pollen and three grains of Cylindropuntia pollen. Holloway suggests that even small quantities of these different kinds of pollen could be the result of a “cultural vector.” The feature could, in other words, have been involved somehow in the processing or storage of materials from these plants. The flotation sample contained three charred seed fragments, identified as “probably screwbean,” and a small, unidentified charred seed. The sample also contained charcoal from probable fuelwood, identified as “cf. Prosopis.”

CHRONOLOGY

A sample of charcoal collected from near the bottom of feature fill (FN 166; Excavation Level 10) produced a radiocarbon date with a two-sigma calibrated range of AD 30–240 (Sample 26CK6146-2; Beta-217139; Table 4.3; Appendix A).

Feature 20

Feature 20 was a broad, roughly basin-shaped pit that was recorded in the north wall of Backhoe Trench 150N (Figures 4.4, 4.12, and 4.24). It was part of a cluster of pits that also included Features 19, 21, and 22. Features 21 and 22 were located on the opposite wall of the trench from Feature 20. In spite of their proximity, Features 20 through 22 can be identified as separate entities. This is indicated by the facts, first, that Feature 21 cut into Feature 22, and second, that the pits in the north (Feature 20) and south (Features 20 and 21) sides of the trench had floors at different depths below ground surface and did not line up with one another.

Feature 20 originated at the contact between the A and Bw soil horizons and would appear to have been located entirely within the Bw horizon. It had a profile width of 1.00 m and depth of 35 cm. The fill within was light brown (7.7 YR 6/4), as compared to the gray of the overlying A horizon, and it included areas of charcoal inclusions scattered throughout. No artifacts were observed in the trench walls or in pollen and flotation samples as they were being collected trench walls.

Three pollen samples (FN 374, 376, and 377) were analyzed from different levels within and above Feature 20 (Figure 4.24). A sample from the overlying A horizon (FN 374) produced an elevated frequency of Cheno-am pollen, similar the to site’s surface control sample. A second sample (FN 376) came from the lower-middle fill within the feature, from 10-18 cm the feature’s floor. This sample stood apart from all of the other analyzed samples in being dominated by ephedra pollen; it also contained a large quantity of microscopic charcoal fragments. Cummings and her colleagues suggest two possible explanations for these data. First, ephedra may have been piled “either on the ground surface near the pit or perhaps within the depression remaining from this abandoned pit in preparation for processing this important medicinal resource in a feature nearby…. Alternatively, it is possible that ephedra grew in the abandoned Feature 20 pit as it filled, taking
advantage of the additional water that is expected to accumulate in depressions. This second scenario is, perhaps, less attractive, since there is no evidence of increased quantities of pollen representing other weedy plants that would be expected to colonize this abandoned pit as it filled” (Chapter 8). The third sample (FN 377) came from the floor and bottom 5 cm of feature fill. The presence of prickly pear pollen in this sample might relate to the storage of material from this plant within the feature. The sample also contained a small quantity of tamarisk pollen, indicating some vector for contamination of the feature with pollen that would have been deposited on the ground surface sometime in the last century.

Figure 4.24. Profile drawing of Feature 20 in the north wall of Backhoe Trench 150N at the Larder Site.

A flotation sample (FN 373) from Feature 20 was also submitted for analysis. It came from fill lying on, to within 12 cm above, the floor of the feature. Charred remains identified in the sample included a piece of grass stem, two fragments of unidentified seeds, a fragment of frothy plant tissue, and charcoal classified as “cf. Atriplex.”

**Feature 27**

Feature 27, a large, bell-shaped pit, was recorded in the north wall of Backhoe Trench 170N (Figures 4.4 and 4.25). It had a profile width of 85 cm and depth of 50 cm. A bit of the feature was also visible in the opposite, south wall. The pit originated the contact between the A and Bw horizons and had been dug through the latter soil unit, such that its floor was located either on or within a few centimeters below the original contact between the Bw and Cy horizons. The fill within the pit was recorded as yellowish brown in color (10YR 5/4) with areas of charcoal throughout. Charcoal pieces were particularly abundant in the bottom 15 cm
of fill. There was also a thin (<1 cm) but distinct layer of charcoal on the floor of the pit that was shown, during sample collection, to extend more than 10 cm back from the wall of the trench. Fragments of charcoal were also observed within this layer.

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Both a pollen and a flotation sample were analyzed from Feature 27. The pollen sample (FN 357), which came from the floor and overlying thin layer of ashy fill, produced a pollen profile representative of the kinds of plants that would have been growing in the environment during the general period when the feature was in use. The profile did not provide any recognizable evidence relating to the “economic” use of these plants. The flotation sample (FN 355) came from the bottom 35 cm of feature fill. It contained several charred specimens, including two large, possible (cf.) mesquite seed-pod fragments, two possible (cf.) screwbean seed and seed-coat fragments, and one fragment of a large, unidentified seed. Also present in the sample was “cf. *Prosopis*” charcoal, presumably from fuelwood.

CHRONOLOGY

A sample of charcoal (FN 356) collected from the lowest 18 cm of feature fill gave a radiocarbon date with a two-sigma calibrated range of 190 BC–AD 50 (Sample 26CK6146-3; Beta-217140; Table 4.3; Appendix A).

Feature 29

Feature 29 was a bell-shaped pit that was large enough to be visible in both the north and south walls of Backhoe Trench 170N (Figures 4.4 and 4.26). The feature was not excavated, nor were any samples from it submitted for analysis. It is nevertheless described here because it probably had the greatest volume of any of the pit features recorded at the Larder Site. As recorded in the south trench wall, Feature 29 had a width of 1.10 m and depth of 83 cm. It originated at the contact between the A and Bw soil horizons and extended through the latter into the Cy horizon. Because the floor of the feature rested on pebbly sediment, its exact location was more difficult to define (during the collection of a floor and near floor pollen sample) than was the case for most of the sampled features. The A horizon (A1) lying on top of the feature consisted of light brown (7.5YR 6/3) sand and silt with pebbles and charcoal flecks, some evidence of root action, and an overall laminated appearance. The fill within the feature (A2) resembled the A horizon: it was also light brown in color (7.5YR 6/4) and consisted of sand and silt (mostly silt) with inclusions of pebbles and charcoal chunks. It was, however, less consolidated (i.e., softer in texture) than the A horizon. No artifacts were observed in the walls of the backhoe trench or in soil samples as they were being extracted from the backhoe-trench walls.

Feature 30

Feature 30, a basin-shaped pit with steep side walls and a relatively level floor, was recorded in the north wall of Backhoe Trench 170N (Figures 4.4 and 4.27). The feature had a profile width of 75 cm and depth of 30 cm and had been excavated into the Bw horizon, but not as deep as the Cy horizon. The A horizon overlying the pit (A1) consisted of light brown (7.5YR 6/3) sand and silt with inclusions of pebbles and some charcoal, evidence of root activity, and a laminated appearance.
Figure 4.25. Profile drawing of Feature 27 in the north wall of Backhoe Trench 150N at the Larder Site.
Figure 4.26. Photographs of Feature 29 in the south (top) and north (bottom) walls of Backhoe Trench 170N at the Larder Site.
Figure 4.27. Photograph (top) and profile drawing (bottom) of Feature 30 in the north wall of Backhoe Trench 170N at the Larder Site.
The fill within the pit (A2) was similar, though visually distinct and consisted of light brown (7.5YR 6/4) sand with some silt and inclusions of small pebbles and a texture that was looser, or softer, than the overlying sediment. The bottom ±3 cm of fill (A3) consisted of ashy gray, fine sand and silt with fewer pebbles than main body of feature fill (A2) and with fairly abundant charcoal pieces. Also visible in the profile were two thin (<1 cm) lenses of charcoal, 5 and 10 cm long with 5-cm gap between. Collection of flotation and pollen samples from this bottom fill level revealed ashy and charcoal patches on the floor of the feature, which also had a light orange hue as if from slight oxidation. No artifacts were observed in the samples as they were being collected, nor were any seen in the feature profile.

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Both a pollen and a flotation sample were analyzed from Feature 30. The pollen sample (FN 368) was collected from the floor and overlying ashy fill layer (A3). It produced evidence indicating that maize was processed or stored in the pit and also possibly indicating economic activity involving cheno-ams and grasses. The flotation sample (FN 365) also came from the ashy fill layer. It contained a variety of charred mesquite and Prosopis remains, including one whole and two fragmentary mesquite seeds with fruit coat, four large mesquite seeds, two small Prosopis seeds, 10 Prosopis pod fragments, and seven Prosopis seed fragments. Probable evidence of firewood consisted of a charred mesquite spine and cf. Prosopis charcoal.

**CHRONOLOGY**

Seeds and seed pods identified from the flotation sample (FN 365) returned a radiocarbon date with a two-sigma calibrated range of AD 1430–1620 (Sample 26CK6146-8; Beta-230256; Table 4.3; Appendix A).

**Feature 31**

Feature 31, a relatively large, basin-shaped pit, was recorded in the north wall of Backhoe Trench 190N (Figures 4.4 and 4.28). This feature originated at the contact between the A and Bw soil horizons and was located entirely within the latter soil unit; it had a profile width of 1.05 m and depth of 40 cm. The fill within the feature was pale brown (10YR 6/3) and contained scattered pieces of charcoal.

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Two Patayan potsherds (FN 319-1 and 319-2) were visible in the wall of the backhoe trench, lying on and just above the feature’s floor. The two sherds appear to be from the same vessel, though they do not fit together (Chapter 7).

Both a pollen and a flotation sample were analyzed from Feature 31. The pollen sample (FN 371) came from multiple locations scattered across the lower two-thirds of feature fill, specifically from between about 5 and 30 cm above the feature’s floor. The sample contained a moderate amount, as well as a few clumps, of cheno-am pollen, suggesting that cheno-ams were either stored in the pit or brought there for some other purpose. The same can be said, though less confidence, for three other plants, evening primrose (Onagraceae), globemallow (Sphaeralcea), and buckwheat (Eriogonum). Each was represented by a single grain of pollen observed during a low-magnification scan of the pollen slide. This scan also revealed the presence on the slide of a single grain of maize pollen. This was in addition to a large grain of grass pollen—possibly from a maize plant—that was included in the “standard” pollen count.

The flotation sample (FN 370) came from the same area of feature fill as the pollen sample. It contained a fragment of a charred screwbean seed/fruit and two fragments of mesquite seed pods.
CHRONOLOGY

Seeds and seed pods from the flotation sample (FN 370) were submitted for radiocarbon dating. They produced a with a two-sigma calibrated range of AD 900–1040 (Sample 26CK6146-9; Beta-230257; Table 4.3; Appendix A).

Feature 36

Feature 36 was a storage pit that was identified in the north wall of Backhoe Trench 190N (Figures 4.4 and 4.29). The western two thirds of the feature’s trench-wall profile was bowl-shaped, whereas its eastern end was globular—hence its assignement to the mixed “bowl/globular” shape category. The pit had a maximum profile width of 77 cm and was about 25 cm deep. As in the case of most of the features recorded at the Larder Site, this storage pit originated at the contact between the A and Bw soil horizons and penetrated into the latter. The bottom of the pit was located about 5 cm above the contact between the Bw and underlying Cy horizon. The bottom 5-7 cm of feature fill was distinctly gray in color and included numerous, though scattered, fragments of charred material.

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A flotation sample (FN 387) from the layer of gray fill at the bottom of the feature was found to contain three charred and flattened fragments from one or more mesquite seed pods, two charred seed fragments that could not be identified, and “cf. Atriplex” charcoal.

Figure 4.28. Photograph of Feature 31 in the north wall of Backhoe Trench 190N at the Larder Site; the arrow points at a potsherd exposed just above the floor of the feature.
Feature 37

Feature 37 consisted of a deep bell-shaped pit that was recorded in the south wall of Backhoe Trench 190N (Figures 4.4 and 4.30). It was part of a cluster of features that included Feature 40, located 2 m to the west, and Feature 38, located about 1 m away on the opposite trench wall. Feature 37 measured about 1 m wide and 60-65 cm deep. The pit had been excavated through the Bw horizon and 5-15 cm into the Cy horizon. The overlying A horizon was pale brown in color (10YR 6/3), and the fill within was light yellowish brown (10YR 6/4) with areas of charcoal staining.

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A soil sample (FN 396) collected from the basal fill and floor within the feature yielded the smallest quantity of pollen of any of the samples analyzed from the site. The sample did, however, produce an elevated count of globe mallow pollen that could reflect either the processing or storage of this plant or simply the presence of one or more globe mallow plants near the then-open pit feature.

Figure 4.29. Photograph of Feature 36 in the north wall of Backhoe Trench 190N at the Larder Site; the arrow points to the gray layer of fill from which the analyzed flotation sample (FN 387) was collected.
Figure 4.30. Profile drawing of Features 37 and 40 in the south wall of Backhoe Trench 190N at the Larder Site.

Features 41A, 41B, and 41C

Feature 41 consisted of a set of three superimposed features—41A, 41B, and 41C—located in the north wall of Backhoe Trench 190N (Figures 4.4, 4.31 and 4.32). Feature 41A, the youngest of the three, consisted of a broad depression that might have been the remains of an ephemeral structure. Next oldest was 41B, a possible pit feature, and older still was 41C, another pit feature. The area of the trench wall containing the features was first drawn, and then a 1×1-m unit was laid out for excavation over the west half of Feature 41A. The unit was excavated to explore the possibility that the feature represented the remains of a structure. To begin with, the A Horizon sediment was removed from this unit in two 5-cm levels with an overall thickness of 10-12 cm (Stratum 1). At this point, the outline of Feature 41A could be distinguished along the northern edge of the 1×1. The fill within this feature (Stratum 2) was then excavated in three 5-cm levels (with the bottom level varying between 3 and 5 cm in thickness). From here, it was possible to follow the outline of Feature 41B. The fill within this feature (Stratum 3) was excavated in two levels—the upper of which was about 7 cm thick, and the lower, about 14 cm. At this point, the edge of the bottom-most feature, 41C, was identified. The fill within this feature (Stratum 4) was removed (much of it as a flotation sample) in a single level with a maximum thickness of 21 cm. Thanks to this excavation procedure, artifacts and samples could be assigned with reasonable confidence to the fill within one or another of the three features.

As recorded in the trench wall, the A horizon consisted of pink (7.5YR 7/4) sand with pebbles, 41A’s fill of brown (7.5YR 5/3), laminated sand and silt with pebbles and some charcoal flecks, 41B’s fill of light brown (7.5YR 6/4) sand and silt with some gypsum and charcoal, and 41C’s fill of very pale brown (10YR 7/3) sand and silt with pebbles, charcoal, and ash. Twenty-five pieces of flaked stone debitage were recovered from the A horizon overlying Feature 41. Artifacts related to Features 41A and 41B are enumerated below.

FEATURE 41A

This sub-feature was recorded in the backhoe trench wall as a broad depression that was 3.75 m wide and 20 cm deep. The feature underlay the A horizon, with its base extending some 10-15 cm into the Bw horizon. This base or “floor” sloped down approximately 5 cm from the western edge of the feature eastward toward the center of the excavation unit. In this central area, the base of the feature seemed to consist of a clay
“cap” that might have been laid over the two pits, Features 41B and 41C. Also in this area was a 20×30-cm area of cobbles that might have been a part of this cap, or that might have served as the base of a support of some kind.

It is possible that Feature 41A consisted of the remains of a shallow, ephemeral structure—it had that appearance in the wall of the backhoe trench. Alternatively, it could have represented a use surface adjacent to Feature 41B. No specific evidence in support of either of these interpretations was, however, recovered during the excavation of the 1×1. There was insufficient time to explore these possibilities further by broadening the excavation.

Figure 4.31. Profile drawing of Features 41A, 41B, and 41C in the north wall of Backhoe Trench 190N at the Larder Site.
A fragment of clear bottle glass (almost white from oxidation) and three Native American potsherds were found in the lower 5 cm of the A horizon (specifically, in the second excavation level). All three of the sherds came from jars. One sherd was Patayan pottery (FN 229), and the other two were Pueblo pottery (FNs 227 and 231). Both of the latter were identified as Tusayan White Ware, Virgin Series, North Creek Gray. A fourth sherd, also from a jar and also identified as North Creek Gray, was found in the bottom 5 cm of Feature 41A’s fill (that is, in the lowest of the three excavated fill levels). The fact that these were the only four North Creek Gray sherds found on the site, combined with the fact that one of the sherds came from the lower fill within Feature 41A, raises the possibility that all four artifacts were associated in some manner with the use of this “depression.” The three sherds shared a distinctive temper, and perhaps they came from the same vessel. In addition to the grayware potsherd, four pieces of flaked stone debitage were recovered from the fill within Feature 41A.
FEATURE 41B

In the trench-wall profile, Feature 41B appeared to be a small, bowl-shaped pit. Upon excavation, however, the feature proved difficult to define due to disturbance from burrowing animals to the hardness (compaction and density) and homogeneity of the soil located in and around the feature. Feature 41B may have been a discrete feature at one time, or it may represent the reworking of the upper portion of Feature 41C.

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Only a single piece of debitage was recovered from the fill within Feature 41B. A bit of charcoal was also present in the fill.

FEATURE 41C

Feature 41C appears to have been a basin-shaped pit, the upper portion of which was modified or destroyed by the construction of Features 41A and 41B. Alternatively, it is possible that Features 41B and 41C represented the upper and lower portions of a single pit feature. Feature 41C was excavated through the Bw horizon, with its floor resting on or penetrating slightly into the underlying Cy horizon. It had steeply sloping sides and a more or less level floor, a profile width of 85 cm, and a depth of at least 40 cm. As noted, the upper portion of Feature 41C may have been destroyed by the construction of Feature 41B. If that were the case, and if the intact Feature 41C had originated at the contact between the A and Bw soil horizons (like most of the pit features investigated at the Larder Site), its depth would have been between about 50 and 55 cm. Based on the outline of the feature exposed in the backhoe-trench wall, only the western third of the surviving portion of the feature was located within our 1×1-m excavation unit. All of the fill in this section of the feature was collected as pollen and flotation samples. No artifacts were observed as these samples were being collected, though a few small pieces of charcoal were observed.

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The flotation sample collected from Feature 41C (FN 276) contained a small, unidentified, charred seed; pieces of possible fuelwood charcoal recovered from the sample were too small to be identified.

Feature 45

Feature 45 consisted of a shallow, bowl-shaped hearth that was visible in the south wall of Backhoe Trench 230N (Figures 4.4 and 4.33). The feature was initially observed in the trench wall as a bowl-shaped stain that was located at the contact between the A horizon and what was tentatively identified as the Cy horizon. (A clearly identifiable Bw horizon did not exist at this location.) We excavated the feature within a 0.5×1.0-m unit that was laid out along the edge of the backhoe trench. The backhoe had removed most of the feature, but what remained suggested that it consisted of a shallow bowl, perhaps 40 cm in diameter, that was surrounded by a gently sloping apron that was 20-25 cm wide. The fill within this remaining portion of the bowl was at most 5 cm thick, whereas that overlying the apron was 2-3 cm thick. The fill in both contexts consisted of dark gray to dark brown sandy silt. All of this material was collected as pollen, flotation, and macrobotanical samples.
Figure 4.33. Photographs of Feature 45 in the south wall of Backhoe Trench 230N at the Larder Site: (top) before excavation and (bottom) following removal of overlying A horizon sediment.
No artifacts were observed as pollen, flotation, and macrobotanical samples were being collected from the feature. The pollen sample (FN 270) was scraped from the floor of the feature, both in the central bowl and the surrounding apron. Holloway identified a fairly large quantity of cheno-am pollen, along with some pollen clumps, in the sample. This evidence suggests that cheno-ams were processed in or around the hearth. The sample also contained small quantities of evening primrose (Onagraceae), globemallow (Sphaeralcea), wild buckwheat (Eriogonum), cholla (Cylindropuntia), and prickly pear (Platyopuntia) pollen. This evidence is less convincing than the cheno-am pollen, but it at least raises the possibility that material from any or all of these plants was also being used in or near the feature. Finally, a single grain of large grass pollen was identified in the sample. This pollen may have come from a maize plant and, if so, would suggest that materials from this plant were also present in or around the feature.

The flotation sample (FN 271) included most of the hearth’s charcoal-stained fill. When analyzed, the sample was found to contain eight charred seed fragments that were probably screwbean. The small macrobotanical sample (FN 268) included a burned seed identified as “cf. Prosopis.” Charcoal from probable firewood in both the flotation and macrobotanical samples was also classified as “cf. Prosopis.”

CHRONOLOGY

Seeds from the flotation sample (FN 271) produced a radiocarbon date with a two-sigma calibrated range of AD 70–250 (Sample 26CK6146-10; Beta-230258; Table 4.3; Appendix A).

Feature 47

Feature 47, a storage pit, was exposed in the south wall of Backhoe Trench 230N (Figures 4.4 and 4.34). The feature was classified as “bowl-shaped” based on its overall appearance in the trench wall. The upper 5-7 cm of the pit’s western edge did turn inward, however, so a case could also be made for assigning it to the mixed “bowl/globular” shape category. The feature originated at the contact between the A and Bw soil horizons and penetrated into the latter soil unit. It did not, on the other hand, come close to reaching the Cy horizon, which, at this location, was confined to the bottom 10-15 cm of the backhoe trench. The A horizon overlying the feature included two subunits, the upper of which (A1) was 10-15 cm thick and pinkish gray in color (7.5YR 7/2). The lower subunit (A2) measured about 5 cm thick and was brown in color (7.5YR 5/2).

Feature 47 was selected for partial excavation. This work began with the laying out of a 0.5×1.50-m unit lying over the feature profile and running along the edge of the backhoe trench. The A horizon was removed from this unit in two levels, of 10 cm and 5 cm, at which point the outline of the pit feature began to become visible in plan view. A 5-cm level of feature fill was then excavated to more clearly define the outline of the pit. Next it was decided that excavation of the western half of the pit would provide an adequate sample of data for analysis. The fill in this portion of the pit was excavated in three 10-cm levels.

As excavated, the feature consisted of approximately half of a circular, bowl-shaped pit with a diameter of 1.00 m and a maximum depth of 35 cm. The fill within the feature was more or less homogeneous, sandy, and pinkish gray (7.5YR 6/2) in color. It incorporated small areas of ashy sediment as well as scattered small pieces of charred material.
Figure 4.34. Drawings of Feature 47 in the south wall of Backhoe Trench 230N at the Larder Site: (top) plan view after removal of overlying A horizon sediment; (bottom) profile in backhoe-trench wall.
The A horizon sediment overlying the feature contained 12 pieces of flaked stone debitage. The fill within the excavated portion of the feature yielded another six flakes, as well as a small piece of worked stone, possibly a pendant or other ornament. Smoothing on the edges of this artifact may have been from oils on the skin of those who handled it. The item came from ca. 25 cm below the top of the feature.

Both a pollen and a flotation sample were analyzed from Feature 47. The pollen sample (FN 286) was taken from the floor of this pit feature. It contained a fairly large number of grains, as well as a single clump, of cheno-am pollen. Also observed in the sample were three grains of evening primrose (Onagraceae) pollen and one grain each of globemallow (*Sphaeralcea*) and Cylindropuntia pollen. The evidence suggests that one or more of these four kinds of plants may have been stored in the feature.

A flotation sample (FN 288) collected from the bottom 10 cm of feature fill contained numerous fragments of charred corn cobs, as well as a number of charred mesquite seeds and seed pods. The mesquite evidence included a fruit with the seed enclosed, 23 seeds and seed fragments, and eight pod fragments; another 14 seed fragments were identified as “probably mesquite.”

**CHRONOLOGY**

Maize cob fragments from the flotation sample (FN 288) were sent to Beta Analytic for radiocarbon dating. They produced a date with a two-sigma calibrated range of 350–50 BC (Sample 26CK6146-11; Beta-230259; Table 4.3; Appendix A). This represents the oldest direct date on maize from the Las Vegas Valley of which we are aware.

**Feature 49**

Feature 49, a relatively broad, bell-shaped pit recorded in the south wall of Backhoe Trench 230N, was included in the sample of excavated features (Figures 4.4, 4.35, and 4.36). The pit originated at the contact between the A and Bw horizons, and it had been excavated through the latter deposit so that its floor lay on, or within a couple centimeters below, the surface of the Cy horizon. The A horizon was gray in color (7.5YR 6/0) and 12-22 cm thick over the feature. As observed in the wall of the backhoe trench, the bottom 10 cm of this soil unit contained laminations that sloped down toward the center of the pit. An area of charcoal staining, 20 cm broad and 5 cm thick, was observed above this laminated zone.

Excavation of the feature began with the laying out of a 0.5×1.00 m unit running along the wall of the backhoe trench. The previously described A horizon was removed in two levels, one 7-10 cm thick and the other 4-12 cm thick (Stratum 1; uppermost Levels 1 and 2 in Figure 4.35 [bottom]); the lower level was terminated as the outline of the feature became visible. This initial investigation showed that the feature extended another 5 or so centimeters to the north, beyond the edge of the excavation unit. That portion of the feature was not excavated. The fill within the pit was removed in two separate strata—an upper, laminated stratum that was excavated in two levels that were up to 10 cm thick (Stratum 2; middle Levels 1 and 2 in Figure 4.35 [bottom]) and a lower, homogeneous stratum that was removed in three levels, the first two of which were up to 10 cm thick and the third of which reached a maximum thickness of 8 cm (Stratum 3; lowest Levels 1 and 2 in Figure 4.35 [bottom]).
Figure 4.35. Drawings of Feature 49 in the south wall of Backhoe Trench 230N at the Larder Site: (top) plan view following excavation; (bottom) profile in backhoe-trench wall.
Feature 49 was an oblong, bell-shaped pit with walls that were deeply undercut below the level of the bell’s “flex-point.” The floor of the feature sloped gently downward around the edge of the feature, but more steeply at the pit’s center where it formed a bowl-shaped depression. The segment of the feature’s rim that was exposed in the eastern portion of the excavation unit was about 12 cm higher than that in the western portion of the unit. The east-side rim consisted of particularly hard dirt that, in the trench profile, formed a “plug” of material that was clearly distinct from the adjacent sediment of the Bw horizon (Figure 4.35). Below this plug, the lower wall of the pit was undercut up to 10 cm. The rim that was formed of this hard material extended in an almost straight line from south to north across the excavation unit. It did not, in other words, describe a curve like the underlying, lower portion of the feature’s wall or, for that matter, like the western rim and wall of the feature. That other side of the feature also appeared, in the backhoe trench wall, to incorporate a plug of sediment—though in this case the material was not as clearly distinct from the Bw horizon as on the eastern side of the feature. This plug of material extended farther into the feature than the one on the opposite wall and, as such, created a much deeper “overhang” for the lower portion of the pit wall—ranging from about 20 to 25 cm.
These deposits on the eastern and western sides of the feature are referred to as “plugs” of material (Figure 4.35) on the hypothesis that they were used to build up the sides and rim of the pit, either when the feature was first constructed or to repair or remodel it sometime after its initial use. Two facts, the straight configuration of the rim formed on the eastern side of the feature and the extent of the overhang produced on its western side, seem particularly consistent with the idea of a repair or remodeling event. Tough speculative, this interpretation has been pursued here in some detail because it represents the best and, in fact, the only reasonable case for the modification of one of the site’s pit features sometime after its initial construction and use.

The feature fill that was exposed in the backhoe-trench wall could be divided into two distinct strata. The upper fill consisted of pink to light brown (7.5YR 7/4-6/4) with abundant charcoal fragments and almost no artifacts. Stratification visible in the wall of the backhoe trench indicated that this fill had been deposited as thin layers of sediment that washed or blew into the feature depression. Sloping of the lenses that was observed in the south wall of the excavation unit (i.e., that became visible after the feature had been excavated) indicated that the fill came primarily from the east side of the feature (Figure 4.37). As previously noted, similar “lensing” was observed in the A horizon, immediately above the feature. The presence of these intact lenses in both the upper feature fill and overlying A horizon suggested that rodents had not burrowed into the feature after it had been abandoned and had filled in. This evidence for a lack of disturbance to the lower feature fill was one reason why Feature 49 was selected for excavation. This lower fill was pinkish gray to pink in color (7.5YR 7/3) and contained numerous pieces of charcoal (Figure 4.37).
The only artifacts recovered during excavation of the feature were pieces of flaked stone debitage. Eleven of these were recovered from the A horizon overlying the feature (Stratum 1), three were found in the upper feature fill (Stratum 2), and five came from the lower feature fill (Stratum 3).

A pollen sample (FN 218) from the upper feature fill produced an elevated count of cheno-am pollen, interpreted by Cummings and colleagues (Chapter 8) as suggesting that the sample came from post-abandonment fill that was probably mixed with the overlying A horizon. This idea that the sample came from a post-abandonment deposit is wholly consistent with the previously discussed interpretation of the laminated sediments that made up the bulk of the upper fill stratum.

Both a pollen and a flotation sample were analyzed from the lower feature fill. The pollen sample (FN 239) was dominated by mesquite pollen, reflecting either the presence of mesquite trees in the vicinity or the storage or processing of mesquite beans (or pods) in this pit. The macrofloral specimens recovered from the flotation sample (FN 240) support the latter interpretation. Those specimens included a charred mesquite endocarp fragment and 16 charred mesquite seed fragments. Other specimens suggest that saltbush seeds (one charred seed) and cactus fruits, pads, or both (one charred spine fragment) may have been stored or processed in the pit. Finally, charcoal included in the sample indicates the use of mesquite and, to a lesser extent, saltbush as fuel.

A sample of charcoal (FN 238) collected from the lowest 8 cm of feature fill (Stratum 3, Level 3) yielded a radiocarbon date with a two-sigma calibrated range of AD 10–150 (Sample 26CK6146-4; Beta-217141; Table 4.3; Appendix A).

Feature 51

Feature 51, a globular pit identified in the south wall of Backhoe Trench 250N, was included in the sample of excavated features (Figures 4.4, 4.14, and 4.38). The pit originated at the contact between the A and Bw soil horizons and was located entirely within the latter soil unit. Excavation began with the laying out of 0.5×1.00 m unit running along the wall of the backhoe trench. The A horizon was removed from this unit in two levels (of 10-14 and 9-16 cm) to a depth of 14-30 cm below ground surface, where the outline of the feature could traced in plan view. Some charcoal “blotching” was observed in the lower half of the A horizon. The outline of the feature intersected the back wall of the excavation unit, and so a small piece of the feature, ca. 5 cm wide, was left unexcavated. The fill within the feature was removed in three 10-cm levels.

The excavated feature made up approximately half of a relatively small (70 cm in maximum diameter by 30 cm deep) circular pit with a globular profile. The curving side walls of the pit undercut the rim by 5-15 cm. Though “structureless,” the fill within the pit did vary slightly in color from pink to pinkish gray to light brown (7.5YR 6/3-7/3); it also contained numerous small pieces of charcoal.
Small quantities of flaked stone debitage were recovered from the A horizon overlying the feature (n=8) and from the feature fill (n=8). In addition, both a pollen sample and a flotation sample were analyzed from this feature. The pollen sample (FN 262) came from the floor and lowest 2 cm of feature fill and produced a pollen assemblage that requires a two-part interpretation. On the one hand, the sample produced evidence indicating that the feature fill was disturbed in recent times, but on the other, it provided evidence that would appear to relate to use of the feature in the prehistoric period. The clearest evidence of disturbance consists of a small quantity of tamarisk pollen that must have been introduced into the sample context in the last 100 to 150 years. Additional possible evidence of disturbance takes the form of a moderate quantity of cheno-am pollen, “which suggests the possibility of some mixing with the overlying A horizon or perhaps storage of Cheno-ams in this pit” (Chapter 8). Evidence relating to the use of the feature consists of the presence in the sample of a small quantity of maize pollen. The pollen data also indicate that a member of the lily family may have been stored in the pit.

The flotation sample (FN 265) came from the bottom 10 cm of feature fill (that is, the third excavated fill level). It produced evidence relating to the processing or storage of mesquite pods or seeds (nine charred seed fragments), possibly of cacti (one charred spine fragment) and possibly of saltbush (specifically *Atriplex*) fruits or seeds (four charred seeds, two charred fruit fragments, and three charred seed perisperm fragments, the
last of which could also have come from some other kind of cheno-am). Alternatively, the saltbush specimens may have been attached to saltbush branches that were burned as fuel. Use of saltbush for that purpose was indicated by the presence in the sample of *Atriplex* charcoal. Mesquite charcoal was also represented in the sample.

**CHRONOLOGY**

A sample of charcoal (FN 263) collected from the bottom 10 cm of feature fill (Stratum 2, Level 3) produced a radiocarbon date with a two-sigma calibrated range of 100 BC–AD 110 (Sample 26CK6146-5; Beta-217142; Table 4.3; Appendix A).

**Discussion**

Only Features 14 and 47 at the Larder site have produced older evidence than Feature 51 for the farming of maize in the Las Vegas Valley. The evidence from Feature 51 consists, first, of a small quantity of maize pollen and, second, of a radiocarbon date of 100 BC–AD 110. The pollen sample came from the floor and lowest 2 cm of feature fill, and the dated charcoal from somewhat higher in the fill. This case would seem to provide good evidence for the presence on the site of cultivated maize during the Terminal Archaic period. Unfortunately, the sample also contained a small quantity of tamarisk pollen, which must have been introduced into the sample context during the past century or so. The presence of this kind of pollen raises the question of whether the maize pollen might also be intrusive in the feature, which is to say, that it might also date to a period later than that of the dated radiocarbon sample.

In considering this issue, it is important to note that grains of maize pollen are relatively large and tend not to travel far from their place of origin. The primary exception involves transport by humans either of pollen-bearing plant parts or of the pollen itself. There are two primary periods, other than that indicated by the radiocarbon date, when the maize pollen might have been introduced into the feature fill. First, the pollen might have been deposited, along with the tamarisk pollen, during the last century. This is unlikely, given the lack of evidence for the period in question of farming on the site or of people performing activities that would have brought maize pollen there. A second possibility concerns the period from AD 600 to 800, which has yielded maize pollen from several dated contexts on the Larder and Scorpion Knoll sites. Perhaps a few grains of maize pollen were introduced into the feature at this time. The likelihood of this having occurred is difficult to assess. The idea’s main appeal is that it could provide a rationale for explaining away the evidence for “early” maize provided by Feature 51—if such a rationale were required. As some researchers have suggested, “extraordinary claims require extraordinary proof.” In point of fact, however, Feature 51 is not the only early storage pit at the Larder Site to have produced evidence of maize. Feature 47 contained numerous fragments of charred maize cob, a sample of which produced a radiocarbon date of 350–50 BC. Given this evidence, it seems most appropriate to take the maize pollen and radiocarbon data from Feature 51 at face value, that is, as a valid observation of early maize in the Las Vegas Valley.

**Feature 52**

Feature 52, a bowl-shaped pit, was recorded in the north wall of Backhoe Trench 250N (Figures 4.4 and 4.39). The feature’s width in the trench-wall profile was 1.00 m, and its depth was 40 cm. The pit originated at the contact between the A and Bw soil horizons and penetrated into the latter soil unit. At its deepest point, the floor of the pit came within 7-8 cm of the contact between the Bw and Cy horizons. The fill within the pit consisted of silt with some fine sand, as well as many fragments of charred material. The fill was brown (7.5 YR 5/4), which differed slightly from the brown to dark brown (7.5 YR 4/3) color of the overlying A horizon sediment. The lower 15 cm of fill was slightly darker in color than the upper 25 cm.
A flotation sample (FN 426) from the bottom 15 cm of slightly darker feature fill was selected for processing and analysis. Charred remains found in the sample included a fragment of a mesquite seed pod, two fragments of possible mesquite seed coats, and a fragment of an unidentified seed. Also present in the sample were fragments of “cf. *Prosopis*” charcoal, presumably from fuelwood.

**CHRONOLOGY**

Charred seed and seed-pod fragments from the flotation sample (FN 426) were submitted for radiocarbon dating. These materials returned a date with a two-sigma calibrated range of 360–290 and 240–50 BC (Sample 26CK6146-12; Beta-232634; Table 4.3; Appendix A).

**Feature 54**

Feature 54 was a long, shallow depression (3.10 m×15 cm) that was observed in the north wall of Backhoe Trench 350N, at the contact between the A and Bw soil horizons (Figures 4.4 and 4.40). It was partially excavated on the chance that it represented the remains of a structural feature. A storage pit, Feature 52, was located immediately east of Feature 54. As recorded in profile, the A horizon was brown to dark brown (7.5YR 4/3) over the two features and light brown (7.5YR 6/4) to both the east and west. The “floor” of Feature 54 was irregular and included three steep-sided dips that had the appearance of possible postholes. The fill, to a depth of 0-15 cm above the floor, included scattered pieces of charcoal.
Several units were excavated through the A horizon in an effort to determine if the feature was a structure. Together, these units formed a 1.00×1.50-m block running along the side of the trench with a second, 0.50×1.00-m unit extending northward from its western third. The A horizon varied in thickness from 20-35 cm across these units. Included in the contact between the A and Bw horizons was a depression in the surface of the Bw horizon that measured approximately 60 cm wide, 1.00 m long, and 10-15 cm deep. Whether this depression was natural or “cultural” in origin could not be determined. Perhaps it represented a “borrow pit” for Bw sediment that was required for some unknown purpose. As for evidence that Feature 54 was a structure, none was recovered. The excavated units covered a combined area of 2 m² and together yielded a fairly small artifact assemblage consisting of 117 pieces of flaked stone debitage.

**Features 55A and 55B**

Feature 55 consisted of two features (55A and 55B) that were recorded in the north wall of Backhoe Trench 310N (Figures 4.4 and 4.41). The later feature, 55B, lay partially on top of the earlier one, 55A.

**FEATURE 55A**

Feature 55A was a bowl-shaped storage pit with a profile width of 1.00 m and depth of 40 cm. It had been dug into the Bw soil horizon. This feature differed from most of those recorded at the site, in that its fill was not confined to the pit itself, but appeared to spill out of the pit to the west to form a band of sediment that was at least 50 cm long and up to 10 cm thick (Figure 4.41). The fill within Feature 55A was light brown (7.5YR 6/4) with ashy patches and inclusions of charcoal. One of these patches that was revealed during sample collection lay immediately above the feature’s floor and some 3-7 cm back from the backhoe-trench wall. Possible evidence of oxidation, in the form of “oranging” of the feature floor, was observed adjacent to this ashy patch.

**Contents**

Both a pollen sample and a flotation sample were analyzed from Feature 55A. The pollen sample (FN 439), which came from the floor and bottom 2-3 cm of feature fill, contained maize pollen, suggesting that the pit was used for storing this food resource. The flotation sample (FN 436) came from the center of the feature, from between 2 and 25 cm above the floor. Charred remains recovered from this sample suggest that a variety of foods were stored or processed either in the feature or nearby it. The plants represented included mesquite (charred endocarp and endocarp fragments and charred seeds and seed fragments), screwbean mesquite (one
charred pod fragment containing a seed), amaranth (charred seeds and seed fragments), and saltbush (charred seeds and seed fragments). Alternatively, the saltbush seeds “might have been charred through use of saltbush branches as fuel and amaranth seeds might have been burned through use of green plants in a buffering vegetation layer when roasting foods” (Chapter 8). Charcoal from the sample indicated the use of saltbush and mesquite for fuel. Also, “recovery of charred insect eggs, insect fecal pellets, and worm casts most likely reflect prehistoric bioturbation in the vicinity of these pits and subsequent re-use of the feature” (Chapter 8).

Figure 4.41. Profile drawing of Features 55A and 55B in the north wall of Backhoe Trench 310N at the Larder Site.

**Chronology**

A sample of unidentified charred material obtained from the lower half of feature fill (between 5 and 25 cm above the feature’s floor) produced a radiocarbon date with a two-sigma calibrated range of AD 640–760 (Sample 26CK6146-6; Beta-217143; Table 4.3; Appendix A).

**FEATURE 55B**

Feature 55B was a small roasting pit that was observed in the north wall of Backhoe Trench 310N. It had a width in profile of 85 cm and a depth of 20 cm. The floor of the pit intruded only a few centimeters into
the Bw horizon, and most of the feature lay within the A horizon. The floor of the pit lay primarily on the Bw horizon, but, at the western edge of the feature, extended out over the fill of Feature 55A. A small area of the floor was observed during sample collection. It consisted of oxidized orange sediment with a thin covering of ash. The oxidation and thus the floor of the feature extended out over Feature 55A’s fill—which provided the best evidence that the roasting pit (55B) postdated the storage pit (55A). The fill within the feature was similar in color to that in Feature 55A and included abundant pieces of charcoal, some patches of ash, and, in the area where pollen and flotation samples were collected, several small (2-5 cm), angular pieces of fire-affected limestone.

Contents

A pollen and a flotation sample were analyzed from Feature 55B. The pollen sample (FN 435) was taken from the floor and lowest 2-3 cm of feature fill. It contained abundant cheno-am pollen, more in fact than any other sample analyzed from the site. This evidence could reflect the processing of cheno-ams in the roasting pit. The flotation sample (FN 432) was collected from across the feature profile. It contained abundant charred remains of possible (cf.) screwbean seeds and seed fragments (n=52) and seed coat or pod fragments (n=20), as well as a single, charred, unidentified “ovoid” seed.

DISCUSSION

Stratigraphic evidence discussed earlier provides strong support for the identification of Features 55A and 55B as separate entities. Also worth noting, however, are two facts: first, the pit feature (55A) contained a quantity and variety of plant remains that one might expect to find in a roasting pit and, second, this feature was in fact closely associated with a roasting pit. These relationships may not have been coincidental. Perhaps both features were associated, though in different ways, with roasting activity carried out at this location on the site. Though the two features were built and used sequentially, the amount of time separating their use is unknown. They could in fact relate to the same episode of food processing.

Feature 61

This bowl-shaped storage pit was recorded in the south wall of Backhoe Trench 230N (Figures 4.4 and 4.42). The feature was about 55 cm wide in the trench-wall profile and about 35 cm deep. As such, it formed a deeper bowl, with steeper sides, than most other features assigned to the bowl-shaped category. A small area of the feature’s floor was exposed during the collection of pollen and flotation samples. This portion of the floor sloped steeply away from the wall of the backhoe trench, indicating that well over half of the feature lay behind the trench wall. Except in two areas, the feature fill was homogeneous and incorporated little charred material. One of these areas consisted of the bottom 4 cm of feature fill, where a few scattered pieces of charred material were observed. The second consisted of a distinct fill stratum located within the upper 15 cm of feature fill (Figure 4.42). This stratum was made of dark, charcoal-stained sediment with patches of ash. The base of this unit sloped downward on both sides toward a central low point, suggesting that it was deposited some time after the feature had been abandoned and had partially filled in. There were no signs of burning along the contact between the charcoal-stained deposit and the underlying feature fill. This would suggest that the material did not burn in place, i.e., did not represent a secondary use of Feature 61 as a fire pit or hearth. It appears more likely that the charcoal-stained sediment represented debris that was cleaned out of a feature of this kind that, in all probability, was located nearby.
We selected two flotation samples from Feature 61 for processing and analysis. One sample (FN 460) came from the charcoal- and ash-bearing deposit located in the upper half of the feature, and the other (FN 462) from the lower half of the feature, specifically from 5-15 cm above the floor (Figure 4.42). There was considerable overlap in the charred specimens that were extracted from the two samples. The upper sample contained four large possible (cf.) screwbean seed fragments, as well as possible (cf.) *Prosopis* charcoal. The lower sample produced both a screwbean seed and a screwbean “fruit part,” two mesquite seed-pod fragments, a possible (cf.) mesquite seed fragment, and an unidentified seed fragment. Like the upper sample, the lower one also contained possible (cf.) *Prosopis* charcoal. The charcoal in both samples presumably came from firewood.
**Possible Pit Features**

The Larder Site is bordered on the west by the incised channel of Las Vegas Wash (Figure 4.3). During the course of fieldwork, we noted several distinctive eroded indentations in the unconsolidated sediment that lies at the top of this cutbank (Figure 4.43). These indentations looked like the eastern halves of pit features whose relatively soft fill had eroded away as the cutbank itself had formed. Five of these possible pit features were identified. Three of these were located within 5 m north of the western end of Backhoe Trench 150N, and two were located within 10 m south of that trench. Whether these indentations actually are the remains of pit features is difficult to say, but for completeness sake, they are mentioned here.

![Figure 4.43. Photo showing possible eroded pit features located on the cut-bank of Las Vegas Wash.](image)
In 2001, HRA archaeologists recorded the Scorpion Knoll Site, 26CK6147, as a small (40×60 m), sparse artifact scatter located on a low knoll between the floodplain of Las Vegas Wash and the eroded toe of an upland alluvial fan (Figure 5.1). The site lay about a hundred meters north/northwest of the Larder Site, 26CK6146 (Figure 5.2: inset). Its recorded artifact assemblage was small, consisting of only about 25 pieces of flaked stone debitage, a scraper, and a potsherd of North Creek Gray (Woodman et al. 2001).

**TESTING PLAN**

HRA’s (2004) treatment plan for the Scorpion Knoll site was based on the plan prepared for the larger and, as it seemed at the time, more significant Larder Site. As stated in the plan,
Site 26CK6147 does not possess the kind of indicators of possible subsurface deposits that are to be observed at 26CK1646. Such deposits may be present, however, and knowing whether or not they are would be useful for planning future projects in the park. To provide that information, HRA proposes a limited program of backhoe trenching at the site. The testing plan for the site is essentially a scaled-down version of the plan presented above for 26CK6146.

1) Artifact concentrations, formal flaked and ground stone tools, potsherds, and soil staining (if present) or other surface evidence of cultural features will be identified and pin-flagged.

2) Formal flaked stone and ground stone tools and tool fragments, potsherds, and possible waste flakes from ground stone tool production and maintenance will be collected.

3) Backhoe trenches will be excavated in a search for buried cultural deposits. Artifact densities on the site are low, and no surface evidence of features has been identified. For these reasons, the trenching strategy is not detailed here but will be determined in the field. We anticipate digging 20-40 m of trenches on the site.

Figure 5.2. Map of the Scorpion Knoll Site, showing the density of collected surface artifacts, location of backhoe trenches, and recorded and tested features.
Table 5.1. Summary of Backhoe Trenches and Recorded Features at Scorpion Knoll.

<table>
<thead>
<tr>
<th>Trench</th>
<th>Length</th>
<th>No. of Features</th>
<th>Feature Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>475N</td>
<td>55 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>485N</td>
<td>55 m</td>
<td>1</td>
<td>5, 6</td>
</tr>
<tr>
<td>495N</td>
<td>55 m</td>
<td>3</td>
<td>4, 7</td>
</tr>
<tr>
<td>500N</td>
<td>15 m</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>505N</td>
<td>55 m</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>515N</td>
<td>34 m</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>A</td>
<td>9 m</td>
<td>2</td>
<td>2, 3</td>
</tr>
</tbody>
</table>

4) If necessary, hand units like those described for Site 26CK6146 (3) will be excavated adjacent to backhoe trenches to provide information to characterize cultural deposits and features exposed in trench walls.

5) If suitable materials and contexts are encountered, samples for flotation and subsequent macrobotanical analysis, pollen analysis, and radiocarbon dating will be collected during the excavation of these hand units. Samples may also be collected from the walls of backhoe trenches [HRA 2004].

This plan was implemented as described, with one major revision. Much more than the proposed 20-40 m of backhoe trench was excavated on the site, first, to provide good subsurface coverage for the knoll as a whole and, second, in response to the discovery, in the walls of the backhoe trenches, of more features than were expected.

As in the case of the Larder Site, the treatment plan for Scorpion Knoll did not specify how a grid system would be established on the site. In practice, our use of a portable GPS unit made it possible to tie the site grid to the local UTM grid (North American Datum 1927, Zone 11). This meant, for example, that a point located on the site grid at 480N 360E was equivalent to 3997480N 678360E on the UTM grid.

SURFACE RECORDATION

Fieldwork at Scorpion Knoll began with the placing of stakes at 20 m intervals across the site area. The next step involved the collection of all artifacts that were visible on the ground surface. Figure 5.2 shows the density of these collected surface artifacts. Subsequent backhoe trenching and hand testing of cultural features showed that there was a good correspondence between the spatial distribution of these artifacts and the location of definite and possible habitation structures. Artifact densities were greatest within 5-10 m east and southeast of the structures. Lower densities of artifacts continued in these directions to distances of 20-25 m from the structures. On the other hand, no surface artifacts were found to the west and northwest of the structures. An additional, low-density scatter of surface artifacts was present at the southern edge of the site, on the south slope of the low rise that we have dubbed Scorpion Knoll. Trenching data suggest that this second artifact scatter was not associated with any habitation structures.

BACKHOE TRENCHING

The backhoe was used to excavate eight trenches across the site with a combined length of 278 m (Figure 5.2; Table 5.1). Most of the trenches were oriented east-west and designated with reference to their idealized northing (475N, 485N, and so on). These trenches were spaced at 10-m intervals, with one exception: a relatively short trench, 500N, was excavated between Trenches 495N and 505N to determine if there was a
cluster of features in this area of the site. A short north-south trench (Trench A) was also excavated, to better define Feature 2 after it had been identified in the walls of Trench 505N. The east-west trenches varied in length from 15 to 55 m and had average depths of 1.1 m (3½ ft). The north-south trench was 9 m long and about 60 cm deep. (Note that a second north-south trench, labeled Trench B, was begun a meter to the east of Trench A but immediately abandoned.)

GEOMORPHIC SETTING AND NATURAL STRATIFICATION OF SEDIMENTS

As discussed in Chapter 2, Scorpion Knoll is located at the lower end of the same alluvial fan as the nearby Larder Site. The fan originates to the north on Frenchman Mountain. “The site occupies a shoulder position on a gentle…west-trending…hillslope crest” (Chapter 2). The project geoarchaeologists identified four stratigraphic units in the backhoe trenches that were excavated at Scorpion Knoll (Figures 2.21 and 2.22). Two of these units, Strata I and IV, do not pertain directly to the site’s archaeological record. Stratum I, consisting of “massive sandy gravel associated with the mainstem channel” is too deeply buried to be relevant. Stratum IV, consisting of more recently deposited Las Vegas Wash alluvium, occurs only to the side of the low rise where the archaeological deposits are located. The other two units, Strata II and III, are, however, relevant to the archaeological record. Stratum II, a Pleistocene deposit, “evidences the distal margin of alluvial fan deposition where sediments trend toward finer textures.” The overlying Stratum III, of Holocene age, consists of “an aeolian sandsheet deposited on the stabilized surface of the distal alluvial fan” (Chapter 2). Two prehistoric storage pits, Features 5 and 6, appear to have been excavated into Stratum II and covered over by material of Stratum III (Figure 2.22). Whether they were actually used and abandoned before Stratum III was deposited across the site is unclear, though this may have been the case. These relationships between Features 5 and 6 and Strata II and III probably apply to the site’s other cultural features as well.

HAND EXCAVATION AND PROFILE RECORDATION

Consistent with the treatment plan, four archaeological features at the site were partially excavated by hand. In the case of Features 1, 2, and 4, these investigations began with the laying out of one or more appropriately sized rectangular units alongside the wall of the backhoe trench where the feature had been detected (Figure 5.3). Feature 8, on the other hand, had not been exposed in the wall of a backhoe trench, but instead was discovered during the excavation of units that overlapped Feature 4. In the case of all four of the tested features, levels were excavated within the rectangular units until the edge of the feature in question had been identified. From this point on, the exposed portion of the feature became the primary unit of excavation. All fill that was excavated by hand was screened through ⅛-inch mesh, except for that reserved for pollen and flotation analysis. Only a relatively small number of artifacts and specimens, consisting of pieces of flaked stone debitage, potsherds, and charred specimens, were obtained from the hand-excavated units. Along with the pollen and flotation samples, charcoal for radiocarbon dating was collected from as many contexts as possible. The hand excavations were documented through plan and profile drawings, photographs, and notes. Four other features, including three storage pits (Features 5, 6, and 7) and a small roasting pit (Feature 3), were also identified in the walls of the backhoe trenches. These features were recorded and sampled (for pollen, flotation, and radiocarbon analysis) according to procedures described in Chapter 4 for similar features encountered at the Larder Site.

FEATURE SUMMARY

Eight features were identified during HRA’s subsurface investigation of Scorpion Knoll. Seven of these were initially recorded in the walls of the backhoe trenches, and one (Feature 8) was found in a hand-excavated unit. Table 5.2 provides information on the distribution of the features among the backhoe
Table 5.2. Summary of Features Recorded at 26CK6147.

<table>
<thead>
<tr>
<th>Feat.</th>
<th>Trench</th>
<th>Wall(s)</th>
<th>Treatment¹</th>
<th>Description</th>
<th>Width/ Diam.²</th>
<th>Depth²</th>
<th>mBS³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500N</td>
<td>N&amp;S</td>
<td>ex</td>
<td>pit structure</td>
<td>2.80</td>
<td>0.25</td>
<td>0.30</td>
</tr>
<tr>
<td>2</td>
<td>505N</td>
<td>N&amp;S</td>
<td>ex</td>
<td>pit structure?/roasting feat.?</td>
<td>3.5±</td>
<td>0.35</td>
<td>0.01</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>W</td>
<td>pro</td>
<td>roasting pit</td>
<td>–</td>
<td>0.40</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td>495N</td>
<td>S</td>
<td>ex</td>
<td>pit structure</td>
<td>3.0</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>485N</td>
<td>S</td>
<td>pro</td>
<td>storage pit basin/bell</td>
<td>1.05</td>
<td>0.60</td>
<td>0.25</td>
</tr>
<tr>
<td>6</td>
<td>485N</td>
<td>S</td>
<td>pro</td>
<td>storage pit basin</td>
<td>1.40</td>
<td>0.75</td>
<td>0.25</td>
</tr>
<tr>
<td>7</td>
<td>495N</td>
<td>N</td>
<td>pro</td>
<td>storage pit irregular</td>
<td>0.75</td>
<td>0.70</td>
<td>0.20</td>
</tr>
<tr>
<td>8</td>
<td>–</td>
<td></td>
<td>ex</td>
<td>pit structure? circular?</td>
<td>–</td>
<td>0.10</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Notes: ¹ex = feature excavated or tested; pro= feature profile recorded and sampled in backhoe-trench wall
²for excavated or tested features, dimensions were measured or estimated for the whole feature; for features recorded in the trench walls, dimensions apply to the feature profile
³mBS=meters below ground surface

Figure 5.3. Photograph of archaeologist Suzanne Eskenazi excavating Feature 1 at Scorpion Knoll.
trenches. The features can be assigned to three morphological/functional categories: pit structure (or possible pit structure), roasting pit, and storage pit.

**Pit Structures**

Two pit structures—Features 1 and 4—and two possible pit structures—Features 2 and 8—were investigated at Scorpion Knoll (Table 5.2). Slightly less than half of Feature 4, and substantially less than half of the other three features, was uncovered. For that reason, generalizations concerning this feature class should be taken with a grain of salt. The two pit structures and one of the possible pit structures had estimated diameters of between 2.8 and 3.5 m; the four features in the group had depths of between 10 and 35 cm. Feature 4 was circular, and the other structures probably were as well. Feature 1 may have had an entryway on its south side. Three of the four features had shallow, dish-shaped profiles (Features 1, 2, and 4); in other words, their side walls were not vertical, but sloped up gradually. The small segment of wall revealed in the fourth feature (Feature 8) was more nearly vertical, and what appeared to be the floor of this possible structure did not simply merge with the side wall, as in the case of the other three features, but met it at an angle. Relatively well-preserved patches of floor were identified in one of the pit structures, Feature 4, as well as in one of the possible pit structures, Feature 8. In the case of Feature 4, this floor area was covered by a thin layer of sand, which made it possible to “pop-off” the overlying fill. Neither this floor nor those in the other structure or the two possible structures showed evidence of having been plastered or otherwise prepared. Feature 4’s floor did, however, produce the kind of elevated pollen concentration value that often results from the trampling of pollen into a structure’s floor.

The two pit structures, Features 1 and 4, differed somewhat in their depths and in the curvatures of their side walls. Feature 1 was a bit deeper than Feature 4, and the outer portions of its profile sloped up a bit more steeply than those of the other structure. These formal differences suggest that different terms might be used to characterize the two structures. Feature 1 warrants the more specific label of “shallow pit structure,” whereas Feature 4 is perhaps better characterized simply as a “structure.”

Features 1 and 4 each produced a bit of evidence relating to their superstructures. For Feature 1, this evidence consisted of charcoal-rich sediment located in feature fill, as well as a patch of clay-rich sediment lying just above the structure’s floor. For Feature 4, this evidence included charred segments of one or two burned poles or posts that were lying on the floor, as well as a patch of charcoal and ash that was also located the floor. Both features, then, contained evidence suggesting that portions at least of their superstructures were destroyed by fire. No floor features—postholes, post rests, hearths, and so on—were found in the excavated portions of either the structures or the possible structures. Hearths may in fact have been absent from these features, or they may simply not have been located in the portions that were investigated.

No floor-contact artifacts were found in any of the structures or possible structures, and only a few artifacts were recovered from near-floor or floor-fill contexts. The two structures (Features 1 and 4) did, however, produce pollen evidence for the processing or use by their inhabitants of maize and cheno-ams. One of the two possible structures (Feature 8) also yielded pollen evidence of maize.

**Roasting Pits and Roasting Area**

Subsurface testing at Scorpion Knoll revealed one definite roasting pit, Feature 3, along with evidence of a possible second roasting pit. Feature 3 consisted of a bowl-shaped pit containing charcoal-rich sediment and a number of small, burned and fire-cracked rocks. The feature resembled the small roasting pit that was identified at the Larder Site, Feature 54B. The second, possible roasting pit was located in the fill of Feature 2. It was evidenced by a cluster of burned and fire-cracked rock. Along with these two discrete features, there may also have been a larger and more diffuse roasting area at the northern edge of the site. This locus of roasting activity was indicated by an area of charcoal-stained soil that was discovered immediately below the ground surface.
Storage Pits

Three storage pits, Features 5, 6, and 7, were recorded in backhoe-trenches at Scorpion Knoll. These features fit comfortably within the shape and size ranges of storage pits recorded at the nearby Larder Site.

ARTIFACTS

One hundred sixty-four artifacts were discovered at the Scorpion Knoll Site. They included 144 flaked stone artifacts, 17 potsherds, and three ground stone fragments. Four of the potsherds were collected from the ground surface. They included two Moapa Brown sherds, one of which had been worked, and two North Creek Gray sherds. The other 13 potsherds were recovered during excavation. Eleven of these excavated sherds came from Feature 4; two of these sherds were Moapa Brown, and nine were North Creek Gray. The other two excavated sherds came from unspecified locations; one of these sherds was North Creek Gray, and the other was too small to be categorized (Table B.3). The site’s flaked stone and ceramic assemblages are discussed in detail in Chapters 6 and 7.

Ground Stone. Suzanne Eskenazi analyzed the three ground stone artifacts that we recovered from Scorpion Knoll (Table C.1). All three artifacts came from subsurface or excavated contexts. One of these items, a quartzite mano fragment, was found in sediment overlying one of the possible pit structures, Feature 2. This tool fragment was shaped, bore evidence of moderate grinding, and included secondary battering on its edges. The other two ground stone artifacts came from contexts associated with one of the pit structures, Feature 4. One of these artifacts, a lightly ground metate fragment that was made from caliche, was found in sediment overlying the feature. The other artifact was a tiny, lightly ground fragment from what appeared to be a palette made of limestone. It came from floor fill (Stratum 2) sediment within the feature.

CHRONOLOGY

HRA’s investigation of the Scorpion Knoll Site yielded two kinds of dating evidence, potsherds and radiocarbon dates. All but one of the 17 potsherds found at the site are from the Ancestral Puebloan ceramic tradition (Chapter 7). The 16 puebloan sherds belong to two types, North Creek Gray and Moapa Brown. North Creek Gray belongs to the Virgin Series of Tusayan Gray Ware, and Moapa Brown to Moapa Gray Ware. The sherds of North Creek Gray could date to any time “within the span of Pueblo pottery in southern Nevada, about AD 500–1250” (Chapter 7). Lynes assigned the Moapa Brown sherds to this type within Moapa Gray Ware based on the darkness of the clay from which they were made. She states further that “The dark gray clay in the sherds…suggests that they are from the early part of Moapa Gray Ware’s span.” How “early” this “early part” of the ware’s date range might have been has not been determined. As a group, the grayware sherds from Scorpion Knoll provide dating evidence that is consistent with the site’s radiocarbon dates.

Four radiocarbon dates are available from Scorpion Knoll (Figure 4.18; Table 5.3). Feature 1 (a pit structure), Feature 2 (a possible structure containing possible roasting-pit debris), Feature 3 (a roasting pit), and Feature 4 (a pit structure) produced one date each. The samples that were dated from Features 1 and 3 consisted of seeds, which as “annual plant products” are not subject to the “old wood problem.” That is, they do not include carbon locked into wood that may have been “laid down” many years earlier by a tree that produced the dated sample. Nor do they share the disadvantage of wood specimens that can survive for many years in the form of dead branches or snags or of wood beams that were salvaged from old buildings for reuse in new ones. Both of these scenarios can create specimens of “old wood” whose radiocarbon dates can precede the human behavioral events that are of interest by decades or even centuries. The dated samples from Features 2 and 4, on the other hand, consisted of charcoal—mixed charcoal in the case of Feature 2 and the outer growth rings on a mesquite pole in the case of Feature 4. Both samples could, therefore, have included old wood and produced significantly early tree-ring dates. In the case of Feature 4’s date, the use of outer growth rings should place an upper limit on one aspect of this problem. Although it is impossible to say for sure, it seems reasonable to suggest that the dated sample included growth rings that were no more than 25 years old.
when the tree branch or stem that provided the wooden pole stop growing, that is, when it died. There is still
the possibility, however, that the stem or branch died a significant number of years before the dated pole was
used in the construction of Feature 4. This would bring into play the second of the two scenarios that are
included in the concept of the “old wood problem.”

Table 5.3. Radiocarbon Dates from Scorpion Knoll.

<table>
<thead>
<tr>
<th>Dated Feature</th>
<th>Dated Sample</th>
<th>Radiocarbon Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Type</td>
<td>26CK 6147-</td>
</tr>
<tr>
<td>1</td>
<td>pit structure</td>
<td>49</td>
</tr>
<tr>
<td>2</td>
<td>pit structure?/roasting feat.?</td>
<td>51</td>
</tr>
<tr>
<td>3</td>
<td>roasting pit</td>
<td>79</td>
</tr>
<tr>
<td>4</td>
<td>pit structure</td>
<td>137</td>
</tr>
</tbody>
</table>

Note: ¹a 13C/12C ratio could not be determined for Sample 26CK6147-3; the other three samples produced ratios
of -23.8‰ to -27.2‰ (Appendix A)
²the “most likely” calibrated range is AD 660-810

A conservative approach to the interpretation of the four radiocarbon dates that we obtained from
Scorpion Knoll is to simply combine the individual dates into a single, overall date range. Following this
procedure, the dates indicate that Scorpion Knoll was occupied sometime between AD 660 and 1020. A
second, more discriminating approach to interpretation involves “weighting” the dates based on their relative
quality. The most obvious contrast here is that between dates from charred seeds and dates from charcoal. For
the reasons just discussed, we might expect samples of charred seeds to provide more accurate dates for a site’s
occupation than samples consisting of charcoal. In keeping with the “old wood” concept, we can note that the
charcoal samples from Scorpion Knoll did indeed produce a somewhat earlier combined date range than the
samples consisting of seeds: the intervals in question are AD 660–880 for the charcoal samples and AD 690–
1020 for the seed samples. Significantly, the “charcoal” date range begins only 30 years earlier than the “seed”
date range.

A third approach to interpretation focuses on the central tendency of the individual radiocarbon date
ranges. Although conceptually and mathematically complex procedures for accomplishing this task are
available, none of these are suitable for a population of just four radiocarbon dates. A more appropriate
approach is to simply use one’s judgment to round the ends of the distribution toward its center, where the
largest portion of the included date ranges resides. In the present instance, it seems reasonable to suggest that
the combined radiocarbon dates apply to a site occupation, or occupations, that occurred between AD 700 and
1000. In this instance, the early date of AD 700 is based on the beginning of the date ranges from seeds rather
than charcoal.

Also worth noting here is a possible break in the overall date distribution that is centered in the second
half of the AD 800s (Figure 4.18; Table 5.3). Two dates ranges end at this time—one in the 860s and the other
in the 880s—and a third date range begins—in the 880s. Significantly, the two early dates are from charcoal,
suggesting that the presence of “old wood” in the samples may account for their “earliness” relative to the third
date. It is at least possible, however, that the two sets of dates are reflecting two temporally distinct occupations.
of the site. Only the collection and dating of more samples—preferably consisting of annual plant products—can indicate if this is indeed the case.

Not discussed to this point is the fact that the charcoal sample from the mesquite pole in Feature 4 produced two calibrated date ranges: AD 660–810 and AD 840–860 (Table 5.3; Appendix A). The earlier of these intervals is much more likely to include the sample’s “true” date than the later one. One could, on that basis, reject or discard the later date range, but to do so would have little effect on the preceding discussion of the site’s radiocarbon dates: at most, it would strengthen slightly the observation that the combined date range from charcoal samples trends earlier than that from seed samples. The narrowing of this sample’s date range might, however, become significant if additional dates were obtained from the site.

FEATURE DESCRIPTIONS

Feature 1

Feature 1, consisting of the remains of a shallow pit structure, was initially identified in both the north and south walls of Backhoe Trench 500N (Figures 5.2, 5.4, and 5.5). The feature was profiled and tested in both walls. Although units were first excavated on the south side of the trench, the portion of the feature located on the north side provided the most useful information and, therefore, will be discussed first.

Three major stratigraphic units were described in the north the wall of the backhoe trench (Figure 5.6). From the top down, they included a 30-cm layer of loose, light brown (7.5YR 6/4), sandy sediment; a 40-70 cm layer of pink to pinkish-white (7.5YR 8/3) sediment with abundant calcium carbonate; and, to the bottom of the trench, a 20-25 cm layer of pinkish white (7.5YR 8/2) silty sand. Feature 1 appeared in the profile as a bowl-shaped dip or depression in the contact between the first and second of these strata. This depression was about 2.8 m wide and 25 cm deep. It was filled primarily with material of the topmost sediment layer, but also contained a bowl-shaped lens of charcoal-stained sediment. This lens was 2-10 cm thick and was located 5-20 cm above the floor of the depression. Its “bowl shape” paralleled that of the depression’s floor, except that it was only 2.2 m long and was offset toward the west side of the depression (Figure 5.6).

To investigate this northern portion of Feature 1, a 0.70×1.00-m unit was placed alongside the trench over the eastern half of the depression. This unit was excavated in two layers to a depth of about 50 cm below the ground surface. The upper layer, Stratum 1, was excavated in three levels to a total depth of about 20-25 cm below ground surface. This stratum consisted of the topmost sediment layer that was described above. Stratum 2 began at the base of Stratum 1 (or 20-25 cm below the surface) and was excavated in a single level that was 15-20 cm thick. It consisted of “cultural fill” within the structure. Specifically, it incorporated the lens of charcoal identified in the trench-wall profile and, in the south-central portion of the unit, a deposit of clay-rich sediment. We interpreted these Stratum 2 deposits as roof fall. Stratum 2 was terminated at the floor and eastern edge of the structure—both of which were unprepared and difficult to identify precisely. The floor did, however, slope up along the eastern edge of the excavation unit, where it appeared to intersect with the lower portion of the structure’s eastern wall.

Feature 1 also appeared as a bowl-shaped depression in the south wall of the backhoe trench. This depression was not as clearly defined, however, as the one in the north trench wall, nor did it contain significant evidence of charcoal staining. To investigate the feature on this side of the trench, two 0.70×1.00-m units were laid out end to end, along the edge of the trench. The two units were excavated to a depth of 16-18 cm below ground surface, where it appeared that the outline of the feature could be discerned. The western unit was then excavated to approximately 50 cm below ground surface. At this point, it became obvious that the edge of the structure could not be identified with any confidence. It is possible that the structure may have extended only a few tens of centimeters into the unit from the north. The outline that was identified in the trench profile and within the two excavation units may have applied to a ramp entryway on this side of the structure.
Figure 5.4. Photograph of Feature 1 in the north wall of Backhoe Trench 500N at Scorpion Knoll, during excavation.

Figure 5.5. Photograph of Feature 1 in the north wall of Backhoe Trench 500N at Scorpion Knoll, with the floor exposed in the bottom of the excavation unit.
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Only one piece of flaked stone debitage was recovered from a definite fill context within Feature 1—that is, from Stratum 2 in the unit that was excavated on the north side of the backhoe trench. Five additional flakes were found in the overlying (Stratum 1) sediment, and two flakes were recovered from the unit excavated on the south side of the trench.

A pollen sample (FN 46) collected from the floor of the structure in the unit excavated on the north side of the trench contained an elevated count of cheno-am pollen and a few grains of maize pollen—the latter having been observed during a scan of the slide. The cheno-am pollen dominated the assemblage, suggesting that plants of this kind might have been processed in the structure. The presence of the maize pollen indicates that the structure’s inhabitants were using or processing maize there. The rest of the pollen record can be interpreted as representing the natural pollen rain, from plants that included mesquite, pine, oak, various members of the sunflower family, ephedra, grasses, wild buckwheat, knotweed, and a member of the rose family.

![Figure 5.6. Profile drawing of Feature 1 in the north wall of Backhoe Trench 500N at Scorpion Knoll.](image)

CHRONOLOGY

A charred seed found in the flotation sample that was analyzed from roof fall gave a radiocarbon date with a two-sigma calibrated range of AD 690–900 and 920–950 (Sample 26CK6147-3; Beta-232635; Table 5.3; Appendix A). For purposes of discussion, these two date ranges can be combined into a single range of AD 690–950.
DISCUSSION AND SUMMARY

Evidence consisting of the size and shape of the depression in the north-wall trench profile, together with the presence of the charcoal lens, suggests that Feature 1 represented the remains of a shallow pit structure. Additional evidence, collected during the excavation of a unit on the north side of the trench and involving the identification of a poorly defined floor and lower wall segment, a probable roof-fall layer, and more of the charcoal-stained lens of sediment, is consistent with this interpretation of the feature. On the basis of these data, we can argue that the structure measured at least 2.8 m across, reached a depth of at least 25 cm relative to the contemporary ground surface, and included a superstructure that incorporated plant material and clay-rich soil. There may have been an entryway on structure’s south side. No evidence was encountered to indicate that this structure contained a hearth. The excavation also provided no evidence relating directly to the kinds of artifacts were made and used by the structure’s inhabitants. We can say, however, that they were processing or using maize and, possibly, cheno-ams within the structure.

Feature 2

Feature 2 was initially exposed in both the north and south walls of Backhoe Trench 505N and, 1-2 m to the north, in the south end and adjacent east and west walls of Backhoe Trench A (Figures 5.2 and 5.7). The feature consisted of a depression that appeared to have been filled, at least in part, with roasting-pit debris. The depression may originally have served as the subterranean portion of a pit structure. The feature was profiled in each of the relevant backhoe-trench walls and then tested-excavated with a unit set against the north wall of Backhoe Trench 505N (Figures 5.8 through 5.10).

The feature looked most like a structure in the in the north wall of Backhoe Trench 505N. There it measured 3.15 m wide and 20-40 cm deep and had a relatively flat base or floor. In the opposite, south wall of Trench 505N, the feature was 1.6 m wide and 25-45 cm deep, and its floor sloped rather steeply toward a low point at its center. If the feature was a structure, then perhaps this profile cut through a side entryway. In Backhoe Trench A, the feature appeared as a depression that extended northward for a distance of 1.00-1.10 m from the south end of the trench. The feature’s floor sloped up gradually from south to north; the feature measured 35 cm deep at the southern end of the trench and 10 cm deep at its (the feature’s) northern edge. Combining the views in the two backhoe trenches, one can project the outline of a circular depression, or structure, with a diameter of about 3.5 m (Figures 5.7 and 5.11).

The feature fill observed in the trench-wall profiles consisted of pinkish gray to light brown (7.5YR 6/3) fine sand with charcoal flecks. The charcoal was most apparent in the lowest 10 cm of fill exposed in the north wall of Trench 505N and in the end and side walls of Trench A. The feature contrasted with the underlying pinkish white (7.5YR 8/2) sediment consisting of clay, gravel, and caliche.

A 1×1-m excavation unit was placed over the eastern portion of the feature exposed in the north wall of Backhoe Trench 505N. The unit was excavated in three levels (measuring 7-10, 6, and 7-13 cm thick) to a total depth of 23-32 cm below ground surface. The bottom two levels, with a combined thickness of 13-19 cm, contained 33 pieces of burned and fire-cracked rock. These rocks were concentrated in the southeastern corner of the unit. This was approximately same area where a patch of charcoal and ash had been noted on the floor of the feature in the trench-wall profile. This portion of the unit may have incorporated the remains of a small roasting pit, or of debris discarded from a roasting feature.
Figure 5.7. Photograph of Feature 2 in the north wall of Backhoe Trench 505N at Scorpion Knoll (note pin flags outlining the hypothetical shape of the feature).

Figure 5.8. Profile drawing of Feature 2 in the north wall of Backhoe Trench 505N at Scorpion Knoll.
Figure 5.9. Photograph of Feature 2 in the west wall of Backhoe Trench A at Scorpion Knoll.

Figure 5.10. Profile drawing of Features 2 and 3 in the west wall of Backhoe Trench 4 at Scorpion Knoll.
The 1×1-m excavation unit yielded only a small artifact assemblage, consisting of five pieces of flaked stone debitage and a mano fragment from the first excavation level; one piece of flaked stone debitage from the second level; and one piece of debitage and one piece of uncharred animal bone from the third level. (The last two items were recovered from a flotation sample and, therefore, were not included in the flaked stone and faunal analyses.) Also present in the unit was the previously mentioned collection of 33 pieces of burned and fire-cracked rock.

Both a pollen sample and a flotation sample were analyzed from the excavated unit. The pollen sample (FN 28) came from the lower portion of the third excavation level, which is to say, from just above the floor of the feature. Both cheno-am and cattail pollen were present in the sample, but not in sufficient quantities to indicate that either of these plants were being exploited by the site’s inhabitants. The sample also contained a greater quantity of microscopic charcoal fragments than the samples from the floors of the two pit structures Features 1 and 4. The presence of this charcoal is “consistent with the interpretation of this feature as either a thermal feature or a dump for debris from nearby roasting pits.” Furthermore, the “total pollen concentration was large…suggesting that as the sediments accumulated in this feature, there was ample time for pollen to accumulate. This is more consistent with an interpretation of use of this feature as a dump for debris from nearby roasting pits than as a thermal feature” (Chapter 8).

Figure 5.11. Schematic plan showing the projected outline of Feature 2 at Scorpion Knoll.
The flotation sample (FN 51) also came from the third excavation level, that is, from just above the feature’s floor. It contained evidence for the processing of mesquite pods (nine charred *Prosopis* seed fragments), saltbush seeds (a charred *Atriplex* seed), and goosefoot seeds (a charred cheno-am perisperm and two charred *Chenopodium* seed fragments). Charcoal in the sample indicated the use of mesquite, saltbush, and possibly acacia wood as fuel.

**CHRONOLOGY**

A sample of the charcoal found in the flotation sample that came from just above Feature 2’s floor was submitted for radiocarbon dating. It provided a date with a two-sigma calibrated range of AD 670–880 (Sample 26CK6147-4; Beta-232636; Table 5.3; Appendix A).

**DISCUSSION AND SUMMARY**

Feature 2 may have represented the remains of a shallow pit structure. This structure would have been about 3.5 m in diameter and 30-40 cm deep, and it would have had an unprepared floor. It may also have had an entryway on its south side. No evidence of a hearth was encountered, though the backhoe trenches and hand-dug unit may well have missed the portion of the structure where a feature of this kind would have been located. Whatever the function of the depression identified as Feature 2, it was filled at least in part with roasting-pit debris. Macrofloral evidence indicates that mesquite pods, goosefoot seeds, and possibly saltbush seeds were processed in the roasting feature, or features, that were the source of the debris. Mesquite, saltbush, and possibly acacia were used in the feature or features as fuel. A small roasting pit may, in fact, have been dug into the fill in the eastern portion of Feature 2. If so, this feature’s outline was obscured and its contents mixed with the surrounding sediment following its use.

**Feature 3**

Feature 3 was a small roasting pit and associated deposit that was recorded in the west wall of Backhoe Trench A. The pit, which was 35-40 cm wide and 10-15 cm deep, intruded into the soil unit that underlay the A horizon (Figures 5.2, 5.10, and 5.12). The A horizon at this location was sandy and somewhat pebbly, loose in texture, and light brown (7.5YR 6/4) in color. The underlying sediment consisted of compacted gravel and gypsum (?) and was pinkish white (7.5YR 8/2) in color. The fill within the pit consisted of fine, pinkish gray (7.5YR 6/2) sand with concentrations of charcoal and ash. The fill also contained a number of small, burned rocks and fire-cracked rocks—a half dozen of these were removed during sample collection. Sediment similar in color to that within the feature, but without the concentrations of charcoal and ash or the burned rocks, extended outward from the edges of the feature in a layer that was 10-12 cm thick—for a distance of 10-15 cm to the south and 80-85 cm to the north (Figures 5.10 and 5.12). Together, the roasting pit and associated deposit appear to lie within, and to partially fill, a shallow depression in the surface of the sediment layer that underlies the A horizon.

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As previously noted, the roasting pit contained a few small rocks that were burned and, in some cases, distinctly fire-cracked. A flotation sample (FN 79) that was collected from general feature fill contained two kinds of hardwood charcoal, one of which was identified as possibly mesquite (cf. *Prosopis*), along with two charred seed fragments that were also categorized as possibly mesquite (*Prosopis*). A pollen sample (FN 82) collected from the floor of the feature was dominated by cattail pollen, but also contained a small quantity of maize pollen (observed during a low magnification scan of the pollen slide). It is possible that the cattail pollen was introduced into the feature by accident, that is, attached to plant parts that were placed in the feature to enhance the roasting process. It perhaps more likely, however, that the pollen was present because of its use as a food item—possibly in the form of “cakes” that could have been cooked in roasting pit.
**CHRONOLOGY**

Seed fragments from the analyzed flotation sample produced a radiocarbon date with a two-sigma calibrated range of AD 880–1020 (Sample 26CK6147-2; Beta-230260; Table 5.3; Appendix A).

**Feature 4**

This pit structure was first recognized as dish-shaped deposit of dark sediment located immediately below the ground surface in both the north and south walls of Backhoe Trench 595N (Figures 5.2 and 5.13). The deposit was 35-60 cm thick and more than 4 m wide. It consisted of loose, silty, pebbly, pink (7.5 YR 7/4) sediment with scattered charcoal flecks and a couple of small patches of charcoal staining. This feature fill contrasted in texture and color with the underlying natural deposit, which consisted of hard, pebbly, pinkish gray (7.5YR 7/2) sediment. Feature 4 was investigated through the excavation of a 2.15×3.00-m block, comprising eight separate excavation units, that extended southward from the backhoe trench (Figures 5.14 and 5.15). A second feature, possibly consisting of a second pit structure, was identified in the southwestern corner of this excavation block. It was labeled Feature 8 and is described separately below.

Figure 5.14 presents a photograph and Figure 5.15 a plan-view drawing of Feature 4 following excavation. Both figures depict the western half of a circular structure with a diameter estimated at about 3 m. The photograph clearly shows how the floor sloped upward from near the center of the structure to its western edge—which is to say, from left to right in the photo. The drawing distinguishes three separate components of the excavated structure. Two of these components consist of areas of the structure’s floor, one where the floor was well preserved and the other where it was poorly preserved. The area of well-preserved floor was located in the northern half of the excavated portion of the structure. Here, the floor was covered in places by a thin layer of yellow sand. The presence of this sand layer meant that, in places, the excavators could easily follow the floor by simply “popping-off” the overlying (Stratum 2) feature fill. Beneath the sand, the floor appeared to consist of the compacted surface of the underlying, natural

![Figure 5.12. Photograph of Feature 3 in the west wall of Backhoe Trench A at Scorpion Knoll.](image)
Figure 5.13. Photograph of Feature 4 in the south wall of Backhoe Trench 595N, Scorpion Knoll.

Figure 5.14. Photograph looking south at Feature 4 and, in the far right corner of the excavation block, Feature 8 at Scorpion Knoll; the arrows point to the outer edge of Feature 8.
Figure 5.15. Plan map of Features 4 and 8, at Scorpion Knoll, following excavation.
The floor had not, in other words, been “finished” with a layer of clay. The area where the floor was poorly preserved occupied the southern half of the excavated structure. Here, the layer of sand was missing, and the floor surface was more difficult to follow. In spite of its condition, this portion of the floor did include one small area where it was covered by a thin but distinct layer of ash and charcoal. The area with the poorly preserved floor was interspersed with patches of obvious animal burrowing, where the floor surface had obviously been destroyed (Figure 5.15). The natural sediment that formed the floor of the structure was rich in gypsum (or anhydrite) to the degree that, once it had been exposed to moisture in the air, a thin layer of “mineral fuzz” began to form across its surface. This hydration of the underlying sediment presumably also occurred as the structure was being built and used, though how this process might have affected the floor surface during its period of use is unclear. No artifacts were found on the floor of Feature 4.

The third component of the structure, which can be seen in Figure 5.15, consisted of a narrow “rise” or “bench/shelf” that outlined the floor area on its western and, it would appear, southern sides. This rise was perhaps not as continuous as the figure would suggest, but nevertheless could be readily followed with the eye along the structure’s western side. The fact that an area of “well-preserved” floor extended over the surface of this rise suggests that it formed the outer edge of the structure’s interior, rather than the base of its wall. The wall would, instead, have been located just outside the rise.

No hearth or other cultural features were identified on the floor of Feature 4. The excavation took in close to half of the structure, and it seems likely that, if a hearth had been located near the structure’s center, evidence of its presence would have been seen along the excavation’s eastern edge. On the other hand, the structure’s hearth may have been offset toward an eastern entryway into the structure. That was the case in a fifth-to-sixth century pithouse that HRA had previously excavated several miles downstream from Scorpion Knoll, at the Three Kids Site (Ahlstrom 2005). If the same were true in Feature 4, evidence of the hearth may simply have been missed by our excavation block. The excavators did encounter a 25-cm-diameter disturbance near the center of the excavated floor area that was initially identified as a possible posthole. Subsequent investigation showed it to be an animal burrow. It is conceivable, however, that in constructing their burrow the animal excavators had followed the relatively soft sediment that would have been found within a disused posthole.

Two fill strata were identified within Feature 4. Stratum 2 lay on top of the floor and was labeled as “floor fill.” This fill layer was 6-12 cm thick and was found across the floor area, at least in areas where the floor was not damaged by animal burrows (Figure 5.16). It consisted of fine, tan silt, with some pebbles and pieces of fire-affected rock and scattered flecks and small pieces of charcoal. It was slightly, though distinctly, darker in color than the overlying Stratum 1 and also incorporated considerably more charcoal than that layer of sediment. Stratum 1, the upper fill layer, was 15-35 cm thick and consisted of pebbly, tan silt and sand with some flecks and chunks of charcoal.

Examination of a profile that ran through the center of the excavation area showed the presence, a few centimeters above the floor, of a 1-2 cm thick layer of Stratum 2 sediment that was more compacted and contained more charcoal fragments than the rest of that fill unit. This may have been material from the building’s superstructure. Additional structural evidence consisted of two charred segments of wooden poles or posts that were uncovered within Stratum 2 and that appeared to be lying on the floor of the structure (Figure 5.17). Both pole segments were about 25 cm long and had diameters of 7-10 cm. Both were identified as probably mesquite (cf. *Prosopis*). It seems most likely that they were the remains of structural elements, whether leaning side-wall poles or upright posts. The presence of these specimens, combined with the fact that fragments of charcoal were more abundant in Stratum 2 than in the overlying Stratum 1 sediment, suggests that some of the scattered Stratum 2 charcoal may also represent fragments of Feature 4’s superstructure.

The depth of the subterranean portion of Feature 4 can be estimated at about 15-20 cm. To begin with, there is a difference of about 10 cm between the lowest point on the structure’s floor and the highest points on the “rise” that forms the edge of the floor. This height difference is roughly equivalent to the thickness of Stratum 2, the layer of floor fill. Observation of the feature’s profile in the backhoe trench wall suggests that
this is too low a value for the structure as a whole. In the profile, the house depression appears to reach a depth of up to 20 cm, relative to the adjacent, undisturbed surface of the underlying, unmodified sediment. These calculations are the basis for the stated estimate of 15-20 cm for the depth of Feature 4.

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Only a few artifacts were recovered during excavation of the block area that contained portions of Features 4 and 8. Well-controlled floor-fill (Stratum 2) deposits in Feature 4 contained three flakes, two potsherds (both North Creek Gray), and a possible small palette fragment. Upper fill (Stratum 1) and disturbed floor-fill (Stratum 2) contexts associated with Feature 4 yielded 29 flakes, one utilized flake, one projectile point tip, eight potsherds (two Moapa Brown and six North Creek Gray), a metate fragment, and a shotgun shell. Finally, units that included portions of Features 4 and 8 or Feature 8 alone yielded one potsherd (North Creek Gray) and 14 flakes. A soil sample (FN 75) collected from the floor of the structure produced a pollen profile similar to that from the floor of another pit structure, Feature 1. The presence in this sample of an elevated quantity of cheno-am pollen and of a small amount of maize pollen (observed during a

Figure 5.16. East-west profiles through excavated portion of Feature 4 at Scorpion Knoll.
scan of the slide) suggests that products from these two kinds of plants were being used or processed in the structure. Other pollen could indicate the use of a member of the nightshade family. Overall, “the sample produced an elevated total pollen concentration of more than 12,000 pollen per cc of sediment. Trampling of pollen into a living floor often results in an accumulation of pollen in greater quantity than observed in the fill of pit features” (Chapter 8).

**CHRONOLOGY**

A charcoal sample consisting of outer rings from one of the two pole segments that were found above the floor of the structure was submitted for radiocarbon dating. The sample produced a two-sigma calibrated date that includes two intervals, AD 660–810 and AD 840–860 (Sample 26CK6147-1; Beta-217144; Table 5.7; Appendix A). Examination of the calibration data indicates that the earlier of the two ranges is much more likely than the later one to include the sample’s “true” date.

**DISCUSSION AND SUMMARY**

Feature 4 consisted of the subterranean portion of a shallow, circular pit structure that measured about 3 m in diameter and 15-20 cm in depth. The superstructure incorporated wooden poles or posts with diameters of 7-10 cm. The two pole segments that were found on the floor of the structure were mesquite. This floor was unprepared, and no evidence of a hearth was encountered. A pollen sample collected from the floor produced the kind of elevated pollen count that is typical of this context within a habitation structure. Our best

![Figure 5.17. Close-up of charred mesquite(?) pole segment on the floor of Feature 4 at Scorpion Knoll.](image)
estimate is that the Feature 4 was built between AD 660 and 810. Little can be said about the artifacts that were used by the structure’s inhabitants. Only two potsherds were recovered from floor fill (Stratum 2), though additional sherds came from the upper (Stratum 1) fill, as well as from sediment that overlay Features 4 and 8 together. The dating of the structure is, however, consistent with the idea that its inhabitants were responsible for at least a portion of the site’s small assemblage of potsherds—it is likely, in other words, that they made use of ceramic vessels.

The presence of the charred remains of two wooden poles or posts indicates that at least a portion of Feature 4’s superstructure burned. The presence of a patch of ash and charcoal on the floor is consistent with this interpretation of the structure’s fate, though the evidence could relate instead to activities that took place within the structure while it was in use. There is, however, no evidence for extensive burning of the superstructure.

**Feature 5**

Feature 5 was a large pit that was recorded in the south wall of Backhoe Trench 485N (Figures 5.2 and 5.18). The pit originated 25 cm below ground surface at the contact between the A soil horizon and the underlying soil unit. It had a profile width of 1.05 m and a depth of 60 cm. The feature’s shape combined characteristics of the “basin” and “bell” categories that were defined at the nearby Larder Site. On the one hand, the feature profile included sloping side walls, a relatively flat floor, and a distinct angle where the walls
and floor of the feature met. These are all characteristics of that site’s basin-shaped pits. In addition, however, the upper portion of the walls included inward and outward turns that resembled the constrictions in the walls of the Larder Site’s bell-shaped pits. The fill within the pit was yellowish brown in color (10YR5/4) and included scattered areas of charcoal.

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No artifacts were observed in the trench-wall profile, nor were any found in the soil that was collected as pollen and flotation samples. A pollen sample (FN 88) collected from the floor and bottom 2-3 cm of feature fill contained globemallow, buckwheat, cholla, and prickly pear pollen that might reflect human use of one or more of these plants.

Feature 6

Feature 6, a large basin-shaped pit, was recorded in the south wall of Backhoe Trench 485N (Figures 5.2 and 5.19). It originated at the contact between the A horizon and the underlying sediment layer. The pit was about 1.4 m wide and 75 cm deep. The fill within the pit was yellowish brown in color (10YR 5/4) and incorporated scattered charcoal. It included a distinct band of sandy sediment with inclusions of small rocks located between 10 and 20 cm of the feature’s floor. No artifacts were observed in the trench wall or in the soils samples that were collected from the wall for possible flotation and pollen analysis.

Figure 5.19. Photograph of Feature 6 in the south wall of Backhoe Trench 485N, Scorpion Knoll.
A soil sample (FN 93) collected from the feature’s floor and bottom 3 cm of fill was sent for pollen analysis. The pollen profile obtained from this sample included evidence of recent contamination, in the form of tamarisk pollen and a large overall pollen count.

**Feature 7**

Feature 7 was an irregular-shaped pit recorded in the north wall of Backhoe Trench 495N, approximately 1.5 m northwest of pithouse Feature 4 (Figures 5.2 and 5.20). It had a pointed bottom and sloping and vertical sides and did not fit any of the shape categories identified at the Larder Site. The pit originated at the boundary between the A soil horizon and underlying sediment layer, at a depth of 20-25 cm below ground surface. The top of the sediment unit identified as feature fill rose 10-15 cm above this soil boundary in the center of the feature, or to within about 7 cm of the ground surface. It also extended out over the edges of the pit, on both its western and eastern sides. The pit had a maximum profile width of about 75 cm, and a depth of 65-70 cm (figuring from the edge of the pit) or 80 cm (measuring to the top of the fill unit). The light brown (7.5YR 6/4) fill contained some scattered fragments of charcoal.

Figure 5.20. Photograph of Feature 7 in the north wall of Backhoe Trench 495 N at Scorpion Knoll, following sample collection.
No artifacts were noted in the feature profile or in the soil samples that were collected from the feature fill. A soil sample (FN 96) collected from the floor and bottom 2-3 cm of feature fill contained pollen from globemallow and a member of the rose family; this evidence may reflect the use of these kinds of plants by the people who built the storage pit.

Feature 8

Feature 8 was discovered in the southwestern corner of the block area that was excavated to investigate Feature 4 (Figures 5.2, 5.14, 5.15, and 5.21). It appears to have been a shallow pit feature that was dug into the southwestern edge of Feature 4, and, like that feature, it may have been a pit structure. Too little of Feature 8 was uncovered, however, for this interpretation to be stated with much confidence. The excavated portion of Feature 8 measured 1.1 m north-south by about 1.5 m east-west and had an evenly curving northeastern edge or wall. As in the case of Feature 4, the floor of Feature 8 was bordered by a low “rise.” The maximum vertical distance between the top of this rise and the lowest portion of the feature’s floor was about 10 cm. This floor resembled the one in Feature 4 in that included areas that were well-preserved, that were poorly preserved, and that had been destroyed by animal burrowing. The floor was underlain by the same gypsum rich stratum as the floor of Feature 4. Three fill strata were identified in a profile that ran north-south through the excavated portion of the feature: a bottom sandy layer with several charcoal/ashy bands, a middle disturbed layer consisting of sand and silt, and an upper layer also consisting of sand and silt. The middle and upper layers also extended to the north, into Feature 4. In general, the fill and floor in the excavated portion of Feature 8 had been much disturbed by animal burrowing.

Figure 5.21. Photograph of Feature 8 (in far right corner of the excavation block) and the southern edge of Feature 4 at Scorpion Knoll.
The two excavation units that included Feature 8 produced a small artifact assemblage consisting of one potsherd, 14 flakes, and a possible small palette fragment. Three of the 14 flakes came from a unit that fell entirely within the bounds of Feature 8; the rest were from a unit that overlapped Feature 4 as well. A pollen sample (FN 122) was collected from sediment located 0-5 cm above Feature 8’s floor. The sample contained a small amount of maize pollen, as well as small quantities of pollen from several wild plants that may reflect the use of those plants by the site’s inhabitants. They included globemallow, buckwheat, primrose, cholla, non-prickly pear cactus, and a member of the rose family.

**Roasting Area**

As used here, the term “roasting area” refers to an archaeological deposit consisting of roasting-pit debris, including charcoal-and-ash-stained sediment and burned and fire-cracked rocks. Deposits of this kind can measure anywhere from a few meters to tens of meters across and from tens of centimeters to more than a meter deep. Some features of this kind incorporate a single, large roasting feature, but in other cases the midden can incorporate a number of small roasting pits. Both kinds of features may also be present, i.e., one large roasting pit at the center of the feature, with some number of small roasting pits located in the surrounding debris deposit. Whatever the configuration of the roasting pits, the existence of the midden indicates that numerous “roasting events,” involving many “cleanings out” of one or more roasting pits, occurred in the area. If small roasting pits are indeed present in the midden, it is likely that they represent only the final episodes of roasting activity. This is because later episodes would tend to obscure or destroy the evidence of earlier ones.

Five observations bear on the identification of a possible roasting area at the northern end of the Scorpion Knoll Site. First, the small roasting pit, Feature 3, is located in this portion of the site. Second, this feature appeared to have been incorporated in a larger deposit of roasting debris. Third, the depression left when a possible pit structure, Feature 2, was dismantled appeared to have been filled in part with roasting-pit debris. Fourth, that feature fill may also have incorporated the obscured evidence of a second small roasting pit. Features 2 and 3, which produced these first four pieces of evidence, were located within two meters of each of other. The fifth and final observation applies to an area located several meters to the west of those two features. It consisted of a dark soil stain, 3 m in diameter, that was revealed immediately below the ground surface during machine-backfilling of the trenches and units that had been excavated at the site (Figure 5.2). The soil stain is probably the upper surface of a deposit of roasting-pit debris. Together, these five pieces of evidence indicate a concentration of roasting features and roasting activity along the northern edge of Scorpion Knoll. Although the evidence does not indicate the presence of a single, broad midden of roasting debris, it is sufficient to support the identification of a “roasting area” in this portion of the site.
CHAPTER 6
FLAKED STONE ANALYSIS

Vanessa French and Suzanne Eskenazi

METHODS

A technological analysis was used to identify material types and reduction sequences for the lithic assemblage recovered from sites 26CK6146, 26CK6147, and 26CK6007. Material types recovered at these sites included volcanic, cryptocrystalline silicates, and metamorphic types (i.e. basalt, andesite, chert, chalcedony, quartzite, and obsidian). The material types and simple color descriptions were described in order to determine if specific raw material types were sourced or exploited.

The debitage was further analyzed and separated according to reduction characteristics. General forms such as primary, secondary, and cores would determine the sequences for biface preparations. Tool manufacture production flakes were determined by biface thinning and pressure flakes. Flaked stone tools were also recovered and identified from the sites. These were separated accordingly into categories such as early, middle, or late stage bifaces, retouched and utilized flakes, and projectile points.

RESULTS

The Larder Site (26CK6146)

A total of 1,077 pieces of debitage was recovered from this site (Table 6.1). Chert dominated the raw materials, (n=691), followed by quartzite (n=179), basalt (n=98), chalcedony (n=97), obsidian (n=9), and andesite (n=3). Thirty-seven tools were also recovered and analyzed (Table 6.2). These included projectile points, middle and late stage bifaces, and utilized flakes and scrapers. Projectile point types included Elko Eared and Elko Corner-notched, Desert Side-notched, and Cottonwood Triangular (Table 6.3). Core fragments were also analyzed; some of these also had slightly battered edges, which may have been caused by repeated strikes or from naturally occurring impacts during transport in the area of the site.

A number of large basalt flakes were recovered from Site 26CK6146. Most of these basalt flakes were recovered on the site’s surface and they are generally located within a concentrated area. These medium to large basalt flakes may have been produced during ground stone production.

Scorpion Knoll (26CK6147)

A total of 139 flakes were collected from this site (Table 6.4), the majority of which were recovered from the surface. Raw material types at this site were similar to those identified at 26CK5146. Chert dominated the assemblage (n=84), followed by chalcedony (n=40), quartzite (n=9), basalt (n=5), and obsidian (n=1). Four formal tools were identified in the assemblage (Table 6.5). These included three late-stage bifaces (all non-diagnostic fragments) and one utilized flake.
Table 6.1. Debitage Recovered from the Larder Site.

<table>
<thead>
<tr>
<th>Reduction Stage</th>
<th>Raw Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chert</td>
</tr>
<tr>
<td>Primary</td>
<td>38</td>
</tr>
<tr>
<td>Secondary</td>
<td>50</td>
</tr>
<tr>
<td>General-Percussion</td>
<td>522</td>
</tr>
<tr>
<td>Biface Thinning</td>
<td>56</td>
</tr>
<tr>
<td>Pressure</td>
<td>4</td>
</tr>
<tr>
<td>Shatter</td>
<td>14</td>
</tr>
<tr>
<td>Over-shot</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>691</td>
</tr>
</tbody>
</table>

Table 6.2. Flaked Stone Tools Recovered from the Larder Site.

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>Raw Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basalt</td>
</tr>
<tr>
<td>Battered Implement</td>
<td>1</td>
</tr>
<tr>
<td>Scraper</td>
<td>1</td>
</tr>
<tr>
<td>Late State Biface</td>
<td>4</td>
</tr>
<tr>
<td>Middle Stage Biface</td>
<td>4</td>
</tr>
<tr>
<td>Cottonwood Triangular</td>
<td>1</td>
</tr>
<tr>
<td>Elko Corner Notch – Base</td>
<td>2</td>
</tr>
<tr>
<td>Desert Side Notched</td>
<td>2</td>
</tr>
<tr>
<td>Elko Eared – Base</td>
<td>1</td>
</tr>
<tr>
<td>Reworked Biface</td>
<td>1</td>
</tr>
<tr>
<td>Utilized Flake</td>
<td>1</td>
</tr>
<tr>
<td>Uniface</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 6.3. Projectile Points Recovered from the Larder Site.

<table>
<thead>
<tr>
<th>FN</th>
<th>Collection Unit Location &amp; Type</th>
<th>Level</th>
<th>Material</th>
<th>Color</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Thickness (mm)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>264N 508E point location</td>
<td>Surface</td>
<td>Chert</td>
<td>Brown</td>
<td>23</td>
<td>26</td>
<td>4</td>
<td>Elko Earred, Base Fragment</td>
</tr>
<tr>
<td>76</td>
<td>115N 522E point location</td>
<td>Surface</td>
<td>Chert</td>
<td>Red</td>
<td>8</td>
<td>13</td>
<td>3</td>
<td>Desert Side Notched, Base Fragment</td>
</tr>
<tr>
<td>107</td>
<td>223N 488E point location</td>
<td>Surface</td>
<td>Quartzite</td>
<td>Dark Gray</td>
<td>27</td>
<td>24.5</td>
<td>5</td>
<td>Elko Earred, Base Fragment</td>
</tr>
<tr>
<td>115</td>
<td>238N 522E point location</td>
<td>Surface</td>
<td>Chert</td>
<td>Brown</td>
<td>18</td>
<td>13</td>
<td>3</td>
<td>Cottonwood Triangular, Base Fragment</td>
</tr>
<tr>
<td>118</td>
<td>171N 520E point location</td>
<td>Surface</td>
<td>Chert</td>
<td>White-Gray</td>
<td>33</td>
<td>23</td>
<td>5</td>
<td>Elko Corner Notched, Base Fragment</td>
</tr>
<tr>
<td>131</td>
<td>Feature 12 130.6N 494.2E 0.5×1 m excavation unit</td>
<td>.20-.24</td>
<td>Chert</td>
<td>Pink-Gray</td>
<td>24</td>
<td>14</td>
<td>3</td>
<td>Desert Side Notched</td>
</tr>
<tr>
<td>202</td>
<td>148.5N 499.E 1×1 m excavation unit</td>
<td>.39</td>
<td>Chert</td>
<td>Tan</td>
<td>22.5</td>
<td>23.5</td>
<td>5</td>
<td>Elko Corner Notched, Base Fragment</td>
</tr>
</tbody>
</table>

Table 6.4. Debitage Recovered from Scorpion Knoll.

<table>
<thead>
<tr>
<th>Reduction Stage</th>
<th>Chert</th>
<th>Chalcedony</th>
<th>Obsidian</th>
<th>Quartzite</th>
<th>Basalt</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Secondary</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>General Percussion</td>
<td>53</td>
<td>32</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>95</td>
<td>68</td>
</tr>
<tr>
<td>Biface Thinning</td>
<td>11</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Pressure</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Shatter</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Bulb Removal</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cores</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>40</td>
<td>1</td>
<td>9</td>
<td>5</td>
<td>139</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6.5. Flaked Stone Tools Recovered from Scorpion Knoll.

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>Raw Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Stage Biface</td>
<td>2</td>
</tr>
<tr>
<td>Utilized Flake</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
</tr>
</tbody>
</table>
Site 26CK6007

This site has the smallest assemblage of the three excavated sites. The flaked stone assemblage includes 30 flakes and a single utilized flake. All of the artifacts were recovered from excavation units. The dominant material type is quartzite (n=17), followed by chert (n=6), chalcedony (n=5), and basalt (n=2). In excavation unit 10N 14E, 12 heat-treated flakes were recovered between .20-.35 meters below the datum; all were quartzite general percussion flakes.

Table 6.6. Flaked Stone Artifacts Recovered from Site 26CK6007.

<table>
<thead>
<tr>
<th>Reduction Stage</th>
<th>Chert</th>
<th>Chalcedony</th>
<th>Basalt</th>
<th>Quartzite</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>General Percussion</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>16</td>
<td>25</td>
<td>83</td>
</tr>
<tr>
<td>Biface Thinning</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>17</td>
<td>30</td>
<td>99</td>
</tr>
</tbody>
</table>

CONCLUSION

The dominant material throughout all three excavated sites is chert, which comprises 63 percent of all raw materials. Quartzite comprises 20 percent of all utilized raw materials, and when combined, basalt, chalcedony, and andesite total less than 20 percent. General percussion flakes are easily the most abundant type recovered from all three sites.

Heat treated flakes were also recovered at the three sites. Most of the heat treated flakes were recovered from hand excavation units rather than from the surface collection units. Many of these heat treated flakes were collected from the Larder Site (26CK6146; n=178) and were found between 0.20 and 0.50 m below the datum. A very small portion was collected from between 0.70 and 0.85 m below the datum. Several tools appeared to be burned as well, including a scraper, two late-stage bifaces, and a battered implement. Sites 26CK6147 and 26CK6007 only produced a very small sample of heat treated flakes. Scorpion Knoll (26CK6147) yielded only three heat-treated flakes, and site 26CK6007 yielded twelve.

The Larder Site, 26CK6146, is the largest of the three sites in size and with respect to the flaked stone assemblage. The presence of several cores and the amount of general percussion and biface thinning flakes suggests that this site was used for tool production. This idea is further supported by the presence of middle and late stage bifaces, utilized flakes, and finished projectile points.

Five 5×5 m surface collection units were established at Site 26CK6146. In one particular unit alone, 115N 520E, 184 flakes were recovered. These 5×5 m units represent only a sampling of the actual flaked stone assemblage that was present on the surface; the high quantity of flakes present in the surface collection units suggests that similar counts would be encountered in other 5×5 m units.
Sherd assemblages from the Larder and Scorpion Knoll sites (26CK6146 and 26CK6147) are very different and reflect the complexity of the Ceramic period use of Las Vegas Wash. The Larder Site yielded an assemblage of sherds of the Patayan tradition, along with several sherds from the prehistoric Pueblo (Anasazi) tradition. The assemblage from Scorpion Knoll consists entirely of Pueblo pottery. Southern Paiute Brown Ware, the third pottery-making tradition common in the Las Vegas Valley, is not present at either site.

METHODS

The fundamental distinction between Pueblo and Patayan pottery lies in the techniques used to bond coils and thin vessel walls. Patayan pottery is thinned with a paddle and an anvil, Pueblo pottery by scraping. Three sets of observations were the basis for determining the method of thinning: presence/absence of sets of scrape marks on the interior surface; whether the interior was smooth, in the sense of no scrapes, or showed evidence of compaction; and whether I could feel the changing thickness or a ridge between anvil impressions. All of the sherds are from jars, recognized by lesser smoothing of their interior surfaces.

I used a 50× binocular microscope to examine the inclusions, clay texture, color, and indications of forming. In the sherds from both traditions, the larger inclusions, at least, are quite certainly temper, in the sense that they were added to the clay as the clay body was prepared, rather than originating as part of the clay itself.

For sherds collected from the surface, temper was reasonably visible. Visibility on sherds from buried contexts was poor, however, due to adhering matrix and some caliche formation. I used a steel probe to loosen the adhering material on the old broken edges of these sherds and a soft brush to sweep it away. No sherds were nipped. Damage to sherds was limited in anticipation of additional studies using other techniques.

CLASSIFICATION

None of the sherds from either site are embellished. The Patayan sherds are not slipped or painted, and none exhibit stucco. Among the Pueblo sherds, none are slipped, painted, corrugated, or coated with fugitive red. Observations on individual sherds are presented in Appendix B (Tables B.1 through B.3).

Patayan Pottery

Except for one sherd that may be Las Vegas Buff, the Patayan sherds represent a range of variation in temper and apparent clay color comparable to that encompassed by desert Topoe Buff, Tizon Brown Ware, and their intergrades as described by Seymour (2005:63-65). In almost all of these sherds, the temper looks the same at this magnification and visibility. The prominent grains are quartz, followed by feldspars, the former clear and the latter usually white and more opaque. The grains are 1-2 mm in diameter, the size of coarse sand. The quartz grains are often polycrystalline and show no signs of rounding. Sometimes they have small dark accessory minerals (DAMs) attached to them. More than one dark mineral is indicated: one appears as a bundle of lath-shaped crystals, the other as a clump of tiny grains, possibly iron oxide. Both of these kinds of DAMs have iron as a constituent and show some oxidation, perhaps the result of weathering or of oxidation during firing. There are also occasional free clumps of these DAMs in the clay bodies. This temper is generally not micaceous, but a few sherds had a flake or two of coppery mica. The sherd of Las Vegas Buff (?) incorporates one or more carbonate grains, probably caliche or carbonate mudstone (see Carpenter 2005:Fig 4.12).
Pueblo Pottery

Two Pueblo wares, each represented by a single type, are present in the collections from both sites. They are common in Pueblo assemblages in the Moapa Valley, located about 67 km (40 mi) northeast of Las Vegas Wash and were probably transported from there.

NORTH CREEK GRAY

Sherds classed as North Creek Gray (Tusayan Gray Ware, Virgin Series [Colton 1952:19-20]) from both sites have light to medium gray clay and temper that is predominantly quartz. North Creek Gray is common in the western part of the Arizona Strip, southwestern Utah, and along the Muddy and lower Virgin Rivers in southern Nevada. It is thought to have been produced at multiple locales within its area of distribution.

MOAPA GRAY

“Olivine” temper distinguishes Moapa Gray Ware sherds. This temper actually includes ortho- and clino-pyroxene and spinel in addition to olivine, a complex of minerals that points to the pottery’s origins in the vicinity of Mt. Trumbull and Tuweep, located north of the western Grand Canyon (Lyneis 1992:44). There, these minerals co-occur in xenoliths found in basalts and as nodules in volcanic ash deposits. Moapa Gray Ware sherds are common at Pueblo settlements in the Moapa Valley from Basketmaker III (AD 500–700) through about AD 1150. Their frequency declines between AD 1150 and 1250.

Clay colors trend from grays and browns in the early part of the span of Moapa Gray Ware to lighter-colored clay. The dark gray clay in the sherds from the Larder and Scorpion Knoll sites suggests that they are from the early part of Moapa Gray Ware’s span. They should, on that basis, be classed as Moapa Brown (Colton 1952:60), the antecedent of Boulder Gray. Although Schroeder (1955:130) alludes to this change, the range of colors particular to specific time periods has not been determined.

SITE SUMMARIES

Larder Site

The sherds from the Larder Site are from two components that differ in kind, in numbers, and to some extent in context. One of these components produced 40 Patayan sherds (Table 7.1), 36 of which were collected on the ground surface and four of which came from beneath the surface. The other component was represented by five Pueblo sherds (Table 7.2); two of these sherds were found on the ground surface, and three were from excavated contexts.

PATAYAN POTTERY

Three contexts account for the four Patayan sherds that were revealed through excavation. Two sherds (FN 319-1 and 319-2) that were from the same vessel, though they did not fit together, were found in the fill of a storage pit (Feature 31), one sherd (FN 229) was found in A horizon sediment overlying a feature identified as a “depression” (Feature 41A), and one sherd (FN 341) was found in the backdirt from a backhoe trench (Trench 170N).
Four Patayan sherds are from jar necks or rims, and I estimate the interior aperture diameter (IAD) for two of them, each from different jars, at about 7 cm. Small apertures like these usually indicate canteens or small ollas. Another of the rim sherds (FN 68-2) has a significantly larger opening, but its diameter cannot be estimated. Each of the rim sherds is from a direct, rather than everted, rim. They are too small to provide much of a vessel profile, but they are more consistent with Waters’ (1982:539-557) Patayan I and Patayan II jar forms than those of Patayan III.

**PUEBLO POTTERY**

The five Pueblo sherds from the Larder Site represent at least four jars. The two Moapa Brown sherds are certainly from different vessels, judging from differing thicknesses and surface finishes. These two sherds were found on the ground surface, about 40 m apart at the northern end of the site (at 304N 464E and 333N 490E). Two of the North Creek Gray sherds (FNs 227 and 231) are probably from the same jar. Both sherds were found in the A horizon sediment overlying Feature 41A. The third sherd of this type (FN 235) came from a different jar. It was found in the fill of Feature 41A. No rim or neck sherds are included in the Pueblo pottery assemblage. None of the sherds are painted, no rims are present, and none of the sherds are corrugated.

Except for the probable early dating of Moapa Brown, none of these sherds has chronological significance within the span of Pueblo pottery in southern Nevada, about AD 500–1250.

**Scorpion Knoll**

Thirteen of the 17 sherds recovered at the Scorpion Knoll Site were found during excavation. The other four sherds came from the ground surface (Table 7.3). All of the sherds but one are from the Pueblo tradition. The exception is too small and caliche-coated to identify. Two types, Moapa Brown (n=4) and North Creek Gray (n=12), are present in the collection, and both occurred in both surface and excavated contexts. All of the sherds are fragments of jars, with one Moapa Brown sherd representing the shoulder/neck intersection. The rest are from the bodies of jars.
Table 7.3. Summary of Pueblo and Unidentified Sherds from Scorpion Knoll

<table>
<thead>
<tr>
<th>Class</th>
<th>Ware</th>
<th>Type</th>
<th>Sherd Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>Moapa Gray</td>
<td>Moapa Brown</td>
<td>Jar body</td>
<td>2</td>
</tr>
<tr>
<td>Tusayan Gray, Virgin Series</td>
<td>North Creek Gray</td>
<td>Jar body</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Excavated</td>
<td>Moapa Gray</td>
<td>Moapa Brown</td>
<td>Jar body</td>
<td>1</td>
</tr>
<tr>
<td>Tusayan Gray, Virgin Series</td>
<td>North Creek Gray</td>
<td>Jar body</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Unidentified</td>
<td>Unidentified</td>
<td>Unidentified</td>
<td>Jar body</td>
<td>1</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Although these assemblages are small, it is of some interest that Patayan sherds occurred almost alone in one context (on the surface of the Larder Site) and that Pueblo sherds occurred alone in two other contexts (on the surface and subsurface at Scorpion Knoll). A fourth context (subsurface at the Larder Site) produced several sherds of each kind. Each of the site assemblages represents multiple vessels—they are not pot drops. Although Ahlstrom et al. (2005) show that there are spatial patterns to the distribution of Pueblo, Patayan, and Southern Paiute pottery in the Las Vegas Valley, we are far from having a fine-grained pottery chronology for this area. At these two sites, at least, Patayan and Pueblo sherds are not mixed.

The Pueblo assemblages resemble those of the settlements in the Moapa Valley in that so many fragments are from jars. Yamashita-3 (26CK6446), near Logandale, dates a little after AD 1050. It yielded 317 (painted) bowl sherds and 5530 plain and corrugated jar fragments. In other words, there are about 17 jar sherds for every bowl sherd. The ratio of corrugated jar sherds to plain ones is about 1:37. While the Las Vegas Wash Pueblo assemblages are probably earlier than this, the kinds and quantities of vessel forms do not argue for specialized activities along the Las Vegas Wash.

Plain sherds, whether Patayan or Pueblo, give little information about chronology. The few Patayan rims from the Larder Site would be at home in either Patayan I or II. The absence of corrugated sherds from the Pueblo assemblages suggests that they predate AD 1100 or so, but it could be the result of the small sample size. The observation of dark gray clay in the Moapa Gray Ware sherds in Pueblo assemblages from both sites suggests that the sherds in question date to the earlier part of the span of Pueblo pottery, somewhere in the Early Ceramic period (AD 500–1000) of Ahlstrom et al. (2005).
CHAPTER 8
BOTANICAL ANALYSES

Botanical and flotation samples recovered during HRA’s investigations at the Larder and Scorpion Knoll sites were analyzed in four stages. In the first stage, Richard Holloway of Quaternary Services examined a single burned seed from the Larder Site in preparation for its submission for radiocarbon dating (Chapter 4:Feature 12). The second stage involved the processing and analysis, by Linda Scott Cummings and her colleagues at the Paleo Research Institute, of a selection of pollen, flotation, and macrofloral samples (below). In the third stage, David Rhode processed and examined additional flotation and macrofloral specimens (Appendix D). Finally, Richard Holloway analyzed another set of pollen samples (below). Use of the phased strategy made it possible to fine-tune the selection of samples that were to be analyzed from one phase to the next. A major goal of this procedure was to obtain radiocarbon dates from features that produced evidence of maize.

POLLEN AND MACROFLORAL ANALYSIS FOR SITES 26CK6146 (LARDER SITE) AND 26CK6147 (SCORPION KNOLL SITE)

Linda Scott Cummings, Kathryn Puseman, Jaime Dexter, and R. A. Varney
Paleo Research Institute

Samples from archaeological sites for the Las Vegas Wash Project in the Clark County Wetlands Park, southeast Nevada, were selected for archaeobotanic analyses. Pollen analysis was conducted on samples from features at Sites 26CK6146 (Larder Site) and 26CK6147 (Scorpion Knoll Site) in an effort to learn how important riparian resources were to the people living at these sites. Additionally, samples from Sites 26CK6146 and 26CK6147 were examined for macrofloral remains to further elucidate plant resources processed at these sites. Radiocarbon ages reported for these sites indicate multiple occupations including the Terminal Archaic period, Virgin Branch (Anasazi), and Southern Paiute or Patayan (Mojave). The Paiute occupied Las Vegas Valley during the historic period; however, evidence suggests an influx of Virgin Branch (Anasazi) groups from the east and Patayan groups from the south during the prehistoric ceramic period. Additional radiocarbon dates are necessary to better determine when the sites were occupied.

Methods

POLLEN

A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for the removal of the pollen from the large volume of sand, silt, and clay with which they are mixed. This particular process was developed for extraction of pollen from soils where preservation has been less than ideal and pollen density is lower than in bogs or lake sediments.

Hydrochloric acid (10%) was used to remove calcium carbonates present in the soil, after which the sample was screened through 150 micron mesh. The sample was rinsed until neutral by adding water, letting the sample stand for 2 hours, then pouring off the supernatant. A small quantity of sodium hexametaphosphate was added to the sample once it reached neutrality, then the beaker again was filled with water and allowed to stand for 2 hours. The sample was again rinsed until neutral, filling the beaker only with water. This step was added to remove clay prior to heavy liquid separation. At this time the sample was dried, then pulverized. Sodium polytungstate (density 2.1) was used for the flotation process. The sample was mixed with sodium polytungstate and centrifuged at 1500 rpm for 10 minutes to separate organic from inorganic remains. The
The supernatant containing pollen and organic remains is decanted. Sodium polytungstate again is added to the inorganic fraction to repeat the separation process. The supernatant is decanted into the same tube as the supernatant from the first separation. This supernatant is then centrifuged at 1500 rpm for 10 minutes to allow any silica remaining to be separated from the organics. Following this, the supernatant is decanted into a 50 ml conical tube and diluted with distilled water. The sample is centrifuged at 3000 rpm to concentrate the organic fraction in the bottom of the tube. After rinsing the pollen-rich organic fraction obtained by this separation, the sample received a short (20-30 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The sample then was acetolated for 3-5 minutes to remove any extraneous organic matter.

A light microscope was used to count the pollen to a total of approximately 30-200 pollen grains at a magnification of 500x. Pollen preservation in this sample varied from good to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University and the University of Colorado Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of pollen, and may be interpreted to represent pollen dispersal over short distances, or the introduction of portions of the plant represented into an archaeological setting. Aggregates were included in the pollen counts as single grains, as is customary. The presence of aggregates is noted by an "A" next to the pollen frequency on the pollen diagram. A plus (+) on the pollen diagram indicates that the pollen type was observed outside the regular count while scanning the remainder of the microscope slide. Pollen diagrams are produced using Tilia, which was developed by Dr. Eric Grimm of the Illinois State Museum. Total pollen concentrations are calculated in Tilia using the quantity of sample processed in cubic centimeters (cc), the quantity of exotics (spores) added to the sample, the quantity of exotics counted, and the total pollen counted and expressed as pollen per cc of sediment.

Indeterminate pollen includes pollen grains that are folded, mutilated, and otherwise distorted beyond recognition. These grains are included in the total pollen count, as they are part of the pollen record.

Pollen analysis also includes identification of starch granules to general categories, if they are present. Starch granules are a plant's mechanism for storing carbohydrates. Starches are found in numerous seeds, as well as in starchy roots and tubers. The primary categories of starches include the following: with or without visible hila, hilum centric or eccentric, hila patterns (dot, cracked, elongated), and shape of starch (angular, ellipse, circular, eccentric). Some of these starch categories are typical of specific plants, while others are more common and tend to occur in many different types of plants.

MACROFLORAL

The macrofloral samples were floated using a modification of the procedures outlined by Matthews (1979). Each sample was added to approximately 3 gallons of water, then stirred until a strong vortex formed. The floating material (light fraction) was poured through a 150 micron mesh sieve. Additional water was added and the process repeated until all floating material was removed from the sample (a minimum of five times). The material that remained in the bottom (heavy fraction) was poured through a 0.5-mm mesh screen. The floated portions were allowed to dry.

The light fractions were weighed, then passed through a series of graduated screens (US Standard Sieves with 2-mm, 1-mm, 0.5-mm and 0.25-mm openings) to separate charcoal debris and to initially sort the remains. The contents of each screen then were examined. Charcoal pieces larger than 2-mm, 1-mm, or 0.5-mm in diameter were separated from the rest of the light fraction and the total charcoal weighed. A representative sample of these charcoal pieces was broken to expose a fresh cross section and examined under a binocular microscope at a magnification of 70x. The weights of each charcoal type within the representative sample also were recorded. The material that remained in the 2-mm, 1-mm, 0.5-mm, and 0.25-mm sieves was scanned under a binocular stereo microscope at a magnification of 10x, with some identifications requiring magnifications of up to 70x. The material that passed through the 0.25-mm screen was not examined. The
heavy fractions were scanned at a magnification of 2x for the presence of botanic remains. Remains from the light and heavy fractions were recorded as charred and/or uncharred, whole and/or fragments. The term "seed" is used to represent seeds, achenes, caryopses, and other disseminules. Macrofloral remains are identified using manuals (Martin and Barkley 1961; Musil 1963; Schopmeyer 1974) and by comparison with modern and archaeological references.

Samples from archaeological sites commonly contain both charred and uncharred remains. Many ethnobotanists use the basic rule that unless there is a specific reason to believe otherwise, only charred remains will be considered prehistoric (Minnis 1981:147). Minnis (1981:147) states that it is "improbable that many prehistoric seeds survive uncharred through common archaeological time spans." Few seeds live longer than a century, and most live for a much shorter period of time (Harrington 1972; Justice and Bass 1978; Quick 1961). It is presumed that once seeds have died, decomposing organisms act to decay the seeds. Sites in caves, water-logged areas, and in very arid areas, however, can contain uncharred prehistoric remains. Interpretation of uncharred seeds to represent presence in the prehistoric record is considered on a sample-by-sample basis. Extraordinary conditions for preservation are required.

**Ethnobotanic Review**

It is a commonly accepted practice in archaeological studies to reference ethnological (historic) plant uses as indicators of possible or even probable plant uses in prehistoric times. It gives evidence of the exploitation, in historic times, of numerous plants, both by broad categories, such as greens, seeds, roots, and tubers, etc. and by specific example, i.e., seeds parched and ground into meal that was formed into cakes and fried in grease. Repetitive evidence of the exploitation of resources indicates a widespread utilization and strengthens the possibility that the same or similar resources were used in prehistoric times. Ethnographic sources outside the study area have been consulted to permit a more exhaustive review of potential uses for each plant. Ethnographic sources do document that with some plants the historic use was developed and carried from the past. A plant with medicinal qualities very likely was discovered in prehistoric times and the usage persisted into historic times. There is, however, likely to have been a loss of knowledge concerning the utilization of plant resources as cultures moved from subsistence to agricultural economies and/or were introduced to European foods during the historic period. The ethnobotanic literature serves only as a guide indicating that the potential for utilization existed in prehistoric times—not as conclusive evidence that the resources were used. Pollen and macrofloral remains, when compared with the material culture (artifacts and features) recovered by the archaeologists, become indicators of use. Plants represented by pollen and charred macrofloral remains will be discussed in the following paragraphs in order to provide an ethnobotanic background for discussing the remains.

**NATIVE PLANTS**

**Cactaceae (Cactus Family)**

Many members of the cactus (Cactaceae) family were important food resources. Cacti such as *Opuntia* (prickly pear), *Echinocereus* (hedgehog cactus, strawberry cactus), *Mammillaria* (pincushion cactus), *Echinocactus*, and *Sclerocactus* might have been utilized for their fruits, seeds, and stems. Fruits were eaten fresh, cooked, or dried for future use. Seeds were eaten in soups, or dried, parched, and ground into a meal to be used in gruel or cakes. Cacti are found throughout the western United States on arid, rocky, or sandy soils (Kavasch 1979:61; Kearney and Peebles 1960:570-571; Kirk 1975; McDougall 1973:320)(Palmer 1871)(Shields 1984:92). Cactus fruits, buds, and stems provided some essential nutrients not available in most native foods (Gasser 1981:224). Various cacti are noted to have been important winter resources for Southern Paiute groups (Bye 1972)(Kelly 1964:36).
**Opuntia** (Prickly Pear Cactus)

All species of *Opuntia* (prickly pear cactus) produce edible fruit. The fruits were eaten raw, stewed, or dried for winter use. Juice from the fruit was applied to warts (Foster and Duke 1990:88). Young stems or pads were peeled and eaten raw or roasted. The spines might have been burned off both the fruit and stems in preparation for consumption (Harrington 1967:24). Peeled pads were used as a dressing on wounds, and a tea made from the pads was used to treat lung ailments. The seeds were eaten in soups or dried, parched, and ground into a meal to be used in gruel or cakes. Cactus plants are found throughout the western United States on arid, rocky, or sandy soils. They are occasionally found growing east to New York and Massachusetts, and west to British Columbia and Washington (Harrington 1964:382-384; Kirk 1975:50-52; Medsger 1966:61; Muenscher 1980:317).

Cheno-ams

Cheno-ams are a group of plants that include *Amaranthus* (pigweed) and members of the Chenopodiaceae (goosefoot) family, such as *Atriplex* (saltbush), *Chenopodium* (goosefoot), *Monolepis* (povertyweed), and *Suaeda* (seepweed). These plants are weedy annuals or perennials, often growing in disturbed areas such as cultivated fields and site vicinities. Plants were exploited for both their greens and seeds. Leaves can be eaten fresh or cooked as greens, either alone or with other foods. The greens are most tender in the spring when young, but may be used at any time. Seeds can be eaten raw but most often were ground into a meal and used to make a variety of mushes and cakes. The seeds usually are noted to have been parched prior to grinding. Various parts of the Cheno-am plants are noted to have been gathered from early spring (greens) through the fall (seeds) (Harrington 1967; Kearney and Peebles 1960; Kirk 1975; Sweet 1976; Tilford 1997).

*Amaranthus* (Amaranth, Pigweed)

*Amaranthus* leaves were an important source of iron and vitamin C, and are reported to have an asparagus-like flavor. *Amaranthus* poultices were used to reduce swellings and to soothe aching teeth. A leaf tea was used to stop bleeding, as well as to treat dysentery, ulcers, diarrhea, mouth sores, sore throats, and hoarseness (Angier 1978:33-34; Harris 1972:58; Kirk 1975:63; Krochmal and Krochmal 1973:34-35).

*Atriplex* (Saltbush)

*Atriplex* (saltbush) occurs as both an annual herb and perennial shrub. The leaves and young shoots have a salty taste and can be used as a seasoning. Saltbush twigs were boiled or baked with meat. Wood ashes were used to color cornmeal as a substitute for baking powder. A poultice of the chewed plant was applied to ant, bee, and wasp sting swellings. *A. canescens* (four-wing saltbush) was used for stomach pain or as an emetic. Dried leaves were used as a snuff for nose trouble, and a poultice of the warm, pulverized root was applied to toothaches. The dried tops also were used to make a tea for treating nausea and vomiting from the flu, as well as for breaking fevers. *Atriplex* seeds are very nutritious and can be ground into a meal, mixed with water and drunk as a beverage, or mixed with some other meal and used as flour. The seeds do not ripen until mid-fall and will remain on the shrubs throughout the winter into the next growing season. *Atriplex* leaves, twigs, and blossoms yielded a bright yellow dye. *Atriplex* is a native that is found widely scattered throughout the western United States in wastelaces and fields, growing in arid, alkaline, or saline soils (Bryan and Young 1978:32; Kearney and Peebles 1960:255; Moerman 1986:85-86; Moore 1990:29; Muenscher 1980:180; Weiner 1972:75).

*Chenopodium* (Goosefoot)

*Chenopodium* seeds are noted to have been important resources for groups in the Southwest. *Chenopodium* leaves are rich in vitamin C and were eaten to treat stomachaches and to prevent scurvy. *Chenopodium* also is rich in calcium and vitamin A. Leaf poultices were applied to burns, and a tea made from the whole plant was used to treat diarrhea. *C. ambrosioides* (Mexican tea, American wormseed) has been used...
to expel worms in animals and humans. It also has been used to season beans. *Chenopodium* is a weedy annual capable of producing large quantities of seeds that can be harvested in the late summer and fall. *Chenopodium* commonly is found in cultivated fields, waste places, open woods or thickets, and on stony hills. It is an opportunistic weed, often establishing itself rapidly in disturbed areas (Angier 1978:191-193; Fernald 1950:592-596; Kirk 1975:56-57; Krochmal and Krochmal 1973:66-67; Martin 1972; Moore 1990:42; Sweet 1976:48).

**Ephedra** (Ephedra, Mormon tea, Joint-fir)

*Ephedra* (ephedra, Mormon tea, joint-fir) is a shrub with jointed stems or needles measuring two to twelve inches long. The stems most often were used to make a tea, although the seeds can be parched and ground into a meal or to make a type of coffee. *Ephedra* tea was a very useful medicinal resource. The tea was drunk as a diuretic, for mild kidney inflammations, weak kidneys, weak lungs, as a decongestant, for head colds and hay fever, and as a mild tonic. The tea also was used to treat syphilis and the painful urination gonorrhea. The Navajo are reported to have boiled the tops of *E. viridis* (green ephedra) into a drink for use as a cough medicine. *Ephedra* is found in arid parts of the western United States, including desert scrub, grassland, chaparral or brush, and pinyon-juniper woodland (Elmore 1976:92; Kirk 1975:21; Moore 1990:26-27; Reed 1970:2; Shields 1984:64; Sweet 1976:22).

**Lamiaceae (Mint Family)**

The Lamiaceae (mint) family is characterized by square stems and the hair-like oil glands on the surfaces of leaves and stems that are often used as flavorings. Members of this family were utilized as potherbs, seasonings, flours, and medicines. A tea made from dried or fresh *Mentha* (wild mint) leaves often is used to relieve stomach pain and to treat intestinal disorders. It also can be used as a colic remedy for infants. The active ingredient is menthol, which acts as a carminative and digestive system antispasmodic (Moore 1990:57, 66, 81; Tilford 1997:60). *Monarda* (beebalm, wild oregano) is used as a cough and sore throat remedy, for stomach pain, and to induce sweating. The young leaves and leaf buds also can be used as a seasoning or a potherb (Moore 1990:61; Tilford 1997:18). The Havasupai are noted to have made flour from the seeds of *Moldavica* (dragon-head) plants (Kearney and Peebles 1960:738). *Salvia* (sage) is a valued medicine for epilepsy. A leaf tea can be used to treat coughs, colds, fevers, sore throats, stomach gas, and worms. Crushed leaves are used as an antiseptic and to relieve skin wounds and cuts. Sage oil can be rubbed on the skin to keep mosquitos and gnats away (Hedrick 1972; Heinerman 1983:54-55; Kirk 1975:84; Krochmal and Krochmal 1973:198; Medsger 1966). *Stachys* (hedge nettle) has edible leaves and flowers, and "it is used for sore throats, urethritis, cystitis, joint inflammations, and migraine headaches" (Tilford 1997:72).

**Liliaceae (Lily Family)**

Several native members of the Liliaceae (lily) family were important resources for prehistoric peoples in the Southwest. Wild onions (*Allium*) were consumed raw, used as flavoring, or preserved for future use (Beaglehole 1937:69; Cushing 1920:227; Nequatewa 1943:20; Robbins, et al. 1916:53, 110; Whiting 1939:70). *Brodiaea capitata* (also known as *Dichelostemma pulchellum*) is a close relative of the onion. All species of *Brodiaea* produce edible, bulb-like underground stems. The small bulbs can be eaten raw or cooked, and are noted to taste best when roasted in hot ashes. *Brodiaea* are perennial herbs in fields, meadows, dry ground, open ground, and/or moist soils (Castetter and Underhill 1935:18; Gallagher 1977:69; Kearney and Peebles 1960:182; Kirk 1975:173; Medsger 1966:197). *Calochortus* (sego lily) roots were frequently eaten raw, and the seeds and flowers ground to make "yellow pollen" (Colton 1974:297; Whiting 1939:70). Southwest Indians are reported to have used the caudex (thickened base) and young shoots of *Nolina microcarpa* (beargrass, sacahuista) in the same way that the corresponding parts of yucca and agave were used (Kearney and Peebles 1960:189; Kirk 1975:281). *Yucca* (yucca, soapweed) buds, flowers, and flower stalks were eaten raw or boiled, and the flower stalks were roasted like agave. *Y. baccata* (banana yucca) produces a fleshy fruit that was eaten raw or roasted, and fruits also were dried and ground into a meal or stored for future use. A fermented beverage also was made from the fruits. Young *Y. glauca* seed pods are slightly sweet and
were boiled and eaten. Yucca seeds also were used as food. Yucca roots contain saponin, and peeled roots were pounded with cold water to produce suds that were used for washing. Stevenson (1915:83) notes that yucca suds were used by all Indians of the Southwest for washing hair and cleaning wool garments and blankets. Fiber from yucca leaves was used to make cloth, sandals, baskets, mats, and rope. Leaves also were used to make brushes for painting pottery and decorating a variety of objects (Bryan and Young 1978:13; Kearney and Peebles 1960:185; Stevenson 1915:72-73, 78-79, 82-83).

Poaceae (Grass Family)

Members of the Poaceae (grass) family have been widely used as a food resource. The seeds could be eaten raw, but usually were parched and ground into a flour to make soups, mush, or breads. Several species of grass contain hairs (awns) that were singed off by exposing the seeds to flame. Young shoots and leaves were cooked as greens. Roots were eaten raw, roasted, or dried and ground into a flour. Grass also is reported to have been used as a floor covering, tinder, basketry material, and to make brushes and brooms. Various grasses were used in the manufacture or decoration of pahos (prayer sticks). Grass seeds ripen from spring to fall, depending on the species, providing a long-term available resource (Chamberlin 1964:372; Colton 1974:338, 365; Cushing 1920:219, 253-254; Fowler 1989:46; Kelly 1964:41-42; Kirk 1975:177-190; Whiting 1939:65).

Prosopis (Mesquite)

Prosopis (mesquite) is a xerophytic shrub or small tree and was very important to many Southwest tribes. The pods are sweet and were eaten fresh, boiled, or fermented to make a mild alcoholic drink. The pods also were dried and ground into flour. P. pubescens (screwbean, screwpod mesquite, tornillo) pods have an even sweeter taste and can be boiled down to make a syrup. The gum was mixed with fat and applied to sores and wounds, or boiled in water to make candy, pottery paint, or hair dye. The bark was used for tanning and dying. The inner bark was pounded and shredded to make coarse fabrics and for weaving baskets. Pottery paddles, cradleboards, and bows were made from mesquite wood, while fire-hardened wood was used for arrow tips. Mesquite wood burns slowly, with an intense heat, and burns down to a long-lasting bed of coals (Curtin 1984:93-95; Kearney and Peebles 1960:402; Kirk 1975:251-253; Peattie 1953:561-563; Reed 1970:4-5, 12, 19).

Solanaceae (Nightshade Family)

Members of the Solanaceae (nightshade) family, including Physalis (tomatillo, ground cherry), Lycium (wolfberry), and Solanum were exploited for food. Physalis was domesticated in Mexico and naturalized in eastern North America. Berries were eaten both raw and cooked. Berries taste best when fully ripe and can be made into preserves and pies, and boiled berries are frequently used in sauces such as chile verde and green chile. Some species are commercially grown for their berries, while others are common weeds of cultivated lands. Ground cherries are annual or perennial herbs found in moist to medium dry, open ground (Kearney and Peebles 1960:753-754; Kirk 1975). The berries and roots of Solanum also are edible (Robbins, et al. 1916:59, 70-73; Stevenson 1915:70). Lycium's red fruit (wolfberry) is edible and available in the spring. The fruit was palatable fresh, but also could be dried and stored, mashed and soaked in water, boiled into a soup, or otherwise cooked. The berries also were made into a beverage. This versatile berry appears to have been used by a diverse group of Indians (Elmore 1978:74; Kelly 1976:43).

Sphaeralcea (Globemallow)

Sphaeralcea (globemallow) was used widely for medicinal purposes. Hopi people used it to treat diarrhea, bowel trouble in babies, broken bones, and as an emetic. S. coccinea was used in a variety of ways. Crushed leaves were made into a poultice for skin inflammations and for sore, blistered feet. Fresh leaves and flowers were chewed or dried and made into a tea to treat sore throats, hoarseness, and minor stomachaches. Navajo-Kayenta peoples used an infusion of the plant to stop bleeding, as a lotion for skin diseases, as a tonic to increase appetite, and as a ceremonial fumigant ingredient. Navajo peoples also used S. angustifolia as a ceremonial medicine and to treat coughs, colds, and influenza. The Pima used a leaf decoction as a remedy for
diarrhea, while the Tewa applied a pulverized root poultice to snakebites and sores. Pima peoples also used *Sphaeralcea* as a cure for sore eyes. The stems may be chewed like chewing gum. *Sphaeralcea* tea has been used as a hair rinse, and a strong tea will curl hair if it is not washed out. Several of the species flower in spring and again after summer rains, and they may be found growing along roadsides and in fields (Curtin 1984:80; Moerman 1986:465-466; Moore 1979:167-168; Shields 1984:53).

*Typha* (Cattail)

*Typha* (cattail) are perennial marsh or aquatic plants with creeping rhizomes. This plant is a rich source of nutrients. Indian groups are noted to have used various parts of the cattail plant throughout the year. In the spring, young shoots were peeled and the inner portion eaten raw or cooked as potherbs. During the summer, young flower stalks were taken out of their sheaths and cooked. Flowers were eaten alone or added as a flavoring or thickening for other foods. Pollen-producing flowers and the pollen itself were collected and used as flour, either alone or mixed with other meal. In the fall, the rootstalks were collected, the outer peel removed, and the white inner cores of almost pure starch were eaten raw, boiled, baked, or dried and ground into flour. Cattail roots were richer in starch during the fall. Cattail starch flour is noted to be similar in quantities of fats, proteins, and carbohydrates to flour from rice and corn. The seed-like fruits also were collected and eaten in the fall. Indian groups are noted to process these “seeds” by burning off the bristles. The slightly astringent flower heads were sometimes used to relieve diarrhea and other digestive disorders. Cattail down was used as dressing for wounds and padding in cradleboards. Leaves and stems were used for weaving mats. Madsen (1989:45) notes that mats made of cattails are often found in Fremont sites with good preservation. These mats may have been used as sleeping mats. Cattails are found in marshy habitats in or near swamps, ponds, sloughs, and edges of streams (Harrington 1967:220-224; Kirk 1975:171; Sweet 1976:8; Tilford 1997:28-29).

*CULTIGENS*

*Zea mays* (Maize, Corn)

*Zea mays* (maize, corn) has been an important New World cultigen, originating from a wild grass called teosinte. At the time of European contact, Heiser (1990:89) notes that "maize was the most widely grown plant in the Americas, extending from southern Canada to southern South America, growing at sea level in some places and at elevations higher than eleven thousand feet in others." Maize has long been a staple of the Southwest inhabitants, and charred maize is found in almost every cliffhouse in the Southwest (Stevenson 1915:73). Maize can show great variability in kernel color, size, and shape; in ear size and shape; and in maturation time. Five types of maize exist, characterized by a different endosperm composition. Pop and flint corn have a hard starch and a high protein content. Flour corn has a soft starch and little protein. Dent corn has a localized deposit of soft starch on top of a hard starch that leaves a depression or dent in the top of the dried kernels. Sweet corn stores more sugar than starch. Innumerable ways of preparing maize exist. Green corn was eaten raw or boiled. Mature ears were eaten roasted or wrapped in corn husks and boiled. The kernels were popped, parched, boiled, or ground and made into a meal. Kernels also were soaked in *Juniperus* (juniper) wood ashes and made into hominy. Cornmeal can be colored with *Atriplex* (saltbush) ashes. Black corn is used as a dye for basketry and textiles and as a body paint. Maize may be husked immediately upon harvesting. Clean husks are saved for smoking and other uses, such as wrapping food. Corn also was sometimes shelled prior to storage. Ears were allowed to dry on the roof, and ristras of maize may be hung inside from the roof (Heiser 1990:89-98; (Mangelsdorf 1974; McGee 1984:240-242; Stevenson 1915:73-76).

*CHARCOAL*

Charcoal recovered from archaeological samples most often represents use of that type of wood as fuel; however, several trees and shrubs had utilitarian and medicinal uses as well. The presence of charcoal indicates that the trees and shrubs represented were present at the time of occupation. If these resources were present and collected as fuel, it also is possible that they were exploited for other purposes as well. The following
paragraphs discuss plants represented only by charcoal in the macrofloral record.

*Acacia* (Acacia)

*Acacia* (acacia, catclaw) are shrubs or small trees of the southwest United States. The *Acacia* often have thorny, slender branches with ferny, evergreen leaves. *A. greggii* (catclaw acacia, devil's-claw) is a common, often abundant, large shrub or small tree with sharp, strong, flattened, hooked spines that cover the branches. These spines are the reason for its common names of catclaw and devil's claw. The brown pods ripen in the fall and can remain on the branches for long periods of time. Native groups ground the dried pods into a meal that was used to make mush, cakes, and in a variety of other ways. Powdered pods and leaves are noted to make a good tea for diarrhea and dysentery, and the straight powder will stop superficial bleeding. Pods also be powdered and applied as a moistened poultice for muscle pain, bruises, or sprains. The flowers and leaves make a good anti-inflammatory for the stomach and esophagus in nausea and vomiting. The root makes a thick, mucilaginous tea good for sore throats, mouth inflammations, and coughs. The wood is strong, durable, and valued as firewood because the long-burning wood would remain an intense bed of coals after most wood was reduced to ashes. Catclaw acacia often forms thickets along streams and washes (Kearney and Peebles 1960:397-398; Kirk 1975:250; Moore 1989:11-12; 1990:80; Peattie 1953:545; Petrides and Petrides 1992:119).

**Discussion**

Sites 26CK6146, and 26CK6147 are situated in the western section of Clark County Wetlands Park north of Henderson in the southeastern corner of the Las Vegas Valley. These two sites are situated on an alluvial-fan terrace above the modern floodplain of Las Vegas Wash. Present-day vegetation on terraces above the floodplain is characterized by the Mojave desert scrub biotic community, including plants such as creosote bush (*Larrea*), four-wing saltbush *Atriplex canescens* – a Cheno-am), desert holly (*Atriplex hymenelytra* – a Cheno-am), and shadscale (*Atriplex confertifolia* – a Cheno-am). Wetland habitats and stands of mesquite (*Prosopis*) either occur on the floodplain or have been known to occur on the floodplain at some time in the past.

A total of 15 pollen and four macrofloral samples were collected from features at Site 26CK6146. This site is believed to document a long period of use and is anchored by radiocarbon dates ranging from AD 10-150 to AD 1400-1460. Four pollen samples and one macrofloral sample were analyzed from Site 26CK6147. Radiocarbon analysis of charcoal from a pithouse (Feature 4) at Site 26CK6147 suggests an occupation between AD 660-810 (Rick Ahlstrom, personal communication, July 14, 2006), reflecting use by Virgin Branch (Anasazi) groups.

**CLARK COUNTY WETLANDS PARK—WEST: SITES 26CK6146 AND 26CK6147**

Sites 26CK6146 (Larder Site) and 26CK6147 (Scorpion Knoll) were identified in the western portion of the Clark County Wetlands Park, approximately 200 m from one another. Both sites are located at the toes of alluvial fans at the abutment of the channel and channel deposits of Las Vegas Wash. Observed modern vegetation is typical of an upland community. No creosote was noted at either site, but it does grow approximately 100 meters upslope of the sites. Emergent wetland, riparian, and tamarisk communities also were observed nearby. Tamarisk was introduced during the historic era. Pollen and macrofloral samples were recovered from both sites. Although a control sample was only collected from the surface of 26CK6146, the close proximity of the two sites, coupled with the apparent similar environmental conditions, suggest that the results of the pollen control also can be applied to Site 26CK6147.
Figure 8.1. Pollen Diagram for Sites 26CK6001, 26CK6146, and 26CK6147, Nevada.
<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
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<tbody>
<tr>
<td><strong>ARBOREAL POLLEN:</strong></td>
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<tr>
<td><em>Alnus</em></td>
<td>Alder</td>
</tr>
<tr>
<td>Fabaceae:</td>
<td>Bean or legume family</td>
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<tr>
<td><em>Acacia</em></td>
<td>Acacia</td>
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<tr>
<td><em>Prosopis</em></td>
<td>Mesquite</td>
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<tr>
<td><em>Fraxinus</em></td>
<td>Ash</td>
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<tr>
<td><em>Juniperus</em></td>
<td>Juniper</td>
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<tr>
<td>Pinaceae:</td>
<td>Pine family</td>
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<td>Fir</td>
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<tr>
<td><em>Pinus</em></td>
<td>Pine</td>
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<td><em>Salix</em></td>
<td>Willow</td>
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<tr>
<td><em>Tamarix</em></td>
<td>Tamarisk</td>
</tr>
<tr>
<td><strong>NON-ARBOREAL POLLEN:</strong></td>
<td></td>
</tr>
<tr>
<td>Apiaceae</td>
<td>Parsley/Carrot family</td>
</tr>
<tr>
<td>Asteraceae:</td>
<td>Sunflower family</td>
</tr>
<tr>
<td><em>Artemisia</em></td>
<td>Sagebrush</td>
</tr>
<tr>
<td>Low-spine</td>
<td>Includes ragweed, cocklebur, sumpweed</td>
</tr>
<tr>
<td>High-spine</td>
<td>Includes aster, rabbitbrush, snakeweed, sunflower, etc.</td>
</tr>
<tr>
<td><em>Boerhaavia</em>-type</td>
<td>Spiderling</td>
</tr>
<tr>
<td>Boraginaceae</td>
<td>Borage family</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td>Mustard family</td>
</tr>
<tr>
<td>Cactaceae:</td>
<td>Cactus family</td>
</tr>
<tr>
<td><em>Cylindropuntia</em> ( antiquated term used in palynology)</td>
<td>Cholla cactus</td>
</tr>
<tr>
<td><em>Opuntia</em></td>
<td>Prickly pear cactus</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Pink family</td>
</tr>
<tr>
<td>Cheno-am</td>
<td>Includes the goosefoot family and amaranth</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Sedge family</td>
</tr>
<tr>
<td><em>Ephedra nevadensis</em>-type (includes <em>E. clokeyi</em>, <em>E. coryi</em>, <em>E. funera</em>, <em>E. viridis</em>, <em>E. californica</em>, <em>E. nevadensis</em>, and <em>E. aspera</em>)</td>
<td>Ephedra, Jointfir, Mormon tea</td>
</tr>
<tr>
<td><em>Ephedra torreyana</em>-type (includes <em>E. torreyana</em>, <em>E. trifurca</em>, and <em>E. antisiphilitica</em>)</td>
<td>Ephedra, Jointfir, Mormon tea</td>
</tr>
<tr>
<td><em>Euphorbia</em></td>
<td>Spurge</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Bean or Legume family</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Mint family</td>
</tr>
<tr>
<td>Onagraceae</td>
<td>Evening primrose family</td>
</tr>
</tbody>
</table>
### Scientific Name | Common Name
---|---
Poaceae | Grass family
Polemoniaceae: Microsteris-type | Microsteris
Phlox-type | Phlox
Polygonaceae: Eriogonum | Knotweed
Polygonum aviculare-type | Wild buckwheat
Rosaceae | Rose family
Solanaceae | Potato/Tomato family
Sphaeralcea | Globe mallow
Typha angustifolia-type | Cattail
Zea mays | Maize, Corn
Indeterminate | Too badly deteriorated to identify

**STARCHES:**
- Angular starch: Typical of starches produced by grass seeds

**SPORES:**
- Monolete: Fern
- Trilete: Fern

**OTHER:**
- cf. *Symplocospollenites* (Redeposited pollen): Pollen liberated from geologic deposits and redeposited in Holocene deposits

**Site 26CK6146**

Site 26CK6146 is believed to have undergone multiple occupations beginning in the Terminal Archaic period and continuing though Southern Paiute or Patayan (Mojave) use of the area. Radiocarbon dating of six features at the site returned ages that range from 190 BC-AD 50 through AD 1400-1460. Several pits, interpreted as storage features, were identified. Fourteen pollen samples were recovered from ten of these storage pits and from one small roasting pit. In most cases, samples were obtained from basal fill (defined as occurring within 5 cm of the feature floor) or from the floor itself. Several of the pits yielded an “ashy basal fill.” These ashy deposits are not believed to reflect use of the pits as thermal features. Some pits did contain evidence of burning on the pit’s floor, which has been interpreted as a means of drying the feature or otherwise preparing it for use. Most of the storage features at the site were located in a Cy horizon soil layer. This stratum consisted of 60% or more gypsum, a natural desiccant. Archaeologists noted that the relatively large amount of gypsum may have assisted with the “success rate” for pit-storage of perishable items at this location (Richard Ahlstrom, personal communication April 14, 2006). In addition to feature samples, a single surface control sample was collected.

The pollen control, Sample 464, yielded a large quantity of Cheno-am pollen, similar to the quantity observed in Sample 8 from Site 26CK6001. This large quantity of Cheno-am pollen probably reflects saltbush and related shrubs growing in the vicinity of the area sampled. In addition, this control sample yielded small quantities of *Prosopis, Juniperus, Pinus, Tamarix, Artemisia*, Brassicaceae, Fabaceae, Poaceae, *Microsteris*-type, *Eriogonum*, Rosaceae, *Sphaeralcea, Typha angustifolia-type*, Low-spine Asteraceae, and High-spine
Asteraceae pollen, representing local mesquite, juniper, pine, tamarisk, sagebrush, a member of the mustard family, legumes, grasses, slender phlox, wild buckwheat, a member of the rose family, globemallow, cattail, and various members of the sunflower family including the ragweed, cocklebur and marshelder group (Low-spine), and the rabbitbrush, snakeweed, sunflower, aster, and other group (High-spine). This sample acts as a control for interpreting the prehistoric record. The large quantity of Cheno-am pollen in this sample is completely anomalous to the prehistoric record and probably is the result of increases in saltbush and related plants as a result of the recent down-cutting of Las Vegas Wash. This sample yielded a very large total pollen concentration (nearly 85,000 pollen per cubic centimeter (cc) of sediment. This is typical of modern samples.

Feature 7. This is a bowl-shaped pit with a well-defined floor. Pollen Sample 312 was recovered from the basal fill and floor of the pit. This sample yielded a moderate quantity of Cheno-am pollen, along with smaller quantities of Prosopis, Juniperus, Pinus, Tamarix, Artemisia, Low-spine Asteraceae, High-spine Asteraceae, Brassicaceae, Ephedra, Euphorbia, Poaceae, Microsteris-type, Rosaceae, Sphaeralcea, and Typha pollen, representing local mesquite, juniper, pine, tamarisk, sagebrush, various members of the sunflower family, a member of the mustard family, ephedra, spurge, grasses, slender phlox, a member of the rose family, globemallow, and cattail. Recovery of a moderate to moderately large quantity of microscopic charcoal fragments is consistent with sampling a cultural feature and indicates burning either nearby or perhaps within this feature. The total pollen concentration is relatively low, totaling approximately 1400 pollen grains per cc of sediment. Recovery of a small quantity of Tamarix pollen in this sample indicates intrusion of modern or historic pollen rain, which would be visible in a sample with a relatively low total pollen concentration.

Feature 12. A bell-shaped pit, designated Feature 12, is represented by pollen Sample 156 and macrofloral Sample 153. Radiocarbon analysis of a probable mesquite seed returned a radiocarbon age of AD 1400-AD 1460, placing feature use during Southern Paiute or possibly Patayan occupation of the area. Sample 156 was collected from the basal fill and floor of the pit. The pollen record for this sample was very similar to that of Sample 312 in many respects. Primary differences include recovery of a much larger quantity of microscopic charcoal fragments, which limited the pollen count. In addition, the total pollen concentration was low (only approximately 225 pollen per cc of sediment). No Tamarix pollen was observed while counting this sample, indicating that this context was intact. Notable pollen types include Opuntia, Lamiaceae, and Zea mays, representing prickly pear cactus, a member of the mint family, and maize. A radiocarbon age of AD 1400-AD 1460 is reasonable for the association with maize. The pollen record suggests processing, storing, or perhaps discarding prickly pear cactus, a member of the mint family, and maize in this bell-shaped pit. Recovery of Typha pollen in a small quantity probably reflects wind transport of cattail pollen, as has been noted in the modern control sample.

Macrofloral Sample 153 was recovered from Level 5 of the pit fill. This sample contained several charred Prosopis endocarp fragments, two charred Prosopis seeds, and several charred Prosopis seed fragments (Tables 8.2 and D.2), most likely reflecting processing of mesquite pods. The pods are sweet and often were dried and ground into flour. A single charred Prosopis pubescens seed also was present, indicating use of screwbean or screwpod mesquite. Screwbean pods are tightly coiled into a spiral and the seeds are smaller, as opposed to the straight pods with lignified endocarp segments and larger seeds of the other species of mesquite. Screwbean pods are noted to have an even sweeter taste than the pods of other species of Prosopis. The charcoal record consisted of probable Acacia and Prosopis, suggesting that acacia and mesquite wood were burned as fuel. The sample also contained one uncharred bone fragment and a small amount of rock/gravel. Recovery of charred remains in the storage pits examined for this project might represent ash and debris cleaned out of thermal features at the site that were used for food processing activities and deposited in the storage pits, reflecting use of the pits as trash pits following their use as storage pits. Alternatively, the pits might have been used for limited food processing activities.

Feature 14. Pollen Sample 327 was collected from the ashy basal fill and the floor of Feature 14, a deep, sloping-sided pit. The pollen record was similar to those from Features 7 and 12 in many respects. Pollen types that might represent economic activity include Opuntia and Zea mays, suggesting the possibility that
Table 8.2. Index of Macrofloral Remains Recovered from Sites 26CK6146 and 26CK6147.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FLORAL REMAINS:</strong></td>
<td></td>
</tr>
<tr>
<td>Cactaceae</td>
<td>Cactus family</td>
</tr>
<tr>
<td>Cheno-am</td>
<td>Includes goosefoot and amaranth families</td>
</tr>
<tr>
<td><em>Amaranthus</em></td>
<td>Pigweed, Amaranth</td>
</tr>
<tr>
<td><em>Atriplex</em></td>
<td>Saltbush, Shadscale</td>
</tr>
<tr>
<td><em>Chenopodium</em></td>
<td>Goosefoot</td>
</tr>
<tr>
<td><em>Descurainia</em></td>
<td>Tansy mustard, Flixweed</td>
</tr>
<tr>
<td><em>Prosopis</em></td>
<td>Mesquite</td>
</tr>
<tr>
<td><em>Sesuvium</em></td>
<td>Sea purslane</td>
</tr>
<tr>
<td>Vitrified tissue</td>
<td>Represents charred material with a shiny, glassy appearance due to fusion by heat</td>
</tr>
<tr>
<td><strong>CHARCOAL/WOOD:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Acacia</em></td>
<td>Acacia</td>
</tr>
<tr>
<td><em>Atriplex</em></td>
<td>Saltbush, Shadscale</td>
</tr>
<tr>
<td><em>Prosopis</em></td>
<td>Mesquite</td>
</tr>
</tbody>
</table>

prickly pear cactus and maize might have been stored in this pit. Prickly pear cactus pollen is not particularly abundant at this site, and since this pollen is transported by insects, recovery of *Opuntia* pollen might well be associated primarily with economic activities. Total pollen concentration was approximately 2100 pollen per cc of sediment.

*Feature 20.* This feature is an irregular bowl-shaped pit. The feature is represented by three pollen samples, each representing a different stratum of fill. Sample 377 was recovered from the basal fill and floor of the pit. The middle fill of the feature is represented by pollen Sample 376, while the overlying A horizon was examined to compare it with the deeper feature deposits. These three samples provide a unique examination of the fill from this pit. At the base, the pollen record is defined by an increased quantity of *Pinus* pollen, the presence of *Opuntia* pollen, and a moderate quantity of Poaceae pollen. The total pollen concentration was low (only approximately 600 pollen per cc of sediment). A small quantity of *Tamarix* pollen was observed to have intruded into the sample or perhaps was introduced at the time the sample was collected. A large quantity of microscopic charcoal fragments were recovered from this fill. The middle sample was dominated by *Ephedra* pollen and also contained a small quantity of Liliaceae pollen. An extremely large quantity of microscopic charcoal fragments were recovered from this middle fill, and the total pollen concentration was nearly 2500 pollen per cc of sediments, which is similar to that noted in the Feature 14 fill. Probable explanations for the large quantity of *Ephedra* pollen and microscopic charcoal fragments include piling ephedra either on the ground surface near the pit or perhaps within the depression remaining from this abandoned pit in preparation for processing this important medicinal resource in a feature nearby. This scenario also pre-supposes the presence of charcoal on the open ground surface that was available for wind (or water) transport into the abandoned Feature 20 fill. Alternatively, it is possible that ephedra grew in the abandoned Feature 20 pit as it filled, taking advantage of the additional water that is expected to accumulate in depressions. This second scenario is, perhaps, less attractive, since there is no evidence of increased quantities of pollen representing other weedy plants that would be expected to colonize this abandoned pit as it filled.

The upper fill exhibited the characteristic “upper fill” signature marked with an elevated Cheno-am pollen frequency. Since this signature was shared by more modern samples, including the modern control
(Sample 464) and the sample from the historic ditch (Sample 8, Site 26CK6001), it is likely that this sample contains some of the same A-horizon fill. In addition, this sample exhibited *Alnus, Prosopis, Pinus, Quercus, Apiaceae, Artemisia, Low-spine Asteraceae, High-spine Asteraceae, Brassicaceae, Opuntia, Onagraceae, Poaceae,* and *Eriogonum,* pollen, reflecting the presence of alder, mesquite, pine, oak, a member of the umbel family, sagebrush, various members of the sunflower family, members of the mustard family, prickly pear cactus, a member of the evening primrose family, grasses, and wild buckwheat. Very little microscopic charcoal was recovered, and the total pollen concentration was more than 25,000 pollen per cc of sediment.

**Feature 27.** Pollen Sample 357 consists of the ashy, basal fill and floor of Feature 27, a bell-shaped pit. Charred remains from the pit yielded a radiocarbon age of 190 BC-AD 50, indicating that the feature was used during the Terminal Archaic period. The pollen record exhibited Low-spine Asteraceae and Cheno-am pollen as co-dominants, reflecting local growth of the ragweed group of members of the sunflower family and also probably saltbush, representing the group of plants producing Cheno-am pollen. Small quantities of *Prosopis,* *Pinus,* *Artemisia,* High-spine Asteraceae, *Ephedra nevadensis*-type, Onagraceae, *Eriogonum,* and *Typha angustifolia*-type document local and/or regional growth of mesquite, pine, sagebrush, various members of the sunflower family such as rabbitbrush, ephedra, a member of the evening primrose family, wild buckwheat, and cattail. The *Typha* pollen is consistent with wind transport from cattails growing in the riparian area in the wash and is not elevated enough to suggest storage in this bell-shaped pit. Certainly the resource was available for exploitation, as were many others. A large quantity of microscopic charcoal fragments were noted in this sample, which is consistent with the description that the feature contained ash and burned remains. The total pollen concentration is approximately 2500 pollen per cc of sediment, which is consistent with this sample representing fill.

**Feature 30.** This flat-floored pit is represented by pollen Sample 368 from the ashy basal fill and pit floor. The Cheno-am and Poaceae pollen frequencies were slightly elevated in Sample 368, suggesting either processing both a member of the Cheno-am group and grasses or local growth of these plants. In addition, small quantities of *Prosopis, Pinus, Salix,* Low-spine Asteraceae, High-spine Asteraceae, Brassicaceae, Cyperaceae, *Ephedra nevadensis*-type, Onagraceae, *Eriogonum,* Rosaceae, Solanaceae, and *Typha angustifolia* pollen reflect local and/or regional mesquite, pine, willow, various members of the sunflower family including the ragweed group and the rabbitbrush group, a member of the mustard family, sedges, ephedra, a member of the evening primrose family, wild buckwheat, members of the rose and nightshade families, and cattail. It is likely that the Solanaceae pollen reflects local growth of a weedy member of the nightshade family; however, the possibility that a plant in this family, such as groundcherry, was processed cannot be ruled out. The presence of *Zea mays* pollen reflects processing or storing maize in this pit. The slightly elevated Cheno-am and Poaceae pollen frequencies might be associated with economic activity involving Cheno-ams and grasses. A moderately large quantity of microscopic charcoal fragments was recovered from this ashy basal fill, and the total pollen concentration was approximately 1200 pollen per cc of sediment, which is consistent with that noted in other fill samples.

**Feature 37.** The floor and basal fill from Feature 37, a deep, bell-shaped pit, was collected as pollen Sample 396. This sample yielded moderate quantities of *Pinus, Low-spine Asteraceae,* High-spine Asteraceae, Poaceae, and *Sphaeralcea* pollen, reflecting regional pines and local members of both groups of the sunflower family, grasses, and globe mallow. Recovery of an elevated globe mallow pollen frequency often is associated with the natural presence of these weedy plants. Occasionally, an elevated pollen frequency represents processing or storing globe mallow, a plant with known medicinal properties. Recovery of small quantities of *Prosopis,* Cheno-am, Onagraceae, and Rosaceae pollen reflects local growth of mesquite, Cheno-ams, and members of the evening primrose and rose families. A fern spore was observed while scanning this sample for cultigens. No pollen evidence for cultigens was noted. A very large quantity of microscopic charcoal fragments was recorded at the base of this pit, which is consistent with the concept of burning the pits to help seal the deposits or to dry out the pits. The total pollen concentration was low at approximately 175 pollen per cc of sediment. This might represent burning much of the pollen present at the time the feature was fired, poor
conditions for preservation, or using the pit for storing remains that did not introduce pollen. Sample 396 yielded the least pollen of any sample examined from this project.

**Feature 49.** This feature is a bell-shaped pit. A radiocarbon age of AD 10-150 was returned for this feature, suggesting that the pit was in use during the Terminal Archaic period. Two pollen samples were recovered from the feature. Sample 239, collected in Level 3, represents the basal fill and floor of the pit. The lower fill, recovered in Level 2, is represented by pollen Sample 218. The pollen record from these two samples was very different. The lower sample (239) was dominated by *Prosopis* pollen, reflecting a local mesquite bosque or storage of mesquite beans in this pit, while the upper sample (218) was dominated by Cheno-am pollen. The pattern of elevated Cheno-am pollen recovery suggests that the upper sample contains post-abandonment fill and probably is mixed with the overlying A-horizon. Therefore, no interpretation is made concerning the pollen in the upper fill sample, which included small quantities of *Opuntia, Typha* and Liliaceae pollen, other than that these pollen types probably represent plants growing either in the pit depression as it filled or near the pit.

Macrofloral Sample 240 also was collected from the lower Level 3 fill of Feature 49. This sample contained a charred Cactaceae spine fragment, a charred *Atriplex* seed, a charred *Prosopis* endocarp fragment, and 16 charred *Prosopis* seed fragments. Cactus fruits and/or pads, saltbush seeds, and mesquite pods/seeds appear to have been stored/processsed in the pit. Alternatively, these remains might have been present in debris cleaned out of a thermal feature and deposited in the pit. Numerous large chunks of *Prosopis* charcoal and a few small fragments of *Atriplex* charcoal indicate that local mesquite and saltbush were burned as fuel. Recovery of charred insect eggs and a few charred rodent fecal pellets might indicate that either this feature or a cleaned out thermal feature was left open and empty for a time, then re-used. The sample also yielded two uncharred bone fragments, a possible lithic flake, a few insect chitin fragments, and a few uncharred insect eggs.

**Feature 51.** This globular, bowl-shaped pit probably was used during the Terminal Archaic period, as anchored by a radiocarbon age of 100 BC-AD 110. Pollen Sample 262 and macrofloral Sample 265 were collected from the basal fill and floor of the pit. The pollen record exhibited a moderate quantity of Cheno-am pollen, which suggests the possibility of some mixing with the overlying A horizon or perhaps storage of Cheno-ams in this pit. A small quantity of *Tamarix* pollen was observed in this sample, strengthening the interpretation of mixing with the overlying A horizon. Other elements of this pollen record were similar to those obtained from other samples at this site. *Zea mays* and Liliaceae pollen were observed during the scan, suggesting the probability that maize was stored in the pit and the possibility that a member of the lily family also was stored. Recovery of an angular starch is consistent with storing maize in this pit. A moderate quantity of microscopic charcoal fragments was noted, representing burning the feature, possibly during the construction phase. Total pollen concentration was approximately 1230 pollen per cc of sediment, which is consistent with that noted in other fill samples.

The macrofloral record for Sample 265 contained a charred Cactaceae spine fragment, suggesting that cacti were processed. Two charred *Atriplex* fruit fragments and four charred *Atriplex* seeds might indicate use of saltbush fruits/seeds; however, the presence of *Atriplex* charcoal indicates the possibility that fruits were adhering to saltbush branches burned as fuel. Three charred Cheno-am perisperm fragments might also reflect saltbush seeds or possibly other Cheno-am seeds. The Cheno-am seed perisperm (similar to endosperm) consists of the nutritive tissue of the seed, surrounding and absorbed by the embryo. It represents a mature seed that has lost the outer seed coat (testa). Recovery of nine charred *Prosopis* seed fragments suggests processing of mesquite pods/seeds. A few pieces of charred, vitrified tissue also were present. Vitrified tissue has a shiny, glassy appearance due to fusion by heat. These tissue fragments might represent charcoal or other charred plant tissue too vitrified for identification. In addition to *Atriplex*, the charcoal record consisted of *Prosopis*, reflecting mesquite wood burned as fuel. Recovery of a few charred insect fecal pellets suggests that some of the burned wood contained insects. Alternatively, charred insect fecal pellets and a charred rodent fecal pellet
might indicate that either this feature or a cleaned out thermal feature was re-used. Numerous insect chitin fragments reflect subsurface disturbance from insect activity in the area.

**Feature 55.** Features 55A and 55B are two superimposed pits. Feature 55A, the lower pit, is bowl-shaped. This feature yielded a radiocarbon age of AD 640-760, placing use of the lower, earlier pit during the Virgin Branch (Anasazi) occupation. Feature 55B is a small, shallow roasting pit that overlies Feature 55A and represents a later occupation of the site.

Pollen Sample 439 was recovered from the basal fill and floor of the lower, older Feature 55A. This pollen record exhibited a typical quantity of Cheno-am pollen, as well as a small quantity of *Zea mays* pollen observed while scanning the sample. This shallow roasting pit appears to have been used to roast maize. A moderately large quantity of microscopic charcoal fragments was recorded, and the total pollen concentration was slightly elevated at approximately 2500 pollen per cc of sediment.

Macrofloral Sample 436 also was taken from the fill of Feature 55A. This sample contained a charred *Prosopis* endocarp, several charred endocarp fragments, two charred *Prosopis* seeds, numerous charred seed fragments, and one charred *Prosopis pubescens* pod fragment containing a seed. Screwbean mesquite and at least one other species of mesquite with the long, straight pods appear to have been utilized by the Virgin Branch (Anasazi) occupants of the site. The presence of charred *Amaranthus* seeds and seed fragments, charred *Atriplex* seeds and seed fragments, and several charred Cheno-am perisperms suggests that amaranth and saltbush seeds were processed in this feature. Alternatively, saltbush seeds might have been charred through use of saltbush branches as fuel and amaranth seeds might have been burned through use of green plants in a buffering vegetation layer when roasting foods. The charcoal record consisted of several small fragments of *Atriplex* and *Prosopis*, reflecting use of saltbush and mesquite wood as fuel. Recovery of charred insect eggs, insect fecal pellets, and worm casts most likely reflect prehistoric bioturbation in the vicinity of these pits and subsequent re-use of the feature. The sample also contained three small uncharred bone fragments and a few gypsum rosette crystals.

Feature 55B, the small, shallow roasting pit overlying Feature 55A, is represented by pollen Sample 435 from the basal fill and floor of the feature. The pollen record for Sample 435 exhibited a larger quantity of Cheno-am pollen than did many of the other features sampled, no Low-spine Asteraceae pollen, and a small quantity of *Typha angustifolia*-type pollen in addition to the usual mixture of pollen types. It is possible that Cheno-ams were stored or processed in this pit. The quantity of microscopic charcoal was moderately large, and the total pollen concentration was typical of a fill sample at approximately 1800 pollen per cc of sediment.

**Site 26CK6147**

Site 26CK6147 is represented by four pollen samples, obtained from two ephemeral pit structures, a thermal feature, and a deep sloping-sided pit. In addition, a single macrofloral sample was collected from the thermal feature. A radiocarbon age of AD 660-810 was reported for pithouse Feature 4, placing site use during the Virgin Branch (Anasazi) occupation of the area.

**Feature 1.** This feature was identified as an ephemeral pithouse. Pollen Sample 46 was recovered from the floor in the north half of the structure. The pollen record from this structure was heavily dominated by Cheno-am pollen, which is a very different signature than that obtained from most of the pits examined from nearby Site 26CK6146. Small quantities of *Prosopis, Pinus, Quercus, Low-spine Asteraceae, High-spine Asteraceae, Ephedra torreyana*-type, Poaceae, *Eriogonum, Polygonum aviculare*-type, and Rosaceae pollen represent mesquite, pine, oak, various members of the sunflower family, ephedra, grasses, wild buckwheat, knotweed, and a member of the rose family growing locally. Recovery of a small quantity of *Zea mays* pollen, observed while scanning this slide, indicates that the occupants of this ephemeral pithouse used or processed maize. Elevation of the Cheno-am pollen frequency also suggests processing a member or members of the Cheno-am group. The quantity of microscopic charcoal fragments was very low when compared with that in
the features at 26CK6146. Total pollen concentration was moderately large at more than 8000 pollen per cc of sediment.

**Feature 4.** This is another pithouse at the site, represented by pollen Sample 75 from the basal fill and floor of the feature. The pollen record from this sample was very similar to that observed in the Feature 1 floor sample. The Cheno-am pollen frequency was similarly elevated in this sample and *Zea mays* pollen was recovered, suggesting the possibility that both Cheno-ams and maize were processed. A small quantity of *Typha* pollen was observed that might reflect wind transport of cattail pollen from a nearby riparian vegetation community. When the site is located within approximately 1 mile downwind of a riparian vegetation community, interpretation of small quantities of *Typha* pollen as anything other than wind transport of pollen, and therefore, availability of this resource, oversteps the bounds of reasonable interpretation. Other members of the pollen record are similar to those obtained in other samples, with the possible exception of a small quantity of Solanaceae pollen, representing a member of the nightshade family. Members of this family tend to be weedy and recovery of this pollen might reflect either processing activities or perhaps only local growth of a member of the nightshade family. The sample exhibited a very small quantity of microscopic charcoal fragments and an elevated total pollen concentration of more than 12,000 pollen per cc of sediment. Trampling of pollen into a living floor often results in an accumulation of pollen in greater quantity than observed in the fill of pit features.

**Feature 2.** This feature consists of a thermal feature or possible dump for debris from nearby roasting pits. Pollen Sample 28 was collected from the lower fill and yielded a moderately large quantity of Cheno-am pollen; however, this quantity was somewhat reduced when compared with other samples from this site. *Typha* pollen was present, but not in a quantity sufficiently large to suggest processing cattails. Other elements of the pollen record most likely represent plants growing locally. This sample yielded a larger quantity of microscopic charcoal fragments than did either of the pithouse floor samples, which is consistent with the interpretation of this feature as either a thermal feature or a dump for debris from nearby roasting pits. Total pollen concentration was large, at more than 16,000 pollen per cc of sediment, suggesting that as the sediments accumulated in this feature, there was ample time for pollen to accumulate. This is more consistent with an interpretation of use of this feature as a dump for debris from nearby roasting pits than as a thermal feature.

Macrofloral Sample 51 was recovered from lower fill in the north half of Feature 2. This sample contained a charred Cheno-am perisperm, a charred *Atriplex* seed fragment, and two charred *Chenopodium* seed fragments (Tables 8.2 and D.3), suggesting that saltbush and goosefoot seeds were processed. Nine charred *Prosopis* seed fragments reflect use of mesquite pods. A few uncharred seeds, leaf fragments, buds, and numerous rootlets represent modern plants at the site. Small pieces of *Prosopis, Atriplex*, and possible *Acacia* reflect use of mesquite, saltbush, and possible acacia wood as fuel. A few insect chitin and puparia fragments, several ants, and a few worm casts indicate limited subsurface disturbance from insect and earthworm activity. The sample also yielded one uncharred bone fragment and one lithic flake.

**Feature 6.** This storage pit was similar to the storage pits recorded at nearby Site 26CK6146. Pollen Sample 93 was obtained from the basal fill and floor of this deep, sloping-sided pit. Unlike the lower fill of most of the pits at 26CK6146, Sample 93 was dominated by Cheno-am pollen. Unfortunately, this record also shows evidence of contamination by pollen from *Tamarix*, a tree introduced into the area within the past 100 years or so. This contamination might be the result either of bioturbation and inclusion of some of the overlying A-horizon with these deposits, downward percolation along roots, or contamination at the time the samples were collected, if they were collected when local tamarisk trees were flowering. This storage pit also yielded no evidence of microscopic charcoal fragments, which is very unusual. The total pollen concentration was approximately 10,000 pollen per cc of sediment, which is rather large for a sample collected from the basal fill and floor of a pit. This pollen concentration is consistent with the interpretation that the pollen record is mixed with pollen from more recent, or even modern, times.
Summary and Conclusions

Pollen analysis of samples from Sites 26CK6146 and 26CK6147 in the Clark County Wetlands Park, Las Vegas Valley, Nevada, indicates that the various prehistoric people living at these sites had access to or even grew their own maize. Five of the eleven pits examined from 26CK6146 yielded evidence of Zea mays pollen, suggesting that approximately half of the tested pits were used to store maize. These two sites are located only approximately 150 to 200 meters apart, and portions of both sites appear to have been occupied simultaneously. Maize is the only cultivated plant represented in the samples examined to date.

Pollen evidence for prehistoric use of native plants is scant, although evidence for the availability of plants that might have been used is abundant. Local resources include at least members of the umbel and mustard families, prickly pear and cholla cactus, Chenopodium, Ephedra, members of the legume family including mesquite, members of the mint family, grasses, members of the nightshade family, globemallow, catail, and a member of the lily family. The macrofloral record indicates use of cactus, amaranth, goosefoot, possibly saltbush, screwbean mesquite, and at least one species of mesquite with long, straight pods. Mesquite appears to have been an important resource throughout the time periods represented. This is the primary wetland resource for which evidence of use has been recovered. The charcoal record notes that local saltbush, mesquite, and probable acacia wood were burned as fuel. Recovery of charred macrofloral remains in features interpreted as storage pits at 26CK6146 might reflect either use of the features as trash pits for debris cleaned out of thermal features at the site or limited use of the features for processing plant resources.

Recovery of a large quantity of Ephedra pollen in Sample 376, representing the middle fill of Feature 30 at 26CK6146, is enigmatic. At present, the most likely interpretations for this large quantity of ephedra pollen includes either a cultural explanation – intentional piling of ephedra branches, while they were in flower, in this approximate location, or a non-cultural explanation – local growth of ephedra in the feature as it filled. Examination of middle fill from additional features might shed light on patterns of pollen recovery across the site.

Opuntia pollen was recovered from three samples representing floors of pits and two samples representing upper fill, making an interpretation of the pattern of recovery of Opuntia pollen difficult. While it is tempting to interpret storing prickly pear cactus in Features 12 and 14, recovery of pollen from the upper fill of Features 20 and 49 suggests that small quantities of Opuntia pollen are present in some post-occupational fill. Charred Cactaceae spine fragments in samples from Features 49 and 51 at 26CK6146 reflect processing cacti, probably prickly pear. A member of the mint family might have been stored in Feature 12. Typha pollen was present in small quantities in ten of the eighteen prehistoric samples examined, as well as in the modern control and the historic sample. Wind transport of small quantities of Typha pollen is expected if the sites are within approximately one mile of a riparian vegetation community; therefore, evidence for use of cattails was lacking. Pollen from a member of the lily family was present in samples from the middle fill of Feature 20 and the upper fill of Feature 49, suggesting the strong possibility that a member of the lily family grew in the pits as they filled. This would provide a favored growing place for members of the lily family and indicate the availability of this resource to people who continued to live at the site after individual pits were abandoned, although no evidence for use of a member of the lily family was obtained.

Future sampling or sample selection at sites for this project should include examination of additional structure floor samples, when available. Floor samples are expected to yield good pollen evidence of plants that were used. When possible, samples should be collected from multiple, small areas of structure floors to avoid averaging the pollen record over a large area. Continued sampling of middle and upper fill samples will provide valuable information concerning resources that might have grown at the site, particularly in abandoned features that provided favorable eco-niches for growth of specific plants.

Considering this area as a “porous farming frontier”, it is important to understand which time periods yield evidence of cultigens and which do not. An adequate sample size for each time period represented should be made for pollen and macrofloral samples. To date, Zea mays pollen has been recovered from features
yielding radiocarbon ages of 100 BC to AD 110 (Terminal Archaic period), AD 640 to AD 760 and AD 660 to AD 860 (Virgin Branch Anasazi), and AD 1400 to AD 1460 (Southern Paiute or Patayan). In addition, Features 14 and 30 yielded evidence of Zea mays pollen, but dates for these features are not known. If intervening time periods are represented by features at the sites in the Las Vegas Wash project area, they should be analyzed for the pollen and macrofloral remains in an effort to close this gap and understand which time periods may be considered to have supported small farming communities in this area. It is possible that agriculture contributed only small quantities of food to the yearly diet and that hunting and gathering still provided the bulk of calories, even if evidence for maize is recovered in all time periods of occupation. Recovery of charred mesquite seeds in all five macrofloral samples examined indicates that mesquite was an important resource to the various occupants in this area.

INTENSIVE SCAN MICROSCOPY OF SAMPLES FROM SITES 26CK6007, 26CK6146, AND 26CK6147

Richard G. Holloway
Quaternary Services

A total of nine samples were sent for pollen extraction and analyses to Quaternary Services. The samples were submitted in conjunction with excavations at three archaeological sites, 26CK6007, 26CK6146 (Larder Site), and 26CK6147 (Scorpion Knoll Site), from Clark County, Nevada.

A single sample was submitted from 26CK6007, which was located at an elevation of 1460 feet AMSL and dated between AD 1000 and 1400. This sample was taken from below a groundstone metate artifact and was analyzed using standard palynological techniques. The site is located some distance to the east of the other two sites. The area of this site has been assigned by Brown and Lowe (1980) to the Mojave Desertscrub biome, which encompasses southern Nevada, southeastern California, and small areas of southwestern Utah and northwestern Arizona.

Four samples each were submitted from sites 26CK6146 and 26CK6147 which were located at an elevation of 1620 feet AMSL. Site 26CK6146 appeared to contain several distinct periods of occupation dating to AD 900–1040, AD 30–250, and an early occupation dating to AD 350–50 BC. Site 26CK6147 appeared to contain a single occupation dating between AD 660–1020 with a single feature dating slightly later, AD 880–1020, although this was within the wider range of occupation of the site.

These two sites are likely included within Transmontane Alkali Marsh as defined by Knoblock and Ezzo (1995). This community “occurs in Las Vegas Wash where standing water is present. ...Characteristic species of this community include cattails (Typha spp.), bulrush (Scirpus spp.), and reed grass (Phragmites communis)” (Knoblock and Ezzo 1995:31). The marsh plant community once occurred on the floodplain of Las Vegas Wash near and upstream from the project sites. In 1975, Ferraro described the wash environment, more or less in this area, as follows: “The entire wash channel, which is between 1,000 feet to 1,200 feet wide, is covered by shallow water. The vegetation in the submerged area is predominantly cattail marsh (Typha domingensis)Y. On the edge of this submerged area in the channel grow arrowweed (Pluchea sericia), salt cedar (Tamarix pendaria), an introduced plant, various grasses, and mesquite (Prosopis juliflora). The wash banks here are sloping and average about twenty feet higher in level than the wash itself, and have been dissected by lateral washes” (Ferraro 1975b:7). The identification of Typha domingensis is interesting as the USDA Plants database (USDA 2007) lists this particular species as the only one occurring within Clark County.

For the analysis of the samples from sites 26CK6146 and 26CK6147, an intensive scan microscopy was requested. The focus of this investigation was to determine the amount and presence of economic pollen types present within the assemblage. As detailed later, a minimum pollen concentration value of 1 grain/g was attempted for any target taxon (i.e. economic pollen taxa) before terminating the examination of the...
assemblage. This was thought to be sufficiently low to insure that most, if not all, potentially economic pollen types would be identified.

**Methods and Materials**

**POLLEN EXTRACTION METHODS**

Chemical extraction of pollen samples was conducted at the Palynology Laboratory at Texas A&M University, using a procedure designed for semi-arid Southwestern sediments. The method, detailed below, specifically avoids use of such reagents as nitric acid and bleach, which have been demonstrated experimentally to be destructive to pollen grains (Holloway 1981).

From each pollen sample submitted, 20 grams (g) of soil were sub-sampled. Prior to chemical extraction, two tablets of concentrated *Lycopodium* spores (batch #307862, Department of Quaternary Geology, Lund, Sweden; 13,500 % 500 marker grains per tablet) were added to each sub-sample. The addition of marker grains permits calculation of pollen concentration values and provides an indicator for accidental destruction of pollen during the laboratory procedure.

The samples were treated with 3 percent Hydrochloric Acid (HCl) overnight to remove carbonates and to release the *Lycopodium* spores from their matrix. After neutralizing the acid with distilled water, the samples were allowed to settle for a period of at least three hours before the supernatant liquid was carefully poured off and discarded. Additional distilled water was added to the supernatant, and the mixture was swirled and then allowed to settle for 10 seconds. The liquid was then carefully poured off and saved in a second beaker. This procedure was repeated a total of three times to ensure that all pollen would be freed from the matrix that remained in the original beaker. The sand and small rocks remaining in the beaker were then discarded. If any clay particles remained in the matrix, the matrix material was placed into a 50 ml centrifuge tube, a solution of Darvan (a detergent) was added and the tube was sonicated in a Delta D-9 Sonicator for no longer than 15 seconds because occasionally, longer sonication can damage some of the most fragile pollen grains. After sonication, the contents of the centrifuge tube were placed in a beaker and the decanting process was repeated three times. We have found that a short sonication will disperse small clods of clay, thus releasing any potential pollen into suspension. All of the saved, suspended fine fraction was decanted through a screen with openings of 150Φ. All material passing through the screen was concentrated using centrifugation mesh screen into a second beaker. This procedure, repeated at least three times, removed lighter materials, including pollen grains, from the heavier fractions.

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

The samples were dehydrated in glacial acetic acid in preparation for acetolysis. Acetolysis solution (acetic anhydride: concentrated sulfuric acid in 9:1 ratio) following Erdtman (1960), was added to each sample. Centrifuge tubes containing the solution were heated in a heating block at 1800 F for approximately 8 minutes, and then cooled for an additional 8 minutes before centrifugation. Each sample was then washed and removal of the acetolysis solution with glacial acetic acid followed by two washes with distilled water. Centrifugation at 2,000 RPM for 90 seconds dramatically reduced the size of the sample, yet from periodic examination of the residue, did not remove fossil palynomorphs. The samples were dehydrated in glacial acetic acid in preparation for acetolysis. Acetolysis solution (acetic anhydride: concentrated sulfuric acid in 9:1 ratio) following Erdtman (1960), was added to each sample. Centrifuge tubes containing the solution were heated in a boiling water bath for approximately 8 minutes and then cooled for an additional 8 minutes before centrifugation and removal of the acetolysis solution with glacial acetic acid followed by distilled water. Centrifugation at 2,000 RPM for 90
seconds dramatically reduced the size of the sample, yet from periodic examination of the residue, did not remove fossil palynomorphs.

Heavy density separation ensued using zinc bromide (ZnBr₂), with a specific gravity of 2.00, to remove much of the remaining detritus from the sample pollen. After 10 minutes of centrifugation at 2,000 RPMs, the light fraction was removed and diluted with 95% ETOH in a ratio of distilled water (10:1) and then concentrated by centrifugation. The samples were then washed repeatedly in distilled water until neutral. The residues were then rinsed in a 5% solution of potassium hydroxide (KOH) for less than one minute which is effective in removing the majority of the unwanted alkaline soluble humates. This was followed by a wash with concentrated HCl, which is essential to remove the remaining dissolved materials that are not water soluble. Next, the samples were washed with distilled water. That process was repeated until the solution was clear.

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

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

A drop of the polliniferous residue was mounted on a microscope slide for examination under an 18×18 mm cover slip sealed with fingernail polish. The slide was examined using 200X or 100X magnification under an aus-Jena Laboval 4 compound microscope. Occasionally, pollen grains were examined using either 400× or 1,000× oil immersion to obtain a positive identification to either the family or genus level.

Abbreviated microscopy was performed on each sample in which either 20 percent of the slide (approximately four transects at 200× magnification) or a minimum of 50 marker grains were counted. If warranted, full counts were conducted by counting to a minimum of 200 fossil grains. Regardless of which method was used, the uncounted portion of each slide was completely scanned at a magnification of 100X for larger grains of cultivated plants such as Zea mays and Cucurbita, two types of Cactus (Platyopuntia and Cylindropuntia), and other large pollen types such as members of the Malvaceae, or Nyctaginaceae families. Because corn pollen was very common in many of these samples, corn grains were tabulated during the scans only if an unequal distribution of this taxon on the microscope slide was observed.

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

Total pollen concentration values were computed for all taxa. In addition, the percentage of Indeterminate pollen was also computed. Statistically, pollen concentration values provide a more reliable estimate of species composition within the assemblage. Traditionally, results have been presented by relative frequencies (percentages) where the abundance of each taxon is expressed in relation to the total pollen sum (200+ grains) per sample. With this method, rare pollen types tend to constitute less than 1 percent of the total assemblage. Pollen concentration values, provide a more precise measurement of the abundance of even these rare types. The pollen data are reported here as pollen concentration values using the following formula:
\[ PC = K \times \frac{3_p}{3_L \times S} \]

Where: 
- \( PC \) = Pollen Concentration
- \( K \) = \textit{Lycopodium} spores added
- \( 3_p \) = Fossil pollen counted
- \( 3_L \) = \textit{Lycopodium} spores counted
- \( S \) = Sediment weight

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

Variability in pollen concentration values can also be attributed to deterioration of the grains through natural processes. In his study of sediment samples collected from a rockshelter, Hall (1981) developed the "1000 grains/g" rule to assess the degree of pollen destruction. This approach has been used by many palynologists working in other contexts as a guide to determine the degree of preservation of a pollen assemblage and, ultimately, to aid in the selection of samples to be examined in greater detail. According to Hall (1981), a pollen concentration value below 1000 grains/gm indicates that forces of degradation may have severely altered the original assemblage. However, a pollen concentration value of fewer than 1000 grains/g can indicate the restriction of the natural pollen rain. Samples from pit structures or floors within enclosed rooms, for example, often yield pollen concentration values below 1000 grains/g.

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

Pollen grains were identified to the lowest taxonomic level whenever possible. The majority of these identifications conformed to existing levels of taxonomy with a few exceptions. For example, Cheno-am is an artificial, pollen morphological category which includes pollen of the family Chenopodiaceae (goosefoot) and the genus \textit{Amaranthus} (pigweed) which are indistinguishable from each other (Martin 1963). All members are wind pollinated (anemophilous) and produce very large quantities of pollen. In many sediment samples from the American Southwest, this taxon often dominates the assemblage.

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

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

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

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

In those samples where the total pollen concentration values are approximately at or below 1000 grains/g, and the percentage of Indeterminate pollen is 20 percent or greater, counting was terminated at the completion of the abbreviated microscopy phase. In some cases, the assemblage was so deteriorated that only a small number of taxa remained. Statistically, the concentration values may have exceeded 1000 grains/gm. If the species diversity was low (generally these samples contained only pine, Cheno-am, members of the Asteraceae (Sunflower) family and Indeterminate category, counting was also terminated after abbreviated microscopy even if the pollen concentration values slightly exceeded 1000 grains/g.

**INTENSIVE SCAN MICROSCOPY**

The use of marker grains permits the palynologist to determine, *a priori*, the number of marker grains which must be counted in order to reach a pre-determined pollen concentration values, in this case 1 grain/g (Dean 1998). In the above formula, the constants (number of marker grains added, the weight of the sediment) were added to the formula. Simply, the equation was then solved for x (the number of marker grains). Assuming that a single grain of a target taxon would be present, a pollen concentration value of 1 grain/g would require counting approximately 1370 marker grains.

An initial count was conducted by counting all pollen within either the first 4 transects, or a minimum of 50 marker grains. The remaining transects on each slide were then examined at lower magnification. An estimate of the number of marker grains per transect was calculated using the initial count and this was multiplied by the number of transects examined to calculate the number of marker grains per slide. This procedure was repeated for each slide examined. Additional slides were examined until the minimum number of marker grains were tabulated. Assuming, that the first grain observed on an hypothetical next slide was one of the target taxa, the maximum potential concentration value can be computed and is reported in Table 1.
Results

The results of the pollen analysis are presented in Table D.4. The individual sample results are discussed below by site, age, and feature number.

SITE 26CK6007

Feature 1

Sample FN 7 was taken from beneath a groundstone metate artifact from within thin feature which dated to AD 1000–1400. The assemblage contained only 114 grains/g total pollen concentration values and was based on a pollen sum of only 14 grains. A single grain of *Pinus* pollen (8 grains/g) was present from the assemblage. Poaceae, Cheno-am, and low spine Asteraceae pollen (16 grains/g each) were present in trace amounts along with high spine Asteraceae (24 grains/g). The remainder of the assemblage consisted of Indeterminate type (24 grains/g) and unknown tricolpate (3 furrows) (8 grains/g).

SITE 26CK6146

Late Period

Feature 31. Sample FN 371 was taken from the middle feature fill of this basin shaped pit storage feature. The assemblage contained 2035 grains/g total pollen concentration values and was based on a pollen sum of 98 grains. *Pinus* pollen (83 grains/g) was present in trace amounts with no other arboreal taxa present. Cheno-am (1225 grains/g) was present in moderate amounts with high concentration values for both high (125 grains/g) and low spine Asteraceae (228 grains/g), and a low amount of Poaceae (21 grains/g) pollen. *Ephedra* and *Typha angustifolia* type were present in trace amounts (21 grains/g each). Indeterminate pollen was high (291 grains/g) and a large sized grass grain (21 grains/g) was also present. *Zea mays*, a large grass, *Sphaeralcea*, Onagraceae, and *Eriogonum* (0.91 grains/g) were present in the low magnification scan of the slide along with a small amount of Cheno-am pollen clumps (6/g).

AD 30–240

Feature 18. Sample FN 173 was taken from the bottom feature fill of this basin shaped pit storage feature. The assemblage contained 606 grains/g total pollen concentration values and was based on a pollen sum of only 22 grains. *Pinus* pollen was very low (138 grains/g) with low amounts of Cheno-am (331 grains/g), moderate amounts of high spine Asteraceae (55 grains/g) and high amounts of low spine Asteraceae (83 grains/g). *Zea mays*, non-Opuntia Cactaceae (1.92 grains/g), *Cylindropuntia* (2.77 grains/g), and Cheno-am pollen clumps (10/g) were present in the low magnification scan of the slide.

Feature 45. Sample FN 270 was taken from the floor contact of this hearth feature. The assemblage contained 2114 grains/g total pollen concentration values and was based on a pollen sum of 130 grains with 16.15% Indeterminate pollen. *Pinus* (98 grains/g) pollen was present in trace amounts only. Poaceae (81 grains/g), and low spine Asteraceae (114 grains/g) were high with moderate to high amounts of Cheno-am (1139 grains/g) and moderate amounts of high spine Asteraceae (49 grains/g) and *Artemisia* (33 grains/g). A large number of Cheno-am pollen clumps (33/g) were also present. *Ephedra* pollen (98 grains/g) was present in high amounts with traces of both non-Opuntia Cactaceae (33 grains/g) and *Cylindropuntia* (16 grains/g). Onagraceae (33 grains/g) and Rosaceae (16 grains/g) were also present.

350–50 BC

Feature 47. This was the oldest dated feature from the site, submitted. Sample FN 286 was taken from this bowl shaped pit storage feature and the assemblage contained a great deal of charcoal. The assemblage contained 1080 grains/g total pollen concentration values and was based on a pollen sum of only 36 grains.
Pinus (60 grains/g) pollen was present in trace amounts only. Cheno-am (750 grains/g) pollen was low to moderate with high amounts of low spine Asteraceae (90 grains/g) and moderate amounts of high spine Asteraceae (60 grains/g). A small amount of Ephedra (60 grains/g) was present in addition to Onagraceae (30 grains/g). Sphaeralcea, and Cylindropuntia (1.68 grains/g) were also observed in the low magnification scan of the slide.

SITE 26CK6147

AD 880–1020

Feature 3. Sample FN 82 was submitted from this roasting pit feature. The assemblage contained 5461 grains/g total pollen concentration values and was based on a pollen sum of 356 grains, with only 2.25% Indeterminate pollen. Pinus (123 grains/g) pollen was very low. Cheno-am (1151 grains/g) was present in moderate to high amounts with high amounts of both high (107 grains/g) and low spine (138 grains/g) Asteraceae. A high number of Cheno-am pollen clumps (31/g) were also present. The assemblage was clearly dominated by Typha angustifolia type (3636 grains/g) pollen. Cyperaceae, Eriogonum, and Sphaeralcea contained a single grain each (15 grains/g) with higher amounts of non-Opuntia Cactaceae, Ephedra, and Nyctaginaceae (31 grains/g each). Zea mays, Onagraceae, Cylindropuntia (0.91 grains/g each), and the large grass grain (1.82 grains/g) were also observed in the low magnification scan of the slide.

AD 660–1020; AD 800–1000

Three features were dated to this time period which essentially is the same period represented by Feature 3. All of these samples were taken from the bottom fill of the floor of each feature.

Feature 5. Sample FN 88 was taken from this basin or bell shaped pit storage feature. The assemblage contained 2994 grains/g total pollen concentration values and was based on a pollen sum of 275 grains, with 8.36% Indeterminate pollen. Pinus (33 grains/g) and Juniperus (11 grains/g) were present in trace amounts only. Cheno-am (2221 grains/g) was present in high amounts along with high (87 grains/g) and low spine (250 grains/g) Asteraceae, and low amounts of Poaceae and Artemisia (11 grains/g each). Nyctaginaceae and an unknown triporate grain (11 grains/g each) were also present. Onagraceae and Eriogonum were present in moderate amounts (33 grains/g each), along with Sphaeralcea (22 grains/g) and a large grass grain (11 grains/g). Cylindropuntia (6.07 grains/g), Platypontia (1.52 grains/g) and Typha angustifolia type (1.52 grains/g) were also observed in the low magnification scan of the slide.

Feature 7. Sample FN 96 was taken from this irregular shaped basin feature. The assemblage contained 557 grains/g total pollen concentration values and was based on a pollen sum of 87 grains, with 18.39% Indeterminate pollen. Pinus pollen (26 grains/g) was present in trace amounts only. Cheno-am (262 grains/g), Poaceae, and Artemisia (6 grains/g each), were present in very low amounts with moderate to high amounts of high (58 grains/g) and low spine (64 grains/g) Asteraceae. Sphaeralcea and Ephedra (6 grains/g each) were both present in low amounts with a slightly higher amount of Onagraceae (19 grains/g). Rosaceae (0.98 grains/g) was present in the low magnification scan of the slide.

Feature 8. Sample FN 122 was taken from this depression which might possibly have been a possible pit structure. The assemblage contained 7983 grains/g total pollen concentration values and was based on a pollen sum of 615 grains, with 3.74% Indeterminate pollen. Pinus (169 grains/g) was present in low amounts only, with a trace of Quercus (13 grains/g) pollen. Cheno-am (6919 grains/g) clearly dominated the assemblage along with high amounts of high (182 grains/g) and low spine (221 grains/g) Asteraceae. Artemisia (26 grains/g) and Poaceae (13 grains/g) were present in low amounts. Ephedra pollen (52 grains/g) was present in moderate to high amounts. Rosaceae, Eriogonum, Cylindropuntia, Cyperaceae, Sphaeralcea and Zea mays were all present in low amounts (13 grains/g each). Onagraceae (1.00 grain/g), non-Opuntia Cactaceae (11.98 grains/g), Nyctaginaceae (9.99 grains/g), and cf. Campanula (2.00 grains/g) were present in the low magnification scan of the slide.
Discussion

The arboreal pollen, which consisted almost exclusively of *Pinus* sp., was present in either very low pollen concentration values, or in trace amounts. *Pinus* sp. pollen was not differentiated into types in this study, although variations in overall size of the pollen grain were noted during the examination. The extremely low pollen concentration values are entirely consistent with the modern vegetation described for this area of Las Vegas Wash.

*Pinus* pollen is produced in structures called strobili which are located in clusters of 7-10+ located on the terminal branch ends. Each strobilus produces in excess of 1 million pollen grains which are specifically adapted to wind dissemination (anemophilous). The low pollen concentration values are consistent with the absence of pine stands in the immediate vicinity of these sites. Certainly, the arboreal component of these pollen assemblages were deposited via long distance transport, probably from higher elevation areas that surround Las Vegas.

SITE 26CK6007

The single pollen assemblage from this site was taken from below a groundstone metate. This assemblage contained so little pollen than an interpretation of either artifact function, or background pollen rain is not possible. The assemblage consisted entirely of several isolated grains of Poaceae, Chen-o-am, and both high and low spine Asteraceae. Indeterminate pollen accounted for 21.43% of the assemblage which indicates rather severe weathering of the assemblage. The maximum potential pollen concentration values (1.25 grains/g) from this sample were low enough to suggest that other taxa were likely not present in the assemblage, and that this assemblage is indeed, severely altered by weathering.

SITE 26CK6146

The total pollen concentration values from the assemblages from this site were somewhat lower than those recovered from 26CK6147. While the sites are located in close proximity, site 26CK6146 contained slightly older deposits and this longer period of occupation may partially explain the lowered pollen concentration values. Percentage of Indeterminate pollen is also somewhat higher which is consistent with this interpretation. Two of the 4 samples from site 26CK6146 contained no Indeterminate pollen and the other 2 samples contained Indeterminate pollen in excess of 15%. The lack of Indeterminate pollen is also consistent with an interpretation that the assemblages were so deteriorated that the Indeterminate pollen had been removed. One of the samples containing no Indeterminate pollen (FN 286) also contained an extremely large quantity of charcoal, which may suggest thermal alteration.

Small amounts of *Zea mays* and a large grass grain were both present in very low pollen concentration values from FN 371 (AD 900–1040) and FN 270 (AD 70–250). I generally separate out a category of large grass grains. This category includes members of the Poaceae which are larger in size than the pollen of known taxa of this family but also are on the extreme smaller size range of corn. While I suspect, that the large grass pollen may in fact be *Zea mays* pollen, I am somewhat uncomfortable in assigning this grain to the taxon *Zea mays*. Interestingly, no *Zea mays* pollen was recovered from those samples containing no Indeterminate pollen, which supports the interpretation that these were heavily deteriorated. The small concentration values of *Zea mays* suggest that this taxon was present and likely corn materials may have been stored within these features.

*Sphaeralcea* pollen was present only from FN 371 (AD 900–1040) FN 286 (350–50 BC), in very small amounts. *Sphaeralcea* sp. has been reported to have been used medicinally within Nevada by Train et al (1941), and thus its presence within storage features is not unexpected.

*Eriogonum* pollen was present within FN 371 (AD 900–1040) and FN 270 (AD 70–250), although only in trace amounts. Several species of *Eriogonum* sp. have also been reported to have been used medicinally within Nevada by Train et al (1941).
A small amount of Onagraceae pollen was recovered from FN 371 (AD 900–1040), FN 270 (AD 70–250), and FN 286 (350–50 BC). Many members of this family are locally available and thus this may or may not be an economic taxon. However, in a number of investigations from the Colorado Plateau, it has been noticed that Onagraceae and *Zea mays* pollen tend to co-occur in a larger number of samples. While an explanation for this observation is not yet available, I generally tend to include Onagraceae as an economic taxon, when this co-occurrence is observed. Members of the Onagraceae have been shown to have been used medicinally.

Cylindropuntia and non-Opuntia Cactaceae were also present in more than minimal amounts from these storage features and it is likely that these features were used to store various Cactus plant materials. Members of the Cactaceae family are insect pollinated and generally produce fewer pollen grains per plant than other types. In an experimental investigation of surface pollen assemblages, Dr. Vaughn Bryant (personal communication 1988), of Texas A&M University recovered less than 2% Opuntia pollen from the middle of a flowering Prickly Pear Cactus. Thus, it is likely that an assemblage taken from a protected area within a storage feature and containing Cactaceae pollen, would likely be the result of a cultural vector.

A single grain of Rosaceae pollen was also present from FN 270 (AD 70–250). This taxon may or may not have been an economic indicator and members of this family may have been present locally within the area. Additionally, there were small numbers of Cheno-am pollen clumps present in all 4 samples. As indicated by Bohrer (1972), pollen clumps of this taxon normally infer cultural use of this taxon.

**SITE 26CK6147**

*Zea mays* pollen was recovered from FN 82 (AD 880–1020) and from FN 122 (AD 660–1020). While overall, the pollen concentration values of this taxon were low, the concentration value of *Zea mays* from the count from FN 122 was somewhat higher (13 grains/g). This may support the interpretation of this feature as coming from a possible pit structure, as *Zea mays* pollen would generally tend to be somewhat higher within structures. There was also a slight increase in the pollen concentration values of the large grass grain from this site.

*Sphaeralcea* was present from all 4 samples from this site in slightly higher concentration values. Its ubiquitous presence indicates a definite storage function for these features. While also used as a condiment (Moerrman 1980) it has also been reported to have medicinal properties (Train et al 1941).

Eriogonum pollen was recovered from all samples except FN 96, a floor sample from an irregular shaped storage pit feature. Eriogonum sp. is also insect pollinated and it is unlikely that this deposition was the result of its local presence. Rather, I suspect that this reflects a cultural vector and that the taxon was likely stored for a medicinal use (Train et al. 1941).

Onagraceae pollen was also present from all 4 samples from this site. FN 88 which was taken from the bottom floor fill, contained the highest pollen concentration values of 11.39 grains/g.

Members of the Cactaceae had a somewhat variable distribution. Cylindropuntia pollen was present in all samples from this site except FN 96, a floor sample from an irregular shaped storage pit feature. Additionally, the pollen concentration values were slightly elevated from those recovered from site 26CK6146. Sample FN 88 from the bell shaped pit feature also contained Platyopuntia pollen (Prickly Pear). Non-Opuntia Cactaceae was present in FN 82 a roasting pit feature and FN 122, the possible pit structure. The pollen concentration values from FN 122 were the highest for this taxon. This also supports the hypothesis of feature 122 functioning as a pit structure.

Rosaceae pollen was present in small amounts from both FN 96 and FN 122. Again, since this taxon is insect pollinated, I suspect the deposition of this taxon was via a cultural vector.
FN 122 also contained small amounts of Cyperaceae and Liliaceae pollen. The Cyperaceae pollen is consistent with the marshy, local environment surrounding the site. Liliaceae pollen is also insect pollinated and its presence also suggests an economic function.

The most surprising aspect of the samples from this site was from FN 82, the roasting pit feature. This assemblage was dominated by pollen of *Typha* sp. (3852.59 grains/g). The pollen morphology of this taxon was primarily a monad, i.e. the grains were individually released from the anthers. This suggests that *Typha domingensis* was the primary species utilized. *Typha latifolia* pollen, on the other hand, is released as tetrads, i.e. 4 pollen grains adhere together and are only rarely released separately. While likely that this represents *Typha domingensis*, based on the pollen morphology, I have decided to refer to this simply as Typha sp. Pollen.

The problem arises in the interpretation of this large dominance of *Typha* sp. pollen. With this high amount of pollen concentration values, it is likely that the male flowers of *Typha* were being utilized. *Typha* contains unisexual flowers, the male, or staminate flowers are located at the apex of the flowering stalk, while the pistillate flowers (female) are located in the typical brown cone, characteristic of the plant.

It is possible that the pollen of this plant may have been introduced accidentally, or as a secondary by-product of the major use. Perhaps, the whole plant was used within this roasting pit as a means of producing a larger quantity of smoke. *Typha* sp. Is an emergent aquatic plant and thus when gathered would be literally soaked with water. When placed in this roasting pit, this would indeed produce a large quantity of smoke.

Alternatively, there are numerous references to the utilization of *Typha* as a food source. Seeds, roots and or tubers, and even the pollen have been documented as a reliable food source among cultural groups from this area (Fowler 1989, 1990). Fowler (1990) and Harrington (1967) have also documented that the pollen of *Typha* was mixed with water, kneaded, formed into cakes and baked. This interpretation seems more likely given the large pollen concentration values for this taxon. The procedure of baking and/or roasting these cakes would certainly apply to a roasting pit feature.

**Conclusions**

The pollen assemblages recovered from these sites are consistent with the present, modern vegetation of the area. The pollen sample from 26CK6007 contained very little pollen and provided no information concerning feature function.

While site 26CK6146 was likely occupied for a longer period of time, the later periods of occupation appeared consistent with the dates from 26CK6147. Both sites are located very close to each other and within more riparian areas of Las Vegas Wash. Thus it is not surprising that the economic taxa recovered from both sites were essentially the same.

Both sites contained small quantities of *Zea mays*, *Eriogonum*, *Sphaeralcea*, Onagraceae, Rosaceae and several members of the Cactaceae Family. The pollen concentration values were generally similar, although slightly higher from site 26CK6147. This suggests that inhabitants of both sites were exploiting similar, if not identical resources. The pollen concentration values for *Zea mays* were actually quite low. At this point, I cannot conclusively argue for corn agriculture, although that remains a possibility. It is possible that *Zea mays* was simply traded into the community, rather than growing the material itself. While either hypothesis is possible, the fact remains that corn was supplying at least a portion of the diet.

The roasting pit feature from site 26CK6147 provided strong evidence for the direct utilization of *Typha* sp. (Cattail). While a variety of potential uses exist, evidence from Ethnography suggest the possibility that the pollen was being utilized as a food source. This has been documented elsewhere as well (Harrington 1967; Zigmond 1981).
CHAPTER 9
SYNTHESIS OF GEOARCHAEOLOGICAL AND ARCHAEOLOGICAL INVESTIGATIONS

SITE FORMATION AND DESTRUCTION

Judson Finley and William Eckerle

Sites 26CK6007 and the Larder Site (26CK6146) contain three distinct cultural components each, whereas the Scorpion Knoll Site (26CK6147) contains subsurface features as well as a small surface artifact scatter. The three components at 26CK6007 are buried within Stratum VIII, a massive deposit of alluvium associated with the mainstem of Las Vegas Wash. Occupations of the Larder Site are associated with a Stratum III sandsheet surface but targeted a soil horizon formed into Stratum I as the host for numerous storage features. Nearby occupations at Scorpion Knoll are associated with the same sandsheet as that forming at the Larder Site, although a salic subsurface soil horizon was not targeted for cultural occupations.

Occupations at both the Larder and Scorpion Knoll sites occurred within very fine sands of an aeolian sand sheet (Table 2.1). Well-sorted aeolian sediments have a potential churn zone thickness of 5-16 cm. While churn zones may obscure vertical separation of components in stratified sites, they conceal artifacts during site clean-up. Potential discrimination of high primary discard areas from low ones is enhanced since artifacts are hidden from view during site cleaning. However, because many artifacts are easily and rapidly trampled into the churn zone, identification of domestic areas that were potentially cleaned is much more difficult in soft substrates. The effects of scuffage on the integrity of these components would have been negligible. Post-occupational dispersal (by slope wash, creep, and aeolian transport) and burial dispersal (by aeolian and/or alluvial deposition) are characterized as moderate, and the effects of post-burial processes are moderate.

**Contextual Integrity of Components**

**SITE 26CK6007**

All occupations at 26CK6007 are constrained to Stratum VIII alluvium. While three components were identified, the lowest component is most important to archaeological data recovery. The middle and upper components are ephemeral occupations with limited artifacts and features. While the age of the occupations is not constrained by radiometric analyses, due to the association with Las Vegas Wash alluvium the occupations are likely less than 2000 years old. The lowest component may be Terminal Archaic, while additional components are likely Ceramic period occupations. Stained zones and features associated with this site generally fall within the predicted churn zone thickness range, indicating that the components retain spatial and contextual integrity.

**LARDER SITE (26CK6146)**

Age estimates from six radiocarbon samples indicate three occupation trends at the Larder Site. The dominant trend occurred ca. 2000 BP (Terminal Archaic period), while outliers in the chronology occur at ca. 1300 and 400 BP (Ceramic period). While features were excavated into a Stratum I soil horizon, the occupation surface for these components occurs with Stratum III aeolian sands. The radiocarbon evidence also constrains the deposition of aeolian sands in the Las Vegas Wash to the last 2000 years. While the radiocarbon chronology spans approximately 1500 years with three potential occupations, it may be difficult to discern differences between associated occupation zones. Slow depositional rates on the sandsheet surface combined
with churn zones thickness of the aeolian sands may have obscured vertical separations between distinct components. Furthermore, repeated site occupation for apparently similar subsistence reasons (i.e., storage of food resources) may obscure other variations in material remains between the components. In spite of these issues, the Larder Site maintains moderate to high preservation potential for regional sites dating to the Terminal Archaic and Ceramic periods.

**SCORPION KNOLL SITE (26CK6147)**

Evidence from the Scorpion Knoll Site indicates that a single cultural level is present in a buried context. A single radiocarbon assay of ca. 1300 BP constrains the age of occupation within the same time frame as occupations at the nearby Larder Site. The occupation occurs within the same sandsheet as that formed at the Larder Site, which is securely dated to the last 2000 years. Although additional radiocarbon tests may show temporal variation in the site occupations similar to that of the Larder site, current evidence indicates a single buried component. Due to the burial context within aeolian sands, the site has a relatively high contextual integrity. Like the Larder Site, occupations at Scorpion Knoll yield archaeologically and geologically significant information regarding the Late Holocene history of the Las Vegas Wash.

**Geologic History**

The current study makes several new contributions to the Late Quaternary history of the Las Vegas Wash. An important point of consideration in studies of archaeological site formation processes is that numerous, interacting depositional environments occur in the lower Las Vegas Wash. These include alluvial fan, axial stream, and aeolian sandsheet settings. Specific variables that must be considered in relation to natural site formation processes are distance of the depositional loci from the stream axis or distributary channels of alluvial fans and the magnitude of floods affecting both the axial stream and alluvial fan surfaces. As a complete geological system, Las Vegas Wash responds to graded time cycles of dynamic equilibrium (Schumm and Lichty 1965) influenced by effective precipitation conditions. Higher effective precipitation, typically associated with glacial climates, increased the competence of Las Vegas Wash resulting in erosion and entrenchment of the channel. Glacial climates also increased sediment contributions to Las Vegas Wash from valley-margin alluvial fans. Drier interglacial climates reduced effective precipitation, lowering the ability of Las Vegas Wash to carry its entire sediment load (i.e., reduced competency), resulting in net sediment aggradation of the stream channel. The most recent aggradation cycle began approximately 3000 BP (USGS 1999). Downcutting is an historic phenomenon directly related to urbanization of Las Vegas Valley and increased runoff due primarily to wastewater treatment.

The oldest stratigraphic deposits documented in this project are Pleistocene alluvial fan and main stem wash sediments exposed in arroyo cutbanks of Las Vegas Wash at Scorpion Knoll. These distal alluvial fan sediments were deposited at a time of higher effective precipitation when Las Vegas Wash was in a cycle of entrenchment. Encroachment of alluvial fan sediments on the valley axis evidences the higher effective precipitation conditions enhancing runoff on alluvial fan surfaces. Although poorly constrained chronologically, the lowest stratigraphic deposits of 26CK6007 are alluvial fan sediments contributed from the Three Kids Wash fan. Given the stratigraphic complexity of the site and the nature of overlying Las Vegas Wash alluvium (i.e., Late Holocene alluvium), the lowest fan deposits and the weakly cemented alluvium of Stratum I at 26CK6007 may be Late Pleistocene or Early Holocene.

Also newly documented by this project is deposition of fine-textured sediments older than 3000 BP forming a subtle terrace inset into an alluvial fan skirt at the Larder Site (Figure 2.17). Previous studies (USGS 1999) have documented fine-textured alluvium in Las Vegas Wash only during the Late Holocene ca. 3000 BP. An aeolian sandsheet deposited on the alluvial fan surface adjacent to the possible terrace remnant contains archaeological deposits securely dated to 2000 BP. Thus the age of the aeolian sandsheet is greater than 2000 BP, as is the age of sediment deposition and downcutting of the older terrace. As Las Vegas Wash was in a
phase of aggradation during emplacement of the sandsheet, this older fine-grained deposit and subtle terrace remnant are likely Early to Middle Holocene landforms.

The Late Holocene fan toe and aeolian sandsheet form a unique depositional environment in Las Vegas Wash that provided prehistoric foragers of the area with unusual opportunities for resource storage. Gypsic and salic soils, which are common in Las Vegas Wash and often form in alluvium, were targeted at the Larder Site for their potential as a desiccant in storage and preservation of plant foods, most likely corn and mesquite pods. These well-dated occupations at the Larder Site also provide one of the oldest radiocarbon dates (ca. 2060+/-50 BP) yet reported for the Las Vegas Wash (cf. Ahlstrom 2005a).

Lastly, these geoarchaeological studies documented Las Vegas Wash alluvium older than 2000 BP indurated with gypsum and other salts. In most cases, gypsum accumulation in Las Vegas Wash evidences increased phreatogenic pumping of groundwater via capillary action that resulted from locally higher or perched water tables (Buck et al. 2006). Most gypsum and other salts are secondary components of soil formation inherited from local parent materials in Frenchman and River Mountains.

Paleoenvironmental Reconstruction

Paleoenvironmental interpretations of Las Vegas Wash archaeological sites are drawn from alluvial chronologies, which in dryland systems are not among the higher resolution paleoenvironmental proxies (Huckleberry 2001). The findings of this study are generally congruent with previous research in Lower Las Vegas Wash (USGS 1999). Greater effective precipitation and increased runoff during the Late Pleistocene is evidenced by a lack of axial stream deposits in Las Vegas Wash and encroachment of alluvial fans into the valley axis. Early and Middle Holocene geologic deposits are rare due to the continuing cycle of downcutting associated with a relatively moist Southwest during the Middle Holocene (Waters and Haynes 2001). Results of geoarchaeological studies at 26CK6146 and 26CK6147 indicate that a minor climatic reversal may have resulted in accumulation of sediments along the lower Las Vegas Wash at some point during the Early or Middle Holocene. Subsequent erosion resulted in a subtle terrace remnant inset into a distal alluvial fan skirt. Effective precipitation decreased after 3000 BP resulting in aggradation of alluvium along Las Vegas Wash and emplacement of sandsheet deposits on alluvial fan surfaces bordering Las Vegas Wash. The Wash served as the most immediate source for aeolian sands in the area. Little climatic variation is indicated in the three millennia since the final phase of sediment aggradation began in Las Vegas Wash. Modern conditions of erosion are anthropogenic and occur independent of a climatic mechanism.

Archaeological Significance Of Project Area History

The Las Vegas Wash has a rich Late Holocene (Terminal Archaic and Ceramic period) archaeological history resulting in part from unique geological circumstances. Excluding periodic flash flood conditions, the general depositional context for local archaeological sites is in fine-grained alluvium or aeolian sands, both of which have excellent preservation potential. Burial contextual integrity at all sites is moderate to high. Aspects of local soil geography were important to prehistoric foragers, particularly the presence of well-developed gypsic and salic soil horizons that were utilized for their resource storage potential. Clark County Wetlands Park and Lower Las Vegas Wash represent a unique environment in the Las Vegas Valley with the potential to continue contributing significant new scientific information regarding the area’s rich natural history.

ARCHAEOLOGICAL INVESTIGATIONS

Richard V.N. Ahlstrom and Jerry D. Lyon

HRA’s investigations at the Larder Site indicate that it served primarily as a specialized, open-air cache site—hence its name. Backhoe trenches excavated at the site revealed the presence of 56 subsurface
storage pits. Simple calculations from this sample suggest that between 500 and 800 features of this kind are present on the site. Data from the excavation and sampling of features indicate that the pits were used primarily for the storage of foodstuffs. The assemblage of charred botanical specimens consists mostly of seeds and seed pods from mesquite and screwbean trees, so these were certainly among the most important items that were placed in the pits. Pollen and flotation data also indicate that maize was stored in some of the features—these botanical data are detailed below. Other evidence indicates that the Larder Site was used for at least short-term camping, perhaps associated with the construction, loading, and subsequent emptying of the storage pits. That evidence includes the presence on the site of a varied, though relatively small, surface artifact assemblage, the recovery of small quantities of flaked stone debitage from the fill of hand-excavated features, and the identification of two or three hearths and a small roasting pit in the walls of backhoe trenches. Several other pieces of evidence are interpreted as placing limits on the intensity of that camping activity. They include the relative scarcity of flaked stone debitage and the near absence of formal flaked stone artifacts, ground stone artifacts, and faunal remains in hand-excavated feature fill, as well as the absence of recognizable habitation features in the walls of the backhoe trenches.

Radiocarbon dates indicate that storage activity began at the Larder Site by around 2000 BC and continued, perhaps with some interruptions, to at least AD 1500. These chronological data support the identification of the Larder Site as a “persistent place” in the cultural landscape of the Las Vegas Valley. Circumstantial evidence suggests that the site’s gypsum-rich substrate made it a particularly good location for the pit-storage of foodstuffs. We suspect that the people who used the site discovered this useful characteristic through trial-and-error and, therefore, returned to this location again and again to use it in this manner.

Backhoe trenching and small-scale hand excavation at Scorpion Knoll uncovered the remains of between two and four ephemeral pit structures, at least one roasting pit, possible evidence of a larger “roasting area,” and three storage features similar to those found at the Larder Site. Surface collection and excavation produced a sparse artifact assemblage, suggesting that the habitation structures were used for only short intervals of time. The apparent absence of firepits from the structures may indicate that they were occupied during warm seasons of the year (spring through fall). These inferences, combined with the recovery of maize pollen from several features, support the identification of Scorpion Knoll as a briefly, though repeatedly occupied “field house” site, broadly similar to Hohokam field-house sites in south-central Arizona (Crown 1983; Deaver 1983). The fields associated with the Scorpion Knoll Site would presumably have been located within tens to hundreds of meters to the northwest, west, and southwest, on the Las Vegas Wash floodplain. Radiocarbon dates place the Scorpion Knoll Site’s occupation between AD 700 and 1000, that is, in the middle portion of the Larder Site’s period of use. It is likely that the site was occupied on more than one occasion during this 300-year interval.

**Pit Storage**

Ethnographic and archaeological literature from the Great Basin and American Southwest provide useful background information for interpreting the large population of storage pits that HRA recorded at the Larder Site.

**ETHNOGRAPHIC LITERATURE**

Between 1868 and 1880, pioneering ethnographer John Wesley Powell collected data on pit storage among Ute, Paiute, and Shoshoni peoples of the Great Basin and Colorado Plateau:

The Indian can save food for future use only by caching it. As long as it is in camp it is common property, or at least it would be considered very ill mannered indeed to not offer a portion of it to any one who might be destitute.
A cache is a hiding or storing away of any articles of value which may be used at some future time. When the season for gathering seeds is passed many of the baskets used for this purpose are thus placed away to be ready for next year, but stores of food are the principal objects thus temporarily put away. I have observed two methods of making caches; one was to dig a hole in the ground, and in it place the articles to be preserved. It was then covered with stones, and sand raked over the top. Then a fire is built over this and kept up perhaps for two or three days which serves a double purpose first to hide all evidences that might otherwise have appeared to indicate the position of the cache, to persons who might be passing, and second, which is the principal cause as asserted by the Utes, to destroy the odor by which wolves or other animals might be attracted to the spot.

Second, many caches are made in caves and crevices, which are everywhere to be found in this region of canons and cliffs, the seeds or other articles being placed in baskets or sacks, and sometimes covered with bast of the cedar, and over the whole a huge pile of stones is placed [Fowler and Fowler 1971:49].

The first of the two methods of caching identified by Powell, involving “a hole in the ground,” is relevant to the evidence of pit storage recovered from the Larder Site. Particularly interesting in that context is the fact that a fire was built over the storage pit after it had been filled. This kind of activity could help explain the organic-rich character of the A Horizon and the presence in some areas of scattered fragments of charcoal within this horizon (Figure 4.6).

ARCHAEOLOGICAL LITERATURE

Prehistoric archaeologists working in the Great Basin and the American Southwest have identified evidence of pit storage in both of the settings mentioned by Powell, that is, in caves and rockshelters and in open sites. Sheltered sites have the obvious advantage of providing a dry environment for storing food and other perishable goods. Storage pits have been found in rockshelters and caves that were also used for habitation or “camping.” Research conducted in the west-central Great Basin suggests, however, that the storage or caching function should be kept separate, in conceptual terms, from the camping function. The supporting data come from the Carson Desert and Humboldt Sink. According to Kelly (2001:12), the cave sites of this area “are distinctly different from other Great Basin cave sites because they contain many more caches. More than 45 pits were recorded at Lovelock Cave (some of which were burials), 31 in Humboldt Cave, and 22 in Hidden Cave. There is little evidence that these caves ever served as habitation sites.” Kelly refers to them instead as “cache cave sites” (2001:12). Closer to home, we have interpreted a sheltered site located several miles north of the Las Vegas Valley—Flaherty Rockshelter—as another cache-cave site, though one that also served as a camp site (Roberts and Ahlstrom 2001). Building on Kelly’s terminology, we can identify the Larder Site as an open-air cache site. As discussed earlier, this identification is based on the number of storage features recorded at the site, combined with the lack of evidence for long-term habitation or, for that matter, even substantial camping activity.

Data that HRA obtained from pit features at the Larder and Scorpion Knoll sites can be compared to evidence from similar features that have been investigated over the last 20 years in the Tucson Basin in southern Arizona (Table 9.1). Wöcherl (2005) has summarized evidence on the occurrences of thermal and nonthermal pits at five sites in this area. She argues that “Differences in proportions of thermal vs. nonthermal pits may reflect differences in site functions, or possibly a sampling bias” (Wöcherl 2005:20):

Nonthermal pits are thought to have processing functions that do not involve fire, or are storage facilities. Eddy (1958) suggested that all nonthermal pits served storage functions. Based on ethnographic data, bell-shaped and cylindrical pits have been interpreted as underground storage facilities (e.g., Huckell and Huckell 1984). However, oxidation or pit firing may not necessarily always be related to food processing. Part of the construction
The sequence may have been the firing of the pit walls themselves. Firing increases pit wall strength and resistance to bioturbation. Both aspects are crucial in an environment where seasonal flooding and abundant rodent disturbance are significant formation processes (Wöcherl 2005:20). Because stored foods would be particularly vulnerable to these processes, storage pits are likely candidates for pit-stabilizing firing practices. Therefore, bell-shaped and/or cylindrical pits should show thermal effects [Wöcherl 2005:22].

The Larder Site has a higher percentage of nonthermal pits than any of the sites included in Wöcherl’s (2005) sample (Table 9.1). The difference is even greater if one discounts the two most questionable hearths in the Larder Site sample. Deleting those features would increase the representation of nonthermal pits from 93% to 96%. A number of pits at the Larder Site produced evidence that fire was used to dry them out prior to use. In no case, however, did this burning appear to be extensive enough to provide the benefits from “firing” that are mentioned by Wöcherl—i.e., increasing pit wall strength and resistance to bioturbation.

Table 9.1. Thermal vs. Nonthermal Pit Features, by Site, Wetlands Park Area and Tucson Basin.

<table>
<thead>
<tr>
<th>Location</th>
<th>Site</th>
<th>Thermal Pits</th>
<th>Nonthermal Pits</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Count</td>
<td>(Percent)</td>
<td>Count</td>
</tr>
<tr>
<td>Wetlands Park</td>
<td>Larder</td>
<td>4</td>
<td>(7)</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Scorpion Knoll</td>
<td>1</td>
<td>(25)</td>
<td>3</td>
</tr>
<tr>
<td>Tucson Basin</td>
<td>Los Pozos</td>
<td>15</td>
<td>(16)</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Las Capas</td>
<td>101</td>
<td>(24)</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>Santa Cruz Bend</td>
<td>27</td>
<td>(31)</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Stone Pipe</td>
<td>21</td>
<td>(35)</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Wetlands</td>
<td>27</td>
<td>(36)</td>
<td>48</td>
</tr>
</tbody>
</table>

In their report on the Steinaker Gap Site, Talbot and Richens (1996:178-180) review evidence on Archaic and early Formative period storage features at open and sheltered sites in areas located to the north of the Las Vegas Valley. In the context of open sites, they draw a distinction between storage pits located within pithouse habitations and those located outside and, in some cases, distant from structures. They note that “early pithouses emerging from the literature and in particular from central and western Colorado, the Wyoming Basin, the Snake River Plain, northern Great Basin, and the Northwest Plateau...suggest that Archaic groups may have stored more foods and may have been less mobile than previously thought” (1996:178). Their data indicate an increase in the use of storage pits ca. 2000–1000 BC, well before our earliest evidence for storage features at the Larder Site. They go on to state that “the earliest Northern Colorado Plateau evidence for both corn and deep, bell-shaped pit storage was found just south of Richfield, at the Elsinore Burial Site, which dated to ca. 100 B.C.” (1996:179). Based on evidence from this open site and from two sheltered sites, Cowboy Cave and Clydes Cavern, they argue that maize was being grown on the Northern Colorado Plateau–eastern Great Basin region by the first or second century BC (1996:180). Their dating of maize alone and in association with bell-shaped storage pits is comparable to the earliest dates obtained for these two “traits” at the Larder Site.

**LARDER SITE DATA**

HRA’s backhoe trenching of the Larder Site led to the identification of 56 pits that we have interpreted as storage features. The pits came in four primary shapes: bowl, basin, bell, and globular. Although there was considerable overlap in the size range of the different shape categories, the bell-shaped pits tended to be somewhat larger than the others. There is nothing in the sample of radiocarbon-dated features to suggest change, over time, in the preferred shape of storage pits (Table 9.2). The typical bell-shaped pit had a
maximum measured diameter of 1.00 m and depth of 0.50 m. A significant fraction of the storage pits (21%) produced evidence suggesting that they had been “fired” in preparation for use. From our sample, we estimate that between 500 and 800 storage pits are present on the site. To provide a sense of what these estimates means in terms of feature density, Figure 9.1 shows the Larder Site with 500 points, or imagined pit features, randomly plotted within its boundaries. This projection applies, of course, to the site’s “archaeological context,” which is to say, to the archaeological evidence that remains to be discovered on the site. What about the “systemic context” of the storage features that are present on the site? Which features were in use at any given time? How many were there? What hearths or other features, activity areas, and artifacts were associated with particular episodes of use? How frequent were these episodes of use? None of these questions can be answered satisfactorily on the basis of the available evidence.

Table 9.2. Storage Pits at the Larder Site Listed by Age and Shape.

<table>
<thead>
<tr>
<th>Feature No.</th>
<th>Location (Trench)</th>
<th>Storage Pit Shape</th>
<th>Conventional Radiocarbon Age</th>
<th>2 Sigma (95%) Calibrated Radiocarbon Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>170N</td>
<td>basin</td>
<td>420±40</td>
<td>AD 1430-1620</td>
</tr>
<tr>
<td>12</td>
<td>130N</td>
<td>bell</td>
<td>490±40</td>
<td>AD 1400-1460</td>
</tr>
<tr>
<td>31</td>
<td>190N</td>
<td>basin</td>
<td>1030±40</td>
<td>AD 900-1040</td>
</tr>
<tr>
<td>55A</td>
<td>310N</td>
<td>bowl</td>
<td>1350±40</td>
<td>AD 640-760</td>
</tr>
<tr>
<td>18</td>
<td>150N</td>
<td>basin</td>
<td>1880±50</td>
<td>AD 30-240</td>
</tr>
<tr>
<td>49</td>
<td>230N</td>
<td>bell</td>
<td>1920±40</td>
<td>AD 10-150</td>
</tr>
<tr>
<td>51</td>
<td>250N</td>
<td>globular</td>
<td>1990±50</td>
<td>100 BC-AD 100</td>
</tr>
<tr>
<td>27</td>
<td>170N</td>
<td>bell</td>
<td>2060±50</td>
<td>190 BC-AD 50</td>
</tr>
<tr>
<td>47</td>
<td>230N</td>
<td>bowl</td>
<td>2130±40</td>
<td>350-50 BC</td>
</tr>
<tr>
<td>52</td>
<td>250N</td>
<td>bowl</td>
<td>2140±40</td>
<td>360-50 BC</td>
</tr>
<tr>
<td>14</td>
<td>130N</td>
<td>bowl/basin</td>
<td>2160±40</td>
<td>360-90 BC</td>
</tr>
</tbody>
</table>

**Subsistence**

The pollen and macrobotanical samples that HRA’s field crew collected from archaeological features at the Larder and Scorpion Knoll sites provided complementary data sets relating to subsistence. Pollen samples provided most of the data that we obtained for the presence of maize, a cultivated plant, as well as somewhat equivocal evidence relating to the use of a variety of nonwoody or herbaceous plants. Macrobotanical samples, on the other hand, provided substantial data on foods collected from woody plants—specifically seeds and seed pods obtained from mesquite and screwbean mesquite trees—but only a little evidence relating to the use of maize and herbaceous plants. As described in Chapter 8, we submitted pollen and macrobotanical samples to more than one analyst. The present discussion combines the results of those analyses into single pollen and macrobotanical data sets. Most of the analyzed macrobotanical specimens were extracted from soil samples by means of flotation, though a few were recovered during the course of hand excavation. Tables 9.3 and 9.4 summarize the findings of the macrobotanical and pollen analyses, by site and feature. It should be noted that all of this subsistence data is botanical in nature and, thus, relates to the exploitation of plants. The small quantity of faunal material recovered during the hand excavation of features at the Larder Site provides no useful information concerning the hunting or collecting of animals as food or for other purposes. At most, one can observe that the collection of a small number of projectile points at the Larder Site is consistent with the idea that the site’s inhabitants engaged in hunting to some degree.
Figure 9.1. Map of the Larder Site, with 500 randomly selected “storage-pit” locations (generated in ArcMAP with Hawth's Analysis Tools vers. 3.04).
EVIDENCE OF WILD PLANT USE

As previously noted, most of the macrobotanical evidence that we obtained from the Larder and Scorpion Knoll sites for the use of wild plants came from mesquite trees and, to a lesser extent, screwbean trees (Tables 9.3 and 9.4). This evidence consisted primarily of charred seeds and seed pods from these two related kinds of leguminous trees. The bulk of the food obtained from these two sources would have consisted of the seed pods rather than the seeds, so to some extent the seeds are an indirect indicator of an important food source. Radiocarbon evidence suggests that mesquite, in particular, served as an important stored food throughout the Larder Site’s 2000 period of use. The macrobotanical assemblage also included evidence for the possible use of amaranth, saltbush, cactus, and goosefoot as food sources.

Pollen evidence for the exploitation of wild herbaceous plants is somewhat difficult to interpret. For one thing, the analysts typically incorporate a degree of uncertainty into their interpretations—for example, “recovery of *Opuntia* pollen [from Feature 14 at the Larder Site] might well be associated primarily with economic activities.” The problem, of course, is that the identified pollen could simply have been part of the area’s natural “pollen rain.” This is so because essentially all of the wild plants whose pollen was found in the analyzed samples either do occur, or could occur, naturally in the vicinity of the Larder and Scorpion Knoll sites. In fact, many of the kinds of pollen from plants with some “economic use” that were found in the archaeological samples were also present in the “control sample” that we collected from the surface of the Larder Site.

A second difficulty arises from the fact that two pollen analysts, Richard Holloway and Linda Scott Cummings, sometimes interpret similar evidence in different ways. Holloway cites Bohrer (1972) in suggesting that the presence of clumps, or anther fragments, of Cheno-am pollen in a sample would normally indicate a “cultural use” for one or more plants in this group. Cummings does not interpret clumps of Cheno-am pollen in this way. Holloway also argues that insect-pollinated taxa found in an assemblage from a protected area, such as a pit feature, are most likely present due to a “cultural vector.” Among the insect-pollinated plant taxa identified in samples from the Larder and Scorpion Knoll sites are members of the cactus (Cactaceae family) family, including prickly pear (*Opuntia* or *Platypuntia*) and cholla (*Cylindropuntia*), members of the rose (Rosaceae) and lily (Liliaceae) families, and wild buckwheat (*Eriogonum*). Holloway also tends to identify primrose pollen as an “economic taxon” when found in association with maize pollen. As in the case of Cheno-am pollen clumps, Cummings does not place the same interpretive weight on the occurrence of pollen from insect-pollinated plants or the co-occurrence of primrose and maize pollen.

Cummings does, however, make other observations concerning the likelihood that certain plants were used by the sites’ inhabitants. She notes, for example, that samples from two storage pits at the Larder Site (Features 30 and 51) contained sufficient quantities of Cheno-am pollen to suggest that the features were used for storing plants of this kind. Similarly, a sample from the only roasting pit that was identified at the site (Feature 55B) included enough Cheno-am pollen to suggest that the plants were either stored or processed in the feature. In all three cases, the analyzed samples contained clumps of Cheno-am pollen, so they also fit this criterion of Holloway’s. The sample from one of the two storage pits (Feature 30) also produced a large quantity of grass (Poaceae) pollen, which, according to Cummings, might indicate “economic activity.” They make a similar argument in two other cases involving unusually large quantities of *Ephedra* pollen (Feature 20) and mesquite (*Prosopis*) pollen (Feature 49). In the case of the latter feature, the evidence suggests that the pit may have been used to store mesquite seed pods.
Table 9.3. Summary of “Productive” Features at the Larder Site.

<table>
<thead>
<tr>
<th>Feat.</th>
<th>Trench/Wall Type</th>
<th>Shape</th>
<th>Date</th>
<th>Maize</th>
<th>Pollen Evidence</th>
<th>Macrobotanical Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>110N Storage Pit</td>
<td>Bowl</td>
<td>–</td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family, globemallow</td>
<td>Numerous mesquite</td>
</tr>
<tr>
<td>12</td>
<td>130N Storage Pit</td>
<td>Bell</td>
<td>AD 1400-1460</td>
<td>X</td>
<td><strong>Prickly pear, mint family</strong>, primrose, rose family</td>
<td>Mesquite, screwbean</td>
</tr>
<tr>
<td>14</td>
<td>130N Storage Pit</td>
<td>Bowl/ Basin</td>
<td>360-90 BC</td>
<td>X</td>
<td><strong>Prickly pear, Cheno-am</strong>, primrose, rose family, globemallow, buckwheat</td>
<td>(mesquite)</td>
</tr>
<tr>
<td>18</td>
<td>150N Storage Pit</td>
<td>Basin</td>
<td>AD 30-240</td>
<td>X</td>
<td><strong>Cheno-am, cholla, non-prickly pear</strong></td>
<td>(Screwbean)</td>
</tr>
<tr>
<td>20</td>
<td>150N Storage Pit</td>
<td>Basin</td>
<td>–</td>
<td></td>
<td><strong>Ephedra, Cheno-am</strong>, primrose, rose family (sample from “middle” fill level)</td>
<td>Mesquite, screwbean</td>
</tr>
<tr>
<td>27</td>
<td>170N Storage Pit</td>
<td>Bell</td>
<td>190 BC-AD 50</td>
<td></td>
<td>Primrose, buckwheat, ephedra</td>
<td>(Mesquite, screwbean)</td>
</tr>
<tr>
<td>30</td>
<td>170N Storage Pit</td>
<td>Basin</td>
<td>AD 1430-1620</td>
<td>X</td>
<td><strong>Cheno-am, grass, nightshade</strong>, primrose, ephedra, buckwheat, rose family</td>
<td>Mesquite, <strong>Prosopis</strong></td>
</tr>
<tr>
<td>31</td>
<td>190N Storage Pit</td>
<td>Basin</td>
<td>AD 900-1040</td>
<td>X</td>
<td><strong>Cheno-am, primrose, globemallow</strong>, buckwheat</td>
<td>Mesquite, screwbean</td>
</tr>
<tr>
<td>36</td>
<td>190N Storage Pit</td>
<td>Bowl/glob.</td>
<td>–</td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family, globemallow</td>
<td>Mesquite</td>
</tr>
<tr>
<td>37</td>
<td>190N Storage Pit</td>
<td>Bell</td>
<td></td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family, buckwheat, ephedra, prickly pear, cholla, non-prickly pear</td>
<td>(Screwbean, cf. <strong>Prosopis</strong>)</td>
</tr>
<tr>
<td>45</td>
<td>230N hearth</td>
<td>–</td>
<td>AD 70-250</td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family, buckwheat, ephedra, prickly pear, cholla, non-prickly pear</td>
<td>(Mesquite, <strong>Prosopis</strong>)</td>
</tr>
<tr>
<td>47</td>
<td>230N Storage Pit</td>
<td>Bowl</td>
<td>350-50 BC</td>
<td></td>
<td><strong>Cheno-am, cholla, globemallow</strong>, primrose</td>
<td>Mesquite cob, mesquite</td>
</tr>
<tr>
<td>49</td>
<td>230N Storage Pit</td>
<td>Bell</td>
<td>AD 10-150</td>
<td></td>
<td><strong>Prosopis, Cheno-am</strong>, primrose, rose family (sample from “basal” fill and floor)</td>
<td>Mesquite, (cactus, saltbush)</td>
</tr>
<tr>
<td>51</td>
<td>250N Storage Pit</td>
<td>Globular</td>
<td>100 BC-110 AD</td>
<td>X</td>
<td><strong>Cheno-am</strong>, primrose, rose family, globemallow, lily family</td>
<td>Mesquite, (cactus, saltbush)</td>
</tr>
<tr>
<td>52</td>
<td>250N Storage Pit</td>
<td>Bowl</td>
<td>360-50 BC</td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family, globemallow</td>
<td>Mesquite</td>
</tr>
<tr>
<td>55A</td>
<td>310N Storage Pit</td>
<td>Bowl</td>
<td>AD 640-760</td>
<td>X</td>
<td><strong>Cheno-am</strong>, primrose, rose family, globemallow</td>
<td>Mesquite, screwbean, amaranth, (saltbush)</td>
</tr>
<tr>
<td>55B</td>
<td>310N Roasting Pit</td>
<td>–</td>
<td>–</td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family</td>
<td>(Screwbean)</td>
</tr>
<tr>
<td>61</td>
<td>230N Storage Pit</td>
<td>Bowl</td>
<td>–</td>
<td></td>
<td><strong>Cheno-am</strong>, primrose, rose family</td>
<td>Screwbean, mesquite</td>
</tr>
</tbody>
</table>

Notes: *pollen taxa interpreted by Richard Holloway as probably or possibly indicating human use are in **bold**; those interpreted by Linda S. Cummings in that way are in **bold italic**; occurrences of clumps or aggregates of cheno-am pollen that were identified by Linda S. Cummings and that Holloway would likely interpret as indicating possible or probable human use are in **bold underlined**; *mostly seeds and seed pods; parentheses = uncertain identification or small specimen count; *a Desert Side-notched point was found in the A horizon above the feature.
Table 9.4. Summary of “Productive” Features at Scorpion Knoll.

<table>
<thead>
<tr>
<th>Feat.</th>
<th>Trench</th>
<th>Type</th>
<th>Shape</th>
<th>Date (AD)</th>
<th>Maize</th>
<th>Pollen Evidence of “Economic” Plants</th>
<th>Macrobotanical Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500N</td>
<td>Pit Structure</td>
<td>?</td>
<td>690-900, 920-950</td>
<td>X</td>
<td>Cheno-am, ephedra, buckwheat, rose family</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>505N</td>
<td>Pit Structure?</td>
<td>Circular?</td>
<td>670-880</td>
<td></td>
<td>Cheno-am, primrose, buckwheat</td>
<td>Mesquite, goosefoot, saltbush</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>Roasting Pit</td>
<td>?</td>
<td>880-1020</td>
<td>X</td>
<td>Cheno-am, cattail, globemallow, primrose, buckwheat, cholla, non-prickly pear cactus</td>
<td>(mesquite)</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>Pit Structure</td>
<td>Circular</td>
<td>660-810, 840-860</td>
<td>X</td>
<td>Cheno-am, nightshade, ephedra, globemallow, rose family</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>485N</td>
<td>Storage Pit</td>
<td>Basin/bell</td>
<td></td>
<td></td>
<td>Globemallow, buckwheat, cholla, prickly pear, primrose</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>495N</td>
<td>Storage Pit</td>
<td>Irregular</td>
<td></td>
<td></td>
<td>Globemallow, rose family, primrose</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>–</td>
<td>Pit Structure?</td>
<td>?</td>
<td></td>
<td></td>
<td>Globemallow, buckwheat, primrose, cholla, non-prickly pear cactus, rose family, ephedra</td>
<td></td>
</tr>
</tbody>
</table>

Notes: a pollen taxa interpreted by Richard Holloway as probably or possibly indicating human use are in **bold** type and those interpreted by Linda S. Cummings in that way are in **bold italic** type; occurrences of clumps or aggregates of cheno-am pollen that were identified by Linda S. Cummings and that Holloway would likely interpret as indicating possible or probable human use are in **bold underlined** type; b parentheses = uncertain identification

The analysts also identify seven samples with meaningful occurrences of cactus pollen—divided among the categories of prickly pear, non-prickly pear, and cholla cactus. Depending on the taxon, the food items in question might have included flowers, flower buds, fruits, or immature pads. Five of the seven samples were from storage pits (four at the Larder Site and one at Scorpion Knoll), one was from a possible pit structure (at Scorpion Knoll), and one was from a roasting pit (also at Scorpion Knoll). Not included in the count is an eighth sample, also from a hearth (at the Larder Site), that also contained cactus pollen.

Tables 9.3 and 9.4 address these differences in interpretive procedures in the following manner. When Holloway states, or implies, that a particular kind pollen identified in one of the samples that he analyzed indicates probable or possible use, that taxon is listed in bold type. Similarly, when Cummings states that a category of pollen identified in one of her samples indicates probable or possible use, that taxon is listed in bold italic type. Other kinds of identified pollen are listed in the table, in plain type, because they come from plants that are known to have been used by Native Americans as a source of food or medicine. This includes evening primrose (Onagraceae) and globemallow (Sphaeralcea). Also listed in this manner are occurrences of Cheno-am pollen that Cummings did not consider indicative of use. To provide some overlap between the interpretive criteria of our two analysts, these entries indicate that Cummings identified clumps of Cheno-am pollen in her samples. As noted, Holloway would typically consider the presence of these pollen clumps or aggregates as evidence of use.

What then, do pollen data have to tell us—even if only tentatively—about the use of herbaceous plants by the inhabitants of the Larder and Scorpion Knoll sites. Together, Holloway and Cummings identify nine
samples with evidence of Cheno-am pollen that probably reflect an economic use for this category of plants. “Cheno-am is an artificial, pollen morphological category which includes pollen of the family Chenopodiaceae (goosefoot) and the genus Amaranthus (pigweed)” (Cummings et al., Chapter 8). Three of the nine identified samples came from thermal features (including a hearth and a small roasting pit at the Larder Site and a second small roasting pit at Scorpion Knoll), two were from pit structures (both at Scorpion Knoll), and the other four were from storage pits (all at the Larder Site). Applying Holloway’s interpretation of Cheno-am clumps to Cummings’ data would almost double the count of features, from nine to 17. The additional occurrences include samples from seven storage pits (all at the Larder site) and one sample (from Feature 2 at Scorpion Knoll) that may represent roasting debris.

Holloway refers to six samples with various combinations of primrose, globemallow, and buckwheat pollen that he considers evidence for the use of these plants. The samples came from four storage pits (two at the Larder Site and two at Scorpion Knoll), as well as a roasting pit and a possible pit structure (both at Scorpion Knoll). As previously mentioned, Holloway employs interpretive criteria that are more likely to identify use-related occurrences of these kinds of pollen than those of Cummings. It is worth noting, therefore, that these categories of pollen are present in many more samples in contexts not considered significant by Cummings or by Holloway (Tables 9.3 and 9.4). It seems to suggest that some unknown number of these occurrences did, in fact, result from the use of these plants by the two sites’ inhabitants.

Cummings also identifies use-related occurrences of pollen from a member of the mint family (from a storage pit at Larder Site), ephedra (from a partially filled-in storage pit at the Larder Site), and a member or members of the nightshade family (from a storage pit at the Larder Site and a pit structure at Scorpion Knoll). She is particularly tentative, however, in suggesting that the nightshade pollen was present due to human use.

Finally, there are two pollen occurrences that may have more to do with how features were used than with what was stored in processed within them. In both cases, the analyst identified the pollen as probably or possibly present as a result of human activity. One case involves the presence of grass pollen in a sample, analyzed by Cummings that was obtained from a storage pit (at the Larder Site). The other concerns the identification of a very large quantity of cattail pollen in a sample, analyzed by Holloway that was collected from a roasting pit (at Scorpion Knoll). In both cases, the pollen may be present because the plants in question were used to line the pit features or to cover whatever food items were placed within them. Holloway suggests, in addition, that the cattails may have been placed in the roasting pit to add moisture to cooking process.

In conclusion, pollen data suggest that the inhabitants of the Larder and Scorpion Knoll sites made use of a variety of herbaceous, as a source of food but also possibly for other uses. This evidence complements the evidence obtained from macrofloral specimens for the importance of mesquite and screwbean seeds and particularly seed pods as subsistence resources.

**EVIDENCE OF MAIZE**

In spite of its location on the northwestern edge of the American Southwest, southern Nevada’s Las Vegas Valley has never played a significant role in archaeologists’ efforts to reconstruct the history of southwestern agriculture—at least not until now. The most obvious and, no doubt, important reason for the Las Vegas Valley’s absence from histories of southwestern farming has been the scarcity of relevant archaeological data. Few sites in the valley have produced evidence of maize, and on the rare occasions when such evidence has been found, it has generally consisted of only one or two fragments of maize kernels or cobs. One can ask, however, whether this dearth of evidence should simply be taken at face value, or if it instead is partly a function of “standard” archaeological practice. Until recently, archaeological projects in the Las Vegas Valley have made only limited use of two procedures for the collection and analysis of botanical specimens that have contributed immeasurably to the archaeological study of prehistoric southwestern agriculture (Huckell 2006:106). One of these involves the analysis of microscopic pollen grains that were either extracted from soil samples or washed from the surfaces of ground-stone artifacts, and the second consists of the analysis of macrobotanical specimens that were either collected in the course of excavation or, more importantly, separated
from soil samples by means of flotation. Perhaps archaeologists have found so little evidence for maize farming in the Las Vegas Valley because they have not been systematically searching for it. And they may not have been seeking this evidence because they have not expected to find it. For whatever reasons, archaeologists have tended to assume that the Las Vegas Valley lay beyond the boundaries of the southwestern “farming frontier” well into the historical period.

There are several reasons why archaeologists may not have expected to find evidence for the farming of maize or other crops in the Las Vegas Valley. One of these reasons, the scarcity of existing evidence, has already been mentioned. A second reason concerns the tendency of archaeologists to view the Las Vegas Valley as a southerly extension of the western Great Basin. That region’s Native American inhabitants practiced hunting-and-gathering lifeways that have been thoroughly documented, by both ethnographers and archaeologists. There is no arguing with the fact that the majority of sites that have been systematically investigated in the Las Vegas Valley fit comfortably within existing models of Great Basin subsistence and settlement. One might, on the other hand, have expected this Great Basin focus to have been tempered by the knowledge that, during the historical period, Southern Paiute people living in the Las Vegas Valley did, in fact, cultivate corn and other crops. This has not been the case, however, perhaps because of a tendency on the part of two ethnographers who studied the Southern Paiute—Julian Steward and Isabel Kelly—to deemphasize this farming activity.

In one of his most influential publications, Basin-Plateau Aboriginal Sociopolitical Groups, Steward (1938:180) acknowledged that “Some horticulture was probably practiced by all Southern Paiute.” He did not, however, consider this to have been an important activity (Van Vlack 2007:104, 119-123). As mentioned earlier, southwestern archaeologists continue to debate the relative importance of farming among the region’s “first farmers.” Central to this debate is the problem of establishing agreed-upon criteria for measuring and comparing the importance of agriculture in different times and places. These concerns are also relevant to Steward’s assessment of Southern Paiute farming. Steward considered horticulture “to have been a minor supplement to hunting and gathering [that] contributed little to [the Paiutes’] prosperity” (Steward 1938:180). A primary goal of Steward’s research was to understand the human ecology of hunter-gatherers in the Great Basin–Plateau region. According to Steward, this kind of study requires the “consideration first of certain features of the natural landscape or environment; second, of cultural devices by which the environment was exploited, and third, of resulting adaptations of human behavior and institutions” (Steward 1938:2). Stated in these terms, Steward clearly concluded that the “cultural device” of farming did not have a sufficient effect on Southern Paiute “adaptations of behavior and institutions” to require any significant modifications to his understanding of hunter-gatherer ecology in the Great Basin–Plateau region (cf. Roberts and Ahlstrom 2006:8; Van Vlack 2007:100).

In the 1930s, Isabel Kelly interviewed Southern Paiute people whose accounts provided details on their ancestors’ lives extending back to the mid-1800s. This included considerable information on farming practices (Kelly and Fowler 1986:371). The information that Kelly obtained on farming in the Las Vegas Valley was not published during her lifetime, but has been reported in recent years by Catherine Fowler (2001). Kelly also documented the variability in farming activity among different Southern Paiute groups (Kelly and Fowler 1986:371). It may seem odd, in light of this varied research, to suggest that Kelly deemphasized farming among the Southern Paiutes. She did deemphasize this activity, however, specifically with regard to its historical depth. Kelly concluded that farming was a “late” addition to Southern Paiute subsistence: “A few decades before occupation by the Whites, Southern Paiute economy was bolstered by the introduction of native agriculture” (Kelly and Fowler 1986:371; also Kelly 1964:36, 39-41). Neither this historical inference, nor Steward’s position that farming was unimportant to an understanding of Basin-Plateau sociopolitical groups, would have encouraged archaeologists to seek out evidence of farming in the Las Vegas Valley during the prehistoric or early historical periods.
Categories of Evidence

Four kinds of evidence have a bearing on the history of maize farming in the Las Vegas Valley. They include macrobotanical specimens, pollen grains, radiocarbon dates, and ethnographic and historical accounts. Each category has strengths (or advantages) and weaknesses (or limitations) that are relevant to its use in the Las Vegas Valley.

Macrobotanical Specimens.

Strengths: (1) The relevant evidence consists of the food itself, in the form of maize kernels, or of the cobs from which the kernels came. (2) Maize kernels and cobs can be radiocarbon dated directly, simplifying the interpretation of the dating evidence. (3) Maize specimens submitted for radiocarbon dating produce $^{13}$C/$^{12}$C ratios that are distinct from those of charcoal and from many, though not all, wild-plant foods that were available to Native Americans living in the Desert West (Tykot 2006:Figures 10-1 and 10-2). When the interpretive stakes are high—as when claims are made for the discovery of “early maize” in an area—doubts may expressed as to whether maize specimens were correctly identified. The analysis of $^{13}$C/$^{12}$C ratios can help to allay these concerns.

Weaknesses: (1) When counts of specimens are small, there is the possibility that the remains were transported from elsewhere. This may be more of a problem with maize kernels than cobs, due to the greater portability of shelled kernels than corn on the cob.

Pollen Evidence.

Strengths: (1) Grains of maize pollen are large, distinctive, and readily identifiable (Figure 9.2). It is practical, therefore, for pollen analysts to search for this pollen using low-magnification scans of pollen slides carried out to supplement the standard, high-magnification counting of pollen grains. (2) Maize is generally pollinated by wind and gravity, and “there is general agreement that the typical downwind dispersal pattern of maize pollen by the airflow in low to moderate wind speeds results in a relatively steep deposition gradient” (Emberlin et al. 1999). This suggests that, in archaeological settings involving small-scale farming activity, the “natural” dispersal of maize pollen would have been a local phenomenon, generally occurring over distances of well under a mile.

(3) To the extent that maize was grown in the Las Vegas Valley, it was on a relatively small scale. There would have been little possibility, therefore, for pollen from maize plants growing in one part of the valley to turn up in cultural features located in another. Discovery of even a few grains in enclosed settings, such as within structures or storage pits, can therefore be taken as reasonable evidence for the presence in the vicinity of pollen-bearing plant parts and, by extension, of the living corn plants themselves.

Weaknesses: (1) The preceding comments notwithstanding, small counts of maize pollen, like those discussed here, can be difficult to interpret. Do they represent the processing, storage, or consumption of maize within, near, or in the vicinity of the sampled cultural feature? Could the pollen grains have arrived at the site more or less by accident, which is to say, adhering to parts of corn plants (kernels, cobs, husks, and so on) that were brought to the site from elsewhere? (2) Under normal circumstances, maize pollen cannot be dated directly, so issues relating to the provenience relationship between the pollen sample and a dated radiocarbon sample must be addressed.

Radiocarbon Dates.

Strengths: (1) Radiocarbon dating can generally place events in intervals of two centuries or less (Taylor 1987), which is better than the temporal resolution provided by the alternatives of
dating on the basis of projectile point styles or (mostly) undecorated pottery types. (2) Radiocarbon dates can be obtained directly from annual plant products, like maize kernels and cobs, as well from associated seeds and seed pods from wild plants. Under these circumstances, there is a close relationship between “dated” and “target” events (Dean 1978). The relevant dated events would include the emergence, during a single growing season, of the dated kernels, cobs, and so on. Target events consist of human behaviors whose results or products can be identified archaeologically. In the cases discussed here, they would include the construction and use of the storage pits and habitation structures that produced pollen or macrobotanical evidence of maize.

Weaknesses: (1) Except in the direct dating of maize specimens, provenience and other relationships between radiocarbon-dated samples and maize evidence must be addressed. (2) Radiocarbon dates on wood charcoal are susceptible to the “old wood problem” (Schiffer 1982, 1987:308-312), which can result in dates that are too old by a century or more for the archaeological contexts that produced the dated samples. There are two aspects to the old wood effect, referred to as “built-in age” and “cross-section effect” (Smiley 1998). Built-in age “refers for the potential for age difference between tree death and human use of materials from the tree” (Smiley 1998:49). Built-in age can be particularly significant in arid places like the Desert West, where dead wood can survive, either as standing snags or pieces of wood lying on the ground, for decades or even centuries. Cross-section effect results from the inclusion in a dated sample of wood from the inner rings of a tree branch or stem—rings that may have grown decades or, in the long-lived trees, a century or more before the death of the sampled stem or branch.

_Ethnographic and Historical Accounts_.

Strengths: (1) Substantial data on the farming practices of Southern Paiutes who lived in the Las Vegas Valley are available from research that Isabel Kelly conducted in the 1930s (Fowler 2001; Kelly and Fowler 1986:371).

Weaknesses: (1) Kelly’s ethnographic accounts reach back only as far as the mid-nineteenth century.

Inferences based on any or all of these kinds of evidence become stronger with the accumulation of data. This process of data accumulation can take two forms. The first involves “redundancy,” in which a particular kind of evidence is observed in multiple cases. An example would be the recovery of charred maize in several similar features that date to the same time interval. The second kind of data accumulation involves “reinforcement,” in which different kinds of evidence complement one another by supporting a particular interpretation. An example would be the discovery in a single, radiocarbon-dated storage pit of pollen and macrobotanical specimens of maize.

_Summary of Maize Evidence from the Las Vegas Valley_

Archaeological evidence in support of a new history of farming in the Las Vegas Valley comes primarily from the Larder (26CK6146) and Scorpion Knoll (26CK6147) sites (Chapters 4, 5, and 8) (Table 9.5). As discussed in Chapter 1, these sites are located about 100 meters apart near the northern end of Clark County Wetlands Park. Some additional evidence relating to the history of farming in the Las Vegas Valley comes from two sites—26CK1139 and 26CK1282—that are located several miles downstream from the Larder and Scorpion Knoll sites at the eastern end of Clark County Wetlands Park. Site 26CK1139 occupies a small rockshelter, and 26CK1282 is situated nearby on the Las Vegas Wash floodplain. HRA recently reanalyzed records, artifacts, and samples from excavations that were conducted at these sites in the 1970s (Ahlstrom 2005a). We interpreted both sites as short-term camping locales. Site 26CK1139 was visited periodically
between AD 1100 and 1900, and 26CK1282 (specifically its late temporal component) between AD 1000/1450 and 1900.

Radiocarbon dates support the identification of six time intervals during which maize was being grown in or near Clark County Wetlands Park (Figure 9.3). The most convincing evidence, relating to the five earliest intervals, comes from the Larder and Scorpion Knoll sites. More equivocal evidence relating to the most recent of the intervals has been found at sites 26CK1139 and 26CK1282.

Figure. 9.2. Light micrograph of *Zea mays* pollen grain (USDA photo, accessed at http://pollen.usda.gov/Light_Micrographs/Poaceae/Poaceae.html).

AD 1650–1900. Evidence for farming in the Wetlands Park area between AD 1650 and 1900 consists of three radiocarbon-dated maize specimens, two from 26CK1139 and one from 26CK1282. Two of the dated samples were individual kernels of maize, and the third was a cob fragment. In spite of the fact that the radiocarbon dates came directly from maize specimens, there are two reasons to question whether the evidence pertains to farming in the immediate vicinity of the two sites. To begin with, the assemblages of botanical remains that have survived from the 1970s included just these three small specimens of maize. By comparison, the assemblages included several hundred whole or fragmentary seeds of mesquite and other wild food plants, as well as 18 whole and fragmentary pinyon nut hulls (Holloway 2005). The latter must have been carried from mountain areas located 20 or more miles from Wetlands Park. Given these numbers, it is reasonable to suspect that the three dated maize specimens came from elsewhere as well. Second, only the cob fragment from 26CK1139 provided a 13C/12C ratio (-9.8‰) that is consistent with maize. The two kernels produced ratios (-23.9‰ and -24.7‰) that agree instead with values typically obtained from charcoal and a number of wild plant foods (Tykot 2006). This raises the possibility that these specimens were misidentified.
Table 9.5. Summary of Maize Data from Sites in the Wetlands Park Area.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Site¹/Feat.</th>
<th>Feature Type</th>
<th>Maize Evidence</th>
<th>Dated Material</th>
<th>Calibrated (2σ) Radiocarbon Date²</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD 1650-1900</td>
<td>1139/–</td>
<td>– Cob Frag.</td>
<td>Cob Frag.</td>
<td>AD 1690-1960+</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>1282/–</td>
<td>– kernel?</td>
<td>Kernel?</td>
<td>AD 1660-1950</td>
<td></td>
</tr>
<tr>
<td>AD 1400-1600</td>
<td>LS/30</td>
<td>Storage Pit</td>
<td>Pollen Seed &amp; Pod</td>
<td>AD 1430-1620</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>LS/12</td>
<td>Storage Pit</td>
<td>Pollen Seed</td>
<td>AD 1400-1460</td>
<td></td>
</tr>
<tr>
<td>AD 900-1050</td>
<td>LS/31</td>
<td>Storage Pit</td>
<td>Pollen Seed &amp; Pod</td>
<td>AD 900-1040</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>SN/3</td>
<td>Roasting Pit</td>
<td>Pollen Seed</td>
<td>AD 880-1020</td>
<td></td>
</tr>
<tr>
<td>AD 650-950</td>
<td>SN/1</td>
<td>Habitation</td>
<td>Pollen Seed</td>
<td>AD 690-900 &amp; 920-950</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>SN/4</td>
<td>Habitation</td>
<td>Pollen Charcoal</td>
<td>AD 660-810 &amp; 840-860</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>LS/55A</td>
<td>Storage Pit</td>
<td>Pollen Charred Matter</td>
<td>AD 640-760</td>
<td></td>
</tr>
<tr>
<td>AD 700-1000?</td>
<td>SN/8</td>
<td>Habitation?</td>
<td>Pollen –</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>100 BC-AD 250</td>
<td>LS/18</td>
<td>Storage Pit</td>
<td>Pollen Charred Matter</td>
<td>AD 30-240</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>LS/51</td>
<td>Storage Pit</td>
<td>Pollen Charred Matter</td>
<td>100 BC-AD 110</td>
<td></td>
</tr>
<tr>
<td>350-50 BC</td>
<td>LS/47</td>
<td>Storage Pit</td>
<td>Cob Frags. Maize Cob</td>
<td>350-50 BC</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>LS/14</td>
<td>Storage Pit</td>
<td>Pollen Seed pod &amp; Charred Matter</td>
<td>360-90 BC</td>
<td></td>
</tr>
</tbody>
</table>

Notes: ¹LS=Larder Site; SN=Scorpion Knoll Site
²Data on radiocarbon dates from Sites 26CK1139 and 26CK1282 can be found in Ahlstrom (2005:Table 11.1); data on dates from the Larder and Scorpion Knoll sites are in Ahlstrom (2008:Tables 4.3 and 5.3).
As was noted earlier, Kelly’s ethnographic or informant data on farming in the Las Vegas Valley reach back, on their most solid footing, to the mid-1800s. This interval falls in the latter portion of the AD 1650–1900 defined with reference to the three radiocarbon dated maize specimens. We cannot say whether these dates are simply consistent with Kelly’s data or, instead, push back the record of farming activity as much as two centuries prior to the temporal baseline provided by Kelly’s data. Unfortunately, the radiocarbon technique is poorly suited to dating events to one or another portion of the 300-year interval from AD 1650 to 1950 (Taylor 1987). This constraint is reflected in the temporal ranges of our three maize dates: AD 1660–1950, 1660–1950, and 1690–1960+ (Ahlstrom 2005a:Table 11.1). This factor is also likely to affect any additional radiocarbon dates obtained in the future from maize specimens that also post-date AD 1650.

In his monograph, *Southern Paiute Ethnohistory*, Robert Euler (1966:111) noted that “Virtually all of the historic documents attest the importance of gathering and hunting among the Southern Paiute. Agriculture, however, is also frequently mentioned, an indication that this activity was, at least to some Paiute, of greater importance than Steward (1938:180) believes.” The historic documents cited by Euler pertain in particular to farming by Paiutes who lived in southwestern Utah’s St. George Basin (Roberts and Ahlstrom 2006:26-28; Van Vlack 2007:37-49). Evidence pointing to the importance of farming in the Las Vegas Valley comes

Figure 9.3. Summary of maize-related radiocarbon dates from Clark County Wetlands Park. Vertical lines represent two-sigma calibrated date ranges, including all dates from the Larder and Scorpion Knoll sites and a selection of dates from Sites 26CK1139 and 26CK1282. Maize-related dates from the Larder and Scorpion Knoll sites are circled in blue, and those from 26CK1139 and the late temporal component of 26CK1282 in green; non-maize-related dates from the early/pithouse component of 26CK1282 are circled in red.
primarily from Kelly’s ethnographic research. The first of these hints resides in her observation that, among the 14 “primary settlements” that her consultants identified in the Las Vegas Valley, “nearly all…were planted with a variety of native crops.” A second hint involves the variety of planted crops, which included “corn, beans, squash, amaranth, sunflowers, and later, sorghum, wheat, watermelon and cantaloupe” (Fowler 2001:80). Third, although its significance should not be overstated, there is the fact that Paiute farmers expended considerable effort in preparing, planting, and irrigating their fields:

According to Kelly, the site near or below a spring was first cleared of brush using a pasu ‘u, or flattened spade-like stick made of screwbean wood. Another implement was a tortoise shell dish…. Any grubbed mesquite was kept for fuel wood, including the roots. Once a plot had been cleared (sizes varied—up to an acre), it was leveled and banked with 6" to 8" of dirt, just enough to hold the water. Irrigation ditches were then dug from the spring…to feed into these “ponds”…. People usually planted in the same pond for two or three years, and then cleared other sites nearby. The ditch was extended to these, and if necessary, laterals taken from it [Fowler 2001:86].

The ponds were irrigated well before planting…. Seeds were presprouted: especially corn and watermelons, but some consultants said most crops except amaranth received this treatment. Presoaking was done in large, clay pottery platters—some 2 ft across—covered with moistened cliffrose bark or some other like material. It took about four days for most seeds to sprout, although watermelons took about one week. They were then transferred to the moist soil in the ponds [Fowler 2001:86].

As stated earlier, two of the three “maize” samples from 26CK1139 and 26CK1282 may have been misidentified. Furthermore, whichever of these samples were maize may not have come from plants that grew in the Wetlands Park area. On the other hand, Kelly’s evidence suggests that any samples of maize that were present at the sites could well have come from fields located elsewhere in the Las Vegas Valley. This is a case, then, where ethnographic and archaeological approaches provide mutually reinforcing evidence. An alternative interpretation should also be considered, however. That is, the maize could have come from Patayan (i.e., ancestral Mojave) communities located to the south, on the Lower Colorado River. That interpretation is consistent with pottery data from Clark County Wetlands Park. Ceramic assemblages from sites in this area are dominated by sherds of Lower Colorado River Buff Ware, to the near exclusion of Southern Paiute Brown Ware. This evidence indicates substantial contacts with those communities to the south (Lyneis 2007; Seymour 2005). Additional evidence for contacts in that direction comes in the form of an intaglio, or ground figure, located a mile south of the confluence of the Las Vegas and Three Kids washes (Woodman and Valentine 1999).

In addition to 26CK1139 and 26CK1282, Gypsum Cave has produced a number of maize specimens that may date to the AD 1650–1900 period. This site is located several miles east of the Las Vegas Valley’s northeastern corner. In his report on excavations conducted in Gypsum Cave in the early 1930s, Harrington refers specifically to row counts for 39 maize cobs, but even more specimens may have been recovered. According to Harrington (1933:81), all of the cobs “belong to the type known as starch or flour-corn, still used by the Pueblo tribes and other Southwestern Indians. This makes it probable that the Pueblo or Paiute visitors, rather than the Basketmakers, were responsible for the Gypsum Cave corn, for Basketmaker corn, so far as is known, was of the flint type” (Harrington 1933:81). By this criterion, the Gypsum Cave maize could date to our AD 1650–1900 period or to any of the other periods discussed here extending back as far as AD 900 and, perhaps, AD 650.

AD 1400–1600. Evidence for maize farming in the Las Vegas Valley before AD 1600 comes primarily from the Larder and Scorpion Knoll sites. HRA obtained 16 radiocarbon dates from these two sites. Ten (62%) of these dates came from features (one date per feature) that also produced evidence of maize. An eleventh feature also contained evidence of maize, but no material suitable for radiocarbon dating. The dates support the
identification of five pre-AD 1600 periods during which maize farming was practiced in the Wetlands Park area. The most recent of these periods, AD 1400–1600, is defined on the basis of two strong cases that provide comparable—i.e., redundant—evidence for the presence of maize. Both cases involve pit features at the Larder Site. One of these, Feature 12, was a bell-shaped storage pit, and the other, Feature 30, was a basin-shaped storage pit. Samples taken from the floor and bottommost 3 cm of fill in each feature contained maize pollen. The maize pollen from Feature 12 was included in the standard pollen count, whereas that from Feature 30 was observed during a scan of the pollen slide. In case of Feature 30, the sampled fill layer was distinctly ashy. We have interpreted this kind of ashy fill, which was present in a number of storage pits at the site, as having resulted from the building of a small fire on the floor of the pit. The purpose of this fire would have been to dry the walls of the pit and thereby prepare the feature for use in storing foodstuffs.

Feature 12 produced a radiocarbon date of AD 1400–1460 from two charred mesquite seeds that emerged as the floor of the pit was being scraped with a trowel. Feature 30’s radiocarbon, of AD 1430–1620, came from a sample of mesquite seeds and seed pods that were “floated” from feature fill that was collected in the same general location as the analyzed pollen sample. Both dates, in other words, were determined from samples consisting of annual plant products.

**AD 900–1050.** Evidence for maize farming between AD 900 and 1050 comes from one feature at the Larder Site and another at Scorpion Knoll. Feature 31 at the Larder Site was a large, basin-shaped storage pit. This feature’s pollen evidence was from a composite sample that was collected from a backhoe trench wall at various points between 5 and 30 cm above the storage pit’s floor. This sample was not, in other words, as specific to the use of the pit as samples that we collected from the floor and lowest 1-3 cm of fill in other features at our two sites. The sample contained a single grain of maize pollen observed during a low-magnification scan of the pollen slide. The feature’s radiocarbon date (AD 900–1040) came from a sample that was separated, by flotation, from a soil sample that we collected from the same broad area of feature fill as the pollen sample. The dated sample may, therefore, have been more closely associated with the post-use filling in of the pit than with its actual use. This distinction between events is probably of little consequence, however, given our assumption that abandoned pit features at the Larder Site probably filled in within a few years—and certainly with a decade or two—of their final use. The dated sample consisted of fragments of annual seeds and seed pods, so the “old wood problem” is not relevant to the date’s interpretation.

Feature 3 at the Scorpion Knoll Site was a small roasting pit. Its maize evidence came from a pollen sample that was taken from the feature’s floor and from the overlying 3 cm of feature fill. As in the case of Feature 31, that evidence consisted of a single grain of maize pollen that was identified during a low-magnification scan of the pollen slide. Feature 3’s radiocarbon date of AD 880–1020 came from two charred seeds that were “floated” from a soil sample collected from the feature’s ashy and charcoal-bearing fill.

To summarize, the dating evidence from Feature 31 at the Larder Site and Feature 3 at Scorpion Knoll was of higher quality than the maize evidence. The dates from both features were derived from samples consisting of annual plant products, specifically seeds and seed pods. In both cases, the dated samples came from what can best be characterized as “general feature fill.” Because of the manner in which roasting pits were used—involving the digging-out of the cooked food items—it appears likely that the dated sample was directly associated with the feature’s use. The association is less clear-cut in the case of the storage pit, Feature 31. Finally, although even small counts of maize pollen grains are likely to be significant, it would have been preferable if more than a single grain had been identified in each of the two analyzed samples.

A third site in the Las Vegas Valley area, 26CK3780, has produced maize evidence that may also date to the AD 900–1050 period. The site is a small rockshelter located in the Apex Area, a mile or so north of the valley’s northeastern corner. The relevant evidence consists of a maize cob that produced a radiocarbon date of AD 980–1055 and 1085–1150 (Ahlstrom and Roberts 2001a; Blair and Wedding 2001). The second of these intervals would date the maize cob up to a century later than our period of AD 900–1050. The dated sample represented the only evidence of maize that was found at the site.
Three features, one at the Larder Site and two at Scorpion Knoll, provide the basis for identifying a period of local farming activity between AD 650 and 950. (There is some overlap between the end of this period and the beginning of the next, but central tendencies in the relevant radiocarbon date distributions support the identification of two separate periods.) Feature 55A at the Larder Site was a bowl-shaped storage pit. A pollen sample collected from the feature’s floor and lowest 3 cm of fill was found to contain maize pollen (observed during a scan of the pollen slide). The feature’s radiocarbon date (AD 640–760) came from a composite sample of unidentified charred material collected from fill located between 5 and 25 cm above the floor of the pit. As in the case discussed earlier, the date from this sample may bear a closer relationship to the final filling of the storage pit than to its actual use. A flotation sample collected from the same area of fill as the radiocarbon sample contained a combination of charcoal and charred seeds and seed pods, and it is likely that both materials were also present in the dated sample. It is possible, therefore, that the dated sample contained “old wood.”

Feature 1 at Scorpion Knoll consisted of the remains of a shallow, probably ephemeral, habitation structure. A soil sample collected from the floor of the structure contained a small quantity of maize pollen (including at least one pollen aggregate) that was observed during a scan of the slide—i.e., outside the standard pollen count. The feature’s radiocarbon date (AD 600–900 and 920–950) came from a charred seed that was recovered, through flotation, from a layer of charcoal-stained sediment located 5-20 cm above structure’s floor. The sediment in question probably represents “roof fall” from the building’s superstructure.

Feature 4 at Scorpion Knoll represented a second shallow ephemeral habitation structure. A soil sample collected from the floor and bottom centimeter of fill in this structure contained a small amount of maize pollen (observed during a scan of the pollen slide). The feature’s radiocarbon date came from a charred segment of a mesquite pole that was found lying in fill a couple centimeters above the floor. The pole probably came from the building’s superstructure. The dated sample was taken from the outer half centimeter or so of the pole segment, which would have limited the effect of “old wood” from the inner portion of the pole on the resulting radiocarbon date. The sample yielded a date with two ranges, AD 660–810 and 840–860. Examination of the calibration data indicates that the earlier of these two intervals has a greater likelihood of being correct than the later one.

In addition to Features 1 and 4, HRA’s field crew investigated small portions of two features at Scorpion Knoll that might also represent the vestiges of habitation structures. One of these, Feature 8, produced a single grain of maize pollen from a sample collected from the bottom 5 cm of feature fill. The feature is undated, but we assume that it was occupied sometime during the AD 650–1050 period identified for the site on the basis of radiocarbon evidence.

Maize from another site in the Las Vegas Valley can also be assigned to the period of AD 650–950. The evidence, consisting of a single charred maize cupule, came from the hearth in a shallow structure, similar to those at Scorpion Knoll, which Gregory Seymour (personal communication 2005) excavated near the center of the valley at the Las Vegas Springs Preserve. No other maize evidence, including pollen, was recovered from the structure. This raises the possibility that the maize was not grown nearby, but was carried in from elsewhere. A radiocarbon sample from the hearth produced a date of AD 680–890.

Data from two features at the Larder Site support the identification of a period of local maize-farming activity between 100 BC and AD 250. Feature 18 was a basin-shaped storage pit (Feature 8), and Feature 51 was a globular storage pit. A soil sample collected from the bottom several centimeters of fill in Feature 18 contained a single grain of maize pollen, which was observed during a low-magnification scan of the pollen slide. A sample of unidentified charcoal that was collected from the same level of feature fill as the pollen sample produced a radiocarbon date of AD 30–240. In the case of Feature 51, the analyzed pollen sample came from the floor and bottom two centimeters of feature fill. A scan of the pollen slide revealed the presence of maize pollen in the sample. This feature’s radiocarbon date, 100 BC–AD 100, was determined from a sample of unidentified charcoal that was recovered from the bottom 10 cm of feature fill. The dates
from both features may be early on account of the old wood effect. In the case of Feature 51, at least, the date is unlikely to be so early as to invalidate the storage pit’s assignment to the period from 100 BC to AD 250.

Three additional features from the Larder Site are worth mentioning here, not because they produced evidence of maize, but because their radiocarbon dates strengthen the argument that the site was utilized between 100 BC and AD 250. Feature 45, a shallow hearth, produced a date of AD 70–250 from a sample of charred seeds recovered from feature fill. Feature 49, a bell-shaped storage pit, provided a date of AD 10–150 from a sample of charcoal obtained from the lower 8 cm of feature fill. Finally, Feature 27, a large, bell-shaped storage pit, gave a date of 190 BC–AD 50 from charcoal found in the bottom 18 cm of feature fill. The last of these date ranges is evenly divided between the periods of 100 BC–AD 250 and 350–50 BC that we have identified on the basis of dated maize evidence. It is included here in the later of these two periods on the chance that the old wood effect has caused the date to be earlier than the context that produced the dated sample.

350–50 BC. The definition of a period of farming activity between 350 and 50 BC is based on data from two storage pits at the Larder Site, Features 14 and 47. Feature 14 was a large, bowl or basin-shaped storage pit. A soil sample collected from the floor and overlying 2-3 cm thick layer of ashy fill contained a small quantity of maize pollen. As mentioned earlier, we believe that this ashy layer was produced by the building of a small fire on the floor of the pit, with the intent of drying the walls of the pit and, in that manner, preparing the feature for use. Flotation of a soil sample taken from fill in the upper portion of the feature revealed the presence of a charred fragment of a seed pod that was identified as “probably mesquite.” This specimen returned a radiocarbon date of 360–90 BC. This was one of the three oldest radiocarbon dates that we obtained from features at the Larder Site—the other two early dates will be mentioned shortly. Feature 14’s radiocarbon date is only one of two pieces of evidence that attest to the antiquity of this storage pit, relative to other features on the site.

The second piece of evidence comes from the site’s record of natural (as opposed to cultural) stratigraphy. HRA’s project geoarchaeologist, William Eckerle, identified three primary soil horizons on the site for HRA’s field crew (Chapter 2). They included an A, a Bw, and a Cy horizon. Most of the pit features that HRA’s archaeologists identified on the site had been excavated into the sediment that became the Bw soil horizon. In other words, the features post-dated the deposition of that sediment layer. Several other features appeared to be located entirely within the A soil horizon—they too post-dated the deposition of the Bw sediment. Only Feature 14 produced evidence indicating that it was constructed prior to the deposition of the sediment within which the Bw soil horizon subsequently took form. The feature is therefore stratigraphically older than any of the other features that HRA recorded on the site. This is a significant finding, given that the feature also produced one of the three oldest radiocarbon dates from the site.

Feature 47 produced one of the site’s other early radiocarbon dates. This storage pit was somewhere between bowl and globular in shape. A flotation sample collected from the bottom 10 cm of feature fill was found to contain numerous charred fragments of maize cobs. This was the only macrobotanical evidence of maize that we recovered from the Larder and Scorpion Knoll sites—the rest of the evidence consisted entirely of maize pollen. A sample drawn from the maize specimens produced a radiocarbon date of 350–50 BC.

The Larder Site’s third early radiocarbon date came from Feature 52, a bowl-shaped storage pit. Unlike Features 14 and 47, Feature 52 did not provide any evidence of maize. It did, however, produce a comparably old radiocarbon date, of 360–290 and 240–50 BC. The dated sample consisted of seeds and seed pods that were recovered, by flotation, from the lower 15 cm of feature fill. The date obtained from this feature reinforces the inference of site use during the period from 350 to 50 BC.
Discussion

The goal in grouping the maize evidence from sites in Clark County Wetlands Park into six different periods has been to emphasize the temporal variation in the data. Viewed in this way, the data represent a time series of maize-related evidence extending, conservatively, from AD 1700 back almost 2000 years to the 200 BC. Some of the archaeological features that have contributed to this data set have provided better data than others, but this overall temporal pattern in the evidence is hard to deny.

The two periods with the most reliable data from individual features are 350–50 BC and AD 1400–1600. The features involved produced a good combination of maize evidence from well-controlled and well-dated contexts. The main limitation in this evidence relates to the fact that each period is identified on the basis of evidence from just two features. A third reliable data set pertains to the combined periods of AD 650–950 and 900–1050. The two periods are identified primarily on the basis of evidence from the Scorpion Knoll Site, and, taken together, they encompass this site’s main period of use. The maize data from this site are not reliable because of the quality of evidence from individual features, but because of the redundancy in evidence from different features. This includes evidence from two ephemeral habitation structures, a third, possible habitation structure, and a roasting pit. Also relevant in this regard is the fact that Scorpion Knoll produced architectural, artifact, and pollen evidence that together support its identification as a field-house site. This kind of functional interpretation does not enhance the quality of the site’s maize data per se. It does, however, provide a context for understanding why that evidence is present and, on that basis, for accepting it rather than trying to explain it away.

The weakest evidence of maize, on the other hand, is probably that pertaining to the periods of 100 BC–AD 250 and AD 1650–1900. The primary limitation in the data from the earlier of these two periods concerns the source of the relevant radiocarbon dates, which came from samples of unidentified charcoal and perhaps other charred material. As a result, the dates may be subject to the “old wood effect,” which could make them too early for the events to which we have applied them. Those events relate to the use of the storage pits that produced the dated samples. Even if the dates are early, however, it seems likely that they apply to events that pre-dated the next identified period of maize use, which does not begin until AD 650. The difficulty with the later period, from AD 1650–1900, arises from the scarcity of maize macrofossils, relative to the much greater abundance of macrofossils from wild plant foods. The three maize macrofossils that date to this interval could easily have been brought from elsewhere to the two sites that produced them. Chances are good, on the other hand that the specimens came from other locations in the Las Vegas Valley and, therefore, are relevant to the history of maize farming in this area.

A general limitation in the data set presented here pertains to the small counts of the pollen grains that constitute the bulk of our botanical evidence of maize. This weakness appears to be inherent in maize-pollen data, and it can overcome only through the collection and analysis of more samples from more features. Fortunately, the hundreds of uninvestigated storage pits that are almost certainly still present at the Larder Site will provide archaeologists with the opportunity to expand on the data set in the future.

It is difficult to predict whether the larger gaps in our time series of maize-farming evidence from sites in Clark County Wetlands Park are real, or if they will fill in as more data are collected from the Larder and Scorpion Knoll sites and, perhaps, from other sites in the vicinity. One gap in the radiocarbon evidence for maize farming—in the AD 400s and 500s—may in fact be genuine. Several years ago, HRA excavated a deeply buried pithouse located several miles down Las Vegas Wash from the Larder and Scorpion Knoll sites (Ahlstrom 2005a). This structure made up the early component of Site 26CK1282 (its late component produced one of the three dated maize macrofossils from the AD 1650–1900, as discussed earlier). Radiocarbon dates place the occupation of the pithouse between AD 430 and 600 (Figure 9.3). We made a concerted effort, primarily through pollen sampling, to find evidence of maize farming by the occupants of this pit structure. No such evidence was forthcoming. What we discovered instead was evidence for the exploitation of wild plant and animal foods (Ahlstrom 2005a:Tables 19.1 and 19.2; 2005b).
CONCLUSION

The evidence for maize farming in the Las Vegas Valley that HRA collected from the Larder and Scorpion Knoll sites and, secondarily, from Sites 26CK1139 and 26CK1282 is unprecedented in the archaeological record of the Las Vegas Valley. This evidence has implications for a number of important research questions. What was the role of farming among the Las Vegas Valley’s prehistoric inhabitants? Was farming a “sometime thing” in the valley, or was it practiced more or less continuously through time? What do the data tell us about temporal and spatial stability of this section of the southwestern “farming frontier?” Did farming spread to the Las Vegas Valley by an upland route, across the Colorado Plateau, or might it have come by a lowland route, up the Lower Colorado River? Did speakers of Uto-Aztecan languages adopt farming from the south sometime after their arrival, as hunter-gathers, in the American Southwest, or did they bring this technology with them when they first arrived in the region (Hill 2006)? At present, our oldest evidence for maize from the Las Vegas Valley is 1000-2000 years younger than the oldest evidence from the Colorado Plateau and Basin-and-Range physiographic provinces. Is the evidence from the valley too recent to be relevant to the question of how farming technology came to the Southwest? Even if this is the case today, has our limited sampling of pit features at the Larder Site pushed the advent of maize farming in the Valley as far back in time as it will go? Might older, relevant evidence exist there?

PREHISTORIC SETTLEMENT PATTERNS IN CLARK COUNTY WETLANDS PARK

Heidi Roberts, Richard V.N. Ahlstrom, and Jerry D. Lyon

Until recently, most archaeologists believed that the Las Vegas Valley’s prehistoric inhabitants had lived a highly mobile lifestyle—hunting animals and gathering and processing wild plants throughout most of prehistory. Julian Steward’s publications on the Southern Paiute people in the Great Basin formed the basis for these interpretations. Unfortunately, as Fowler (1982:126) explained in 1982, “none of the data provided by Steward in his brief sketch of these two Southern Paiute groups [Ash Meadows and Las Vegas] is site specific on matters of settlement pattern or subsistence.”

With the discovery of pithouse habitations at Corn Creek, toward the northern end of the Las Vegas Valley (Roberts et al. 2007:81-85), and of maize evidence in storage and habitation features in Clark County Wetlands Park, in the valley’s southeastern corner (Ahlstrom 2008), the interpretation of a solely collector-based economy for the region has come under question. Maize pollen and cobs from radiocarbon-dated pit storage features in Wetlands Park suggest that farming began in the Las Vegas Valley around 350-50 BC and continued to AD 1600 and likely into the Historic period. This paper examines the archaeological evidence of settlement permanence and farming in Clark County Wetlands Park and compares these data to environmental reconstructions.

Summary of Previous Archaeological Studies

Almost 10 years ago, HRA Inc. began studying the archaeology of lower Las Vegas Wash in Clark County Wetlands Park in Henderson, Nevada (Figure 1.1). It was in the 1970s that archaeologists with the University of Nevada, Las Vegas (UNLV) first discovered concentrations of prehistoric artifacts in the area that was later to be designated as Wetlands Park. The initial discoveries were made during a power-line survey (Brooks and Larson 1975), but other studies followed. Throughout the decade of the 1970s, archaeologists documented numerous fragile-pattern and rockshelter sites, particularly in the vicinity of the confluence of Las Vegas Wash and its tributary, Three Kids Wash (Ferraro 1975). During excavations in that area for a planned desalination plant, UNLV archaeologists discovered that cultural deposits were deeply buried in the floodplain (Figure 9.4). Charcoal stains located 3 m and more below the ground surface were found to be prehistoric hearths and occupation surfaces (Ferraro 1978; Ferraro and Ellis 1982). Unfortunately, before the UNLV archaeologists could complete their analysis of the collected artifacts and samples, the desalination project was
cancelled and the additional funding needing to complete the studies was not available (Roberts and Ahlstrom 2000:52). Local archaeologists assumed that the Park’s prehistoric sites had been completely excavated and that there was little left to learn about them (White and Lawrence 2000; Roberts and Ahlstrom 2000:53).

As the Wash’s fragile floodplain continued to erode, an organization known as the Clean Water Coalition was formed to build erosion-control weirs and prevent further erosion. Related to that effort, in 1999 the Southern Nevada Water Authority, in conjunction with the Bureau of Reclamation (BOR) and Clark County, hired HRA to evaluate the condition and integrity of the Park’s cultural resources. This effort, which took in the entire park area, included the recording of newly identified sites, as well as the re-recording of sites that had been identified in the past (Roberts and Ahlstrom 2000).

Between 1999 and 2003, HRA documented the Park’s archaeological sites (Ahlstrom and Roberts 2001; Roberts and Ahlstrom 2000; Woodman et al. 2001; Woodman et al. 2003), test-excavated portions of Sites 26CK1282 and 26CK1474 (Ahlstrom and Roberts 2001), conducted data recovery at portions of five sites with fragile-pattern features (Ahlstrom 2002), and completely excavated a pithouse at 26CK1282, known as the Three Kids Pithouse (Ahlstrom 2005) (Figure 9.5). To better understand how these new discoveries fit with previous excavations, the BOR hired HRA to reevaluate the museum collections from the 1970s investigations (Ahlstrom 2003). The collection included pottery fragments, stone tools, shell ornaments, and specimens of plant remains and animal bone that were not analyzed when the desalination project was cancelled. Although HRA could not locate many of the excavation notes, these artifact collections provided new information on the lifeways of people who inhabited the area between ca. AD 200 and 1800 (Ahlstrom 2003, 2005).

Figure 9.4. Photograph of UNLV investigations in the 1970s along Las Vegas Wash in Clark County Wetlands Park.
HRA’s most recent test excavations in Wetlands Park are providing a wealth of new data on prehistoric settlement and subsistence strategies. In the fall of 2005 and winter of 2006, HRA conducted test excavations at the sites reported here, the Larder Site (26CK6146), Scorpion Knoll (26CK6147), and 26CK6007. These three sites had been recorded by HRA during the initial surveys of the Park. The Larder site was identified as a large scatter of prehistoric artifacts, Scorpion Knoll as a small scatter of lithic debitage accompanied by a single potsherd, and 26CK6007 as a lens of charcoal eroding out of a cutbank (Roberts and Ahlstrom 2000; Woodman et al. 2001). The Larder and Scorpion Knoll sites are located about a hundred meters apart and, together, make up the Larder–Scorpion Knoll archaeological locality.

The Radiocarbon Record

As part of its work in Wetlands Park, HRA has accumulated approximately 53 radiocarbon dates from habitation, storage, thermal, and other types of features. Figure 9.6 summarizes these dates, including those obtained from the sites investigated by UNLV in the 1970s. (All radiocarbon dates discussed here are presented as two-sigma (95%) calibrated date ranges.) Unfortunately, we still know very little about one of the sites with the longest long occupation span—26CK1474. Most of the notes and maps were lost after the excavation, and the artifact assemblage and radiocarbon dates cannot be linked. If we eliminate the dates associated with UNLV’s excavations at this site, we are left with radiocarbon dates that can be linked to specific prehistoric cultural features at six sites (Table 9.6). They include 26CK1474 (features radiocarbon dated during HRA’s testing [Ahlstrom and Roberts 2001]), Larder Site (26CK6146), Scorpion Knoll (26CK6147), 26CK1138, 26CK1139 and 26CK1282.
Figure 9.6. Radiocarbon dates obtained from archaeological sites in Clark County Wetlands Park.

Table 9.6. Summary of Sites in Clark County Wetlands Park with Radiocarbon-dated Features.

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Name</th>
<th>Site Type</th>
<th>Excavated Features</th>
<th>Occupation Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK1282</td>
<td>Three Kids Site</td>
<td>Stratified floodplain</td>
<td>Pithouse, hearths, thermal features, pits</td>
<td>AD 430-600 and AD 1420-1900</td>
</tr>
<tr>
<td>26CK1138</td>
<td>–</td>
<td>Fragile pattern</td>
<td>Cleared circles, rock rings, hearths</td>
<td>AD 1300-1900</td>
</tr>
<tr>
<td>26CK1139</td>
<td>–</td>
<td>Rockshelter</td>
<td>Hearths, midden</td>
<td>AD 1020-1900</td>
</tr>
<tr>
<td>26CK1474</td>
<td>–</td>
<td>Stratified floodplain</td>
<td>Cultural deposits visible in cutbank</td>
<td>410 BC-AD 960</td>
</tr>
<tr>
<td>26CK6146</td>
<td>Larder Site</td>
<td>Open artifact scatter</td>
<td>Storage pits, hearths, activity surfaces</td>
<td>350 BC-AD1600</td>
</tr>
<tr>
<td>26CK6147</td>
<td>Scorpion Knoll</td>
<td>Open artifact scatter</td>
<td>Pithouses, thermal features, storage pits</td>
<td>AD 650-1050</td>
</tr>
</tbody>
</table>

Figure 9.7 is a plot of the Wetlands Park radiocarbon date ranges, with the dates obtained by UNLV for 26CK1474 excluded and with the remaining dates color coded by feature type or rockshelter component.
The figure shows that the majority of the dated features are storage pits from the Larder Site, which cluster into the three periods of 350 BC–AD 250, AD 650–1050, and AD 1400–1600. Habitation features have been radiocarbon dated at two sites, namely the Three Kids Wash Pithouse (26CK1282) and Scorpion Knoll (26CK6147). The remaining dates come from three sites in the vicinity of Three Kids Wash, including a rockshelter (26CK1139), a fragile-pattern site (26CK1138), and thermal features (26CK1282). Taken together, the dates suggest fairly continuous use of the Wash since 300 BC. The exception is a 200-year period between AD 200 and 400. We suspect that this period may not be represented due to sampling problems; however, the idea that the Wash was abandoned during this interval cannot be ruled out.

In his recent *Desert Oasis* report, Ahlstrom (2005) defined two occupation periods for the Park—an Early Period (AD 1–1100) and a Late Period (AD 1100–1900). Now, with the even more recent radiocarbon dating of “old” storage pits at the Larder Site and of pithouses at the Scorpion Knoll Site, we can revise this sequence to include three periods. They are the Terminal Archaic period (350 BC–AD 250), the Early Pithouse period (AD 400–1100), and the Late Ceramic period (AD 1100–1900). The following sections of this paper summarize the features, the radiocarbon dates, and the artifact assemblages that belong to each of these three periods. The dated features represent a small and possibly biased sample of the archaeological record; however, they can tell us a good deal about stability and change in settlement and subsistence strategies through time.

![Figure 9.7. Radiocarbon dates associated with prehistoric features in Wetlands Park.](image-url)
The Terminal Archaic Period (350 BC to AD 250)

Features dating to the Terminal Archaic period have been discovered at the Larder Site and at 26CK1474 (Table 9.7). The single feature from 26CK1474 that dates to this period was recorded by HRA during test excavations at the Three Kids Site (Ahlstrom and Roberts 2001). The dated feature was identified in the incised channel cutbank of Las Vegas Wash at a depth of 7.4 m below the present ground surface. The feature is a 13 m-long linear ash and charcoal stain in fine sand that likely represents a Late Archaic occupation. The average thickness of the feature is 15-20 cm, and its composition resembles the kind of trample or churn zone that often results from a single occupation or several short-term occupations on a loose, sandy substrate (Roberts and Eskenazi 2006). Roberts and Eskenazi (2006) discovered that sand dune deposits in southwestern Utah frequently contain charcoal-stained churn zones that can be identified in backhoe trench profiles. When excavated, these 15-20 cm thick lenses of charcoal, ash, artifacts, and other cultural debris represented trample zones surrounding hearths or ephemeral habitation features.

Seven storage pits and one hearth from the Larder Site date to the Terminal Archaic period. The storage features are unlined pits of various shapes (Figure 9.8). Ahlstrom (2008) has suggested that the Larder Site was a particularly good place to dig storage pits because the underlying deposit of gypsum may have functioned as a desiccant keeping stored food dry. The analysis of macrobotanical specimens from the storage pits indicated that they were used to cache a variety of wild plant foods including, in order of ubiquity, mesquite seeds or seed pods, screwbean seeds or seed pods, saltbush seeds, and cactus fruit or pads. The pollen record suggested that other economic wild plants may have been stored in the pits, including evening primrose, globe mallow, buckwheat, lily, cholla, and prickly pear. Macrobotanical and pollen evidence suggested that a domesticated plant food, maize, was also stored in pits dating to the Terminal Archaic period. This evidence included a number of charred fragments of maize cobs from one pit and small counts of maize pollen from two others (Ahlstrom, this chapter).

No habitation features dating to this period were discovered during the test excavations at the Larder Site, and we must assume that habitations were either ephemeral or located elsewhere. A hearth feature discovered at the Larder Site also dated to the Terminal Archaic period. Although damaged by the backhoe trench, Feature 45 was sufficiently intact to indicate that it was a shallow, basin-shaped hearth with charcoal and ash fill. The presence of a hearth at the site, combined with the absence of identifiable habitation features, supports a model of less permanent settlement than during the following Early Pithouse period (described below). More data must be collected, however, before the information from the Larder site can be integrated into a complete Terminal Archaic settlement system. Overall, the features and artifacts suggest that the Wash’s Terminal Archaic residents grew and stored maize at the Larder Site along with mesquite pods and other wild plant species. The site was likely occupied seasonally or perhaps for weeks or months at a time.
Table 9.7. Features from Wetlands Park Dating to the Terminal Archaic.

<table>
<thead>
<tr>
<th>Site</th>
<th>Feature No.</th>
<th>Type</th>
<th>Shape</th>
<th>Artifacts</th>
<th>Date (2 sigma)</th>
<th>Pollen</th>
<th>Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK1474</td>
<td>1</td>
<td>Midden</td>
<td>N/A</td>
<td>3 flakes</td>
<td>410 BC-AD 100</td>
<td>None submitted</td>
<td>Cholla or prickly pear seed</td>
</tr>
<tr>
<td>Larder Site</td>
<td>14</td>
<td>Storage pit</td>
<td>Bowl</td>
<td>None</td>
<td>360-90 BC</td>
<td>Maize, prickly pear</td>
<td>Mesquite pods</td>
</tr>
<tr>
<td>Larder Site</td>
<td>18</td>
<td>Storage pit</td>
<td>Basin</td>
<td>16 flakes</td>
<td>AD 30-240</td>
<td>Maize, Cheno-am, cholla, non-prickly pear cactus</td>
<td>Screwbeans</td>
</tr>
<tr>
<td>Larder Site</td>
<td>27</td>
<td>Storage pit</td>
<td>Bell</td>
<td>None</td>
<td>190 BC-AD 50</td>
<td>No economic pollen</td>
<td>Mesquite pods, screwbean seeds</td>
</tr>
<tr>
<td>Larder Site</td>
<td>45</td>
<td>Hearth</td>
<td>Bowl</td>
<td>None</td>
<td>AD 70-250</td>
<td>Cheno-am, primrose, mesquite, globe-mallow, buckwheat, rose family, cactus</td>
<td>Screwbeans</td>
</tr>
<tr>
<td>Larder Site</td>
<td>47</td>
<td>Storage pit</td>
<td>Bowl</td>
<td>6 flakes, pendant</td>
<td>350-50 BC</td>
<td>Cheno-am, globe-mallow, cholla</td>
<td>Maize cob, mesquite</td>
</tr>
<tr>
<td>Larder Site</td>
<td>49</td>
<td>Storage pit</td>
<td>Bell</td>
<td>None</td>
<td>AD 10-150</td>
<td>Mesquite</td>
<td>Mesquite pods and seeds, saltbush, cactus</td>
</tr>
<tr>
<td>Larder Site</td>
<td>51</td>
<td>Storage pit</td>
<td>Globular</td>
<td>16 flakes</td>
<td>100 BC-AD 100</td>
<td>Maize</td>
<td>Mesquite pods and seeds, saltbush, cactus</td>
</tr>
<tr>
<td>Larder Site</td>
<td>52</td>
<td>Storage pit</td>
<td>Bowl</td>
<td>None</td>
<td>360-50 BC</td>
<td>None submitted</td>
<td>Mesquite pods</td>
</tr>
</tbody>
</table>
Table 9.8. Features in Wetlands Park that Date to the Early Pithouse Period.

<table>
<thead>
<tr>
<th>Site</th>
<th>Feature No.</th>
<th>Type</th>
<th>Date(s) (2 sigma)</th>
<th>Projectile points</th>
<th>Ground Stone</th>
<th>Ceramics</th>
<th>Economic Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK1474*</td>
<td>Locus A, 12</td>
<td>Charcoal stain</td>
<td>AD 660-790</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Not sampled</td>
</tr>
<tr>
<td>Three Kids</td>
<td>3</td>
<td>Pithouse</td>
<td>AD 430-600</td>
<td>2 Rose Spring</td>
<td>None</td>
<td>None</td>
<td>Mesquite, cattail, Cheno-am, mustard, saltbush</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Corner-notched</td>
<td>Slab and basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>metates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scorpion Knoll*</td>
<td>1</td>
<td>Pit structure</td>
<td>A.D 690-950</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Maize, Cheno-am</td>
</tr>
<tr>
<td>Scorpion Knoll*</td>
<td>2</td>
<td>Pit structure</td>
<td>AD 670-880</td>
<td>None</td>
<td>Mano fragment</td>
<td></td>
<td>Mesquite pods, saltbush seeds, goosefoot</td>
</tr>
<tr>
<td>Scorpion Knoll*</td>
<td>3</td>
<td>Roasting pit</td>
<td>AD 880-1020</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Maize, mesquite pods, Cheno-am, cattail, globosemallow, primrose, buckwheat, cactus</td>
</tr>
<tr>
<td>Scorpion Knoll*</td>
<td>4</td>
<td>Pit structure</td>
<td>AD 660-860</td>
<td>None</td>
<td>Metate fragment</td>
<td>Moapa Brown, North Creek Gray</td>
<td>Maize, Cheno-am, nightshade</td>
</tr>
<tr>
<td>Larder*</td>
<td>31</td>
<td>Storage pit</td>
<td>AD 900-1040</td>
<td>None</td>
<td>None</td>
<td>Patayan</td>
<td>Maize, screwbean, mesquite, Cheno-am, primrose, globemallow</td>
</tr>
<tr>
<td>Larder*</td>
<td>55A</td>
<td>Storage pit</td>
<td>AD 640-760</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Maize, screwbean, saltbush, amaranth</td>
</tr>
</tbody>
</table>
The Early Pithouse Period (AD 400 to 1100)

Four sites contain features dating to the Early Pithouse period: 26CK1474, the Larder Site, Scorpion Knoll, and Three Kids Wash Site (Table 9.8). Pithouse habitations occur only during this period, and their presence suggests greater settlement permanence than during the preceding and following periods. Far Western Puebloan (Virgin Branch) pottery and maize are associated with some of the features, but only after AD 650. The latest feature in the group, a storage pit at the Larder Site, contained two Patayan potsherds.

The Three Kids pit structure is the oldest feature from this period; it was built around AD 500 (Figure 9.9). The feature was a shallow circular pit structure that measured approximately 4 m in diameter. It consisted of a superstructure of mesquite poles and presumably brush and earth that was built over the shallow pit. There was an oval-shaped hearth inside the structure near a ramp or step entry opening to the east.

Rose Spring Side-notched points suggest the pit structure's occupants used the bow and arrow, but since pottery was not recovered from the floor fill or floor of the structure, HRA concluded the feature’s inhabitants probably did not use pottery. Only one Moapa gray sherd was recovered during our excavations, and it came from sediment immediately overlying the structure. This sherd was probably deposited after the feature’s abandonment. A substantial number of pollen samples failed to produce evidence of maize at the structure, and it is unlikely that the occupants processed corn there—despite the fact that maize was being grown 200 years earlier at or near the Larder Site. What the macrobotanical and pollen samples do tell us is that the pit structure’s occupants were foragers who focused on mesquite and marsh resources (particularly cattails). Elsewhere in the Far Western Puebloan region at this time, around AD 500—for example at Black Dog Cave in the Moapa Valley—people were using ceramics, living in pithouses, and cultivating maize.
Some 200 years later, a more Puebloan-like settlement/subsistence pattern emerges at the Scorpion Knoll Site. We identified two pit structures (Figures 9.10 and 9.11), two possible pit structures, three storage pits, and one thermal feature in backhoe trenches excavated at Scorpion Knoll (Table 9.8). The presence of the structures suggests a relatively permanent mode of settlement, but the site’s artifact assemblage argues against it. Considering that we excavated and screened at least 6 cubic meters of fill from up to four habitation features (Features 1, 2, 4, and 8), the recovered artifact assemblage was very small. It included 139 flakes, 3 late-stage bifaces, 18 potsherds (North Creek Gray, Moapa Brown, and an unidentified ware), and several ground stone fragments. This is a very small count, as compared to the artifact assemblages recovered from other excavated pit structures in the Las Vegas Valley (Roberts et al. 2007: Table 4.4; Roberts and Seymour 2006). Radiocarbon dates suggest that the site may have been occupied on more than one occasion, and there is no particular reason to think that more than one habitation structure was in use at the site at any one time.

In spite of the small artifact assemblage, the site yielded pollen evidence of maize cultivation. This evidence, combined with the small size and expedient nature of the artifact assemblage, led Ahlstrom (this volume) to suggest that the Scorpion Knoll may represent a field-house site that was occupied briefly during planting and harvesting. The organization of the site’s features is vaguely reminiscent of Far Western Puebloan settlements—that is, with pithouses, storage features, and an outdoor cooking area. The latter is represented by a roasting pit (Feature 3), what may have been roasting debris discarded in one of the possible pit structures (Feature 2) after it was dismantled, and a soil stain that appeared to mark the location of additional roasting debris and, possibly, additional roasting features. There are, however, clear differences from the Puebloan pattern: for example, the storage features are not slab-lined, the pottery assemblage is uncharacteristically small, and it lacks sherds from decorated vessels.
HRA identified two storage pits, Features 31 and 55A, at the Larder Site that date to the Early Pithouse period (Table 9.8). Feature 55A, the older of the two features, is an amorphous storage pit that is associated with a superimposed roasting pit, Feature 55B. The feature dates to the same period as those at Scorpion Knoll. Feature 55A was not excavated, and no artifacts were identified in the profile; however, maize pollen was identified in the pollen sample collected from feature fill exposed in the backhoe trench wall. The storage of maize in this feature is consistent with findings from Early Pithouse period contexts at Scorpion Knoll.

Feature 31 was a large storage pit. As in the case of Feature 55A, Feature 31 was not excavated, but pollen and flotation samples were taken from it. Two Patayan pottery sherds from a single vessel were also collected from a few centimeters above the feature’s floor. The pollen sample contained maize pollen, and the flotation sample produced the remains of gathered plants, including mesquite pods, screwbeans, amaranth seeds, and saltbush seeds. The feature produced a radiocarbon date that falls toward the end of the Early Pithouse period. This fact, combined with the presence of the Patayan sherds, suggests the identification of Feature 31 as a precursor to changes observed in the archaeological record after AD 1000.
The Late Ceramic Period (AD 1100 to 1900)

Several sites, including the Larder Site, a small rockshelter site (26CK1139), a fragile-pattern site (26CK1138), and portions of the Three Kids Site (26CK1282) were occupied during the Late Ceramic period (Table 9.9). Data collected from these sites suggest, first, that there was a shift after AD 1050 in the locally dominant pottery from grayware to buffware and brownware and, second, that sites with pithouses were replaced by temporary campsites located in rockshelters and open settings. Also, arrow point styles shifted from the Rose Spring varieties of the Late Pithouse period to Desert Side-notched points. Examples of the latter were found at the rockshelter and fragile-pattern sites and even at a storage feature at the Larder Site.

Two storage pits at the Larder Site date to the Late Ceramic period. Feature 12 (Figures 4.13 and 4.21) is a bell-shaped storage pit with pollen evidence of maize and macrobotanical evidence of mesquite storage. One Desert Side-notched point and eight flakes were recovered during the excavation of this feature. Feature 30, a basin-shaped storage pit that was recorded in a backhoe trench, also contained maize pollen (Figure 4.27).

The other Late Ceramic period sites are located in the Three Kids Wash locality (Roberts and Ahlstrom 2000), which was a focus of occupation during this period. Radiocarbon dates from the rockshelter suggest that it was occupied periodically after AD 1000 and into the Early Historical period. Additional evidence for occupation into the AD 1800s consists of glass trade beads collected from the rockshelter (26CK1139) and from the nearby fragile-pattern site, 26CK1138. That site and another fragile-pattern site, 26CK1126, are located on terraces near the Three Kids confluence. Rock rings are common features at these sites. Although cattail pollen was recovered from one rock ring feature, and a couple others appear to have been ephemeral habitation structures, we still do not fully understand the function of these types of features.
Table 9.9. Features in Wetlands Park that Date to the Late Ceramic Period

<table>
<thead>
<tr>
<th>Site</th>
<th>Feature No.</th>
<th>Type</th>
<th>Date(s) (2 sigma)</th>
<th>Projectile points</th>
<th>Ground Stone</th>
<th>Ceramics</th>
<th>Economic Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK1138</td>
<td>whole site</td>
<td>Fragile pattern</td>
<td>AD 1700-1920</td>
<td>Desert Side-Notched</td>
<td>2 one-handed manos</td>
<td>20 Tizon Brownware, 1 Parker Stucco, 1 North Creek Gray</td>
<td>Mesquite, pinyon nuts, cattail seeds</td>
</tr>
<tr>
<td>26CK1139</td>
<td>whole site</td>
<td>Rock-shelter</td>
<td>AD 1040-1900</td>
<td>1 Rose-Spring, 1 Parowan Basal-notched, 5 Cottonwood Triangular, 9 Desert Side-Notched</td>
<td>1 Basin metate, 12 slab metates, 10 mano fragments</td>
<td>37 buffware, 5 brownware, 4 grayware</td>
<td>Maize kernels and cob, pinyon nuts, mesquite, cactus</td>
</tr>
<tr>
<td>Three Kids 1</td>
<td>Roasting pit</td>
<td>AD 1490-1950</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Cheno-am</td>
</tr>
<tr>
<td>Three Kids 2</td>
<td>Trash deposit</td>
<td>AD 1490-1950</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Paiute Brown ware</td>
<td>None</td>
</tr>
<tr>
<td>Larder Site 12</td>
<td>Storage pit</td>
<td>AD 1400-1460</td>
<td>Desert Side-Notched</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Maize, mesquite pods, prickly pear, mint family</td>
</tr>
<tr>
<td>Larder Site 30</td>
<td>Storage pit</td>
<td>AD 1430-1620</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Maize, mesquite pods, Cheno-am, grass, nightshade</td>
</tr>
</tbody>
</table>
Hearths buried less than a meter below the surface at the Three Kids Site (just east of the Three Kids Pithouse) also date to the Late Ceramic period.

As a group, the Late Ceramic period features and sites have produced abundant evidence for reliance on mesquite. Pine nuts were also recovered from the rockshelter and from fragile pattern site 26CK1138. The nuts would have been transported from distances of over 10 miles, and their presence supports the notion of greater mobility and a collecting (versus horticulture) based subsistence strategy. Pollen evidence from the Larder Site indicates that maize was still being stored and, probably, grown in the Wash between AD 1200 and 1600. Other evidence of cultigens dating to the period includes a kernel and a cob of maize from the rockshelter, 26CK1139, as well as a kernel from the Three Kids Site (but see Ahlstrom [this volume] for reservations concerning some of this evidence).

**Summary**

We can draw several conclusions from these data. First, as Ahlstrom discusses in this volume, maize was introduced as early as 300 BC and was being stored at the Larder Site from then to as late as AD 300. After a two hundred year gap in the radiocarbon record, around AD 500, the bow and arrow makes an appearance at the Three Kids Pithouse site. Ironically, no evidence of maize or pottery was recovered from the Three Kids pithouse. Maize was again stored in pits at the Larder Site that date between AD 600 and 1000.

Around AD 700, we see distinct evidence of Puebloan influences at Scorpion Knoll. Pottery consists of Puebloan gray ware, and the site’s layout is vaguely Puebloan as well, with extramural features surrounding habitation structures. Food production is indicated by maize pollen from several contexts at this site and the nearby Larder Site. The Scorpion Knoll site also differs from Far Western Puebloan sites in at least two important ways. The storage features at Scorpion Knoll (and the Larder Site) are not slab-lined, and pottery appears to have been of limited importance, as compared to its role at contemporaneous sites in the Moapa Valley and in southwestern Utah. In our opinion, there is evidence during the Pithouse Period for contact with the Puebloan world, but there is not enough evidence to indicate wholesale population replacement. We propose that a local indigenous population selectively adopted certain Puebloan traditions—use of pit structures and pottery—but not others.

Between AD 1100 and 1900, the Wash was occupied primarily in the Three Kids area. At this time, Desert Side-notched style arrow points become common and ceramics are predominantly buff and brown ware. Many of the sites dating to this period are open sites with fragile-pattern features such as rock rings, rock alignments, and cleared circles in desert pavement. Excavations by UNLV demonstrated that some of these surface features contained buried deposits such as heaths or charcoal stains. Maize was still stored in pits at the Larder Site between AD 1200 and 1400; however, there is no evidence of habitation features or pit structures dating to this period.

The rich variety of house types and subsistence strategies visible in the Wash’s archaeological record are consistent with Isabel Kelly’s ethnographic accounts of the region’s Southern Paiute farmers (Fowler 1982; Fowler 1999). Kelly’s informants in the 1930s explained to her that there were 32 occupation sites in and around the Las Vegas Valley (Fowler 1999), including 14 settlements with at least some permanent residents. These settlements were located around springs, near washes, and in the foothills of the Spring Range. Other camps were small, but many also had permanent residents. The Southern Paiute planted native crops at nearly all of the 14 larger settlements and at some of the smaller ones, as well. In addition to the main settlements, there were numerous task-oriented temporary camps. Presently, we do not know which, if any, of the named springs may have been located in Wetlands Park; however Dr. Fowler is currently working on an ethnohistory of the Las Vegas Paiutes that may shed light on this matter.

According to Fowler and Kelly, the Las Vegas Paiute’s “produce was stored on site or cached in caves in the mountains. Seed stock, especially corn, was stored in pottery jars with lids chipped to fit and then sealed,” and other seeds were stored in pots, buckskin bags, or cliffrose bark bags (Fowler 1999:120). In
Paradise Valley, Kelly’s informants reported that Las Vegas Paiute farmers stored seeds in large circular granaries like the Chemehuevi or Mohave (Fowler 1999:120).

Kelly’s notes also make it clear that “not everyone planted, and only a few planted intensively” (Fowler 1999:120). Furthermore, wild plants such as pine nuts, wolfberry, mesquite, screwbean, and agave were also important. The subsistence pattern described by Kelly for the Las Vegas Paiutes fits with the archaeological record of Las Vegas Wash.

Houses were also variable and, in fact, resembled the prehistoric types. According to Kelly (Fowler 1992), Southern Paiute winter houses were dome-shaped and tall enough to stand in:

To construct them, first the ground was cleared and then post holes (4 or more) for the uprights were dug along the wall for the mesquite supports. If the houses were smaller, a central post forked at the top was set in the ground. Additional posts of willow were leaned against the central dome of which ever type. A covering of cane arrowweed or grass, depending on what is at hand, was added for the walls, and perhaps some mud along the base. The doorway faced east and the house had a central fire pit…. This house would be used for two to three years or longer, being renewed only periodically. It was occupied in winter, with people moving in shortly after harvesting their crops.

Additional structures that might characterize a site included a semi-circular brush walled shade, often used as a summer kitchen, and as a storage facility in fall and winter; a flat-roofed shade with four upright posts, also used in spring and summer primarily; and the storage platforms. There is no mention of excavated storage pits at Valley sites, although this technique was used in the mountains and in caves [Fowler 1999:121].

As Gasser and Kwiatkowski (1991) explained in their paper on Hohokam subsistence strategies, we should not assume that plant use was the same for all prehistoric settlements in a given culture area. Microenvironmental differences create variability in plant use and differences in horticultural practices (Gasser Kwiatkowski 1991:419). The edible wild plants in the immediate environment of Wetlands Park and the suitability of the area for farming undoubtedly changed through time, and subsistence practices may also have been subject to the whim, taste, and skills of the area’s residents.

**Climate and Farming in Clark County Wetlands Park**

A closer look at rainfall patterns and climate changes since 300 BC may provide insight into some of the variability in the subsistence and settlement practices in Wetlands Park. Is it possible that maize was grown in Wetlands Park when environmental conditions were conducive to this activity? Did the residents of Wetlands Park grow corn when the wash flowed, but focus on foraging when water was scarce? This would be comparable to the kind of forager-farmer switching behavior suggested by Madsen and Simms (1998) for the Fremont regions of Utah. Or, as Kelly hints, perhaps the strategies were highly variable through time and depended on individual preferences, as well as other unknown factors.

Figure 9.12 overlays time periods when maize was grown in Wetlands Park with climatic reconstructions for the region summarized by Finley and colleagues (Chapter 2; Figure 2.8). The figure is a first attempt to correlate climate (specifically wetter vs. drier periods) and horticulture. Wet periods are shown in green and dry ones in red. The figure shows that periods of maize storage at the Larder and Scorpion Knoll sites correspond to the wetter intervals, when Las Vegas Wash may have been flowing more of the time. Three intervals, which are similar though not identical to the three periods (Terminal Archaic, Early Pithouse, and Late Ceramic) discussed earlier, may be identified. These intervals differ slightly from the three periods outlined above because they reflect a specific range of activities, the processing and storage of maize. The first of these intervals, between 300 BC and AD 200, corresponds to the end of the Middle Neoglacial (Chapter 2). This was a time of alluviation and heavy stream flow throughout the American Southwest and Great Basin, as
well as high sedimentation rates in Las Vegas Wash. The second interval with evidence of maize storage corresponds to the Pueblo I and early Pueblo II periods, ca. AD 700 or 800 to 1000. This is a period of Puebloan expansion throughout the Southwest, and it is probably no coincidence that Puebloan grayware pottery was deposited at Scorpion Knoll at this time. The period of storage activity involving maize, AD 1400–1600, corresponds to the Little Ice Age, when wetter colder conditions prevailed in the Southwest and Great Basin.

Figure 9.12. Climatic Reconstruction for Southern Nevada and Wetlands Park Maize Dates from 400 BC to AD 1900 (climatic data from Finley et al. [Chapter 2] and Euler et al. 1979).

These data suggest that environmental factors may have largely influenced the prehistoric subsistence and settlement strategies of Las Vegas Wash’s occupants. Other factors, such as availability of wild plants and animals, cultural preferences, skill, and personal tastes, may have played an equally important role in determining shifts in subsistence strategies and settlement permanence through time. We are only beginning to uncover the rich and varied prehistory of Clark County Wetlands Park, and future research will undoubtedly shed light on these and other important research questions.
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APPENDIX A
RADIOCARBON DATING
FROM: Darden Hood, Director (mailto:dhood@radiocarbon.com)
(This is a copy of the letter being mailed. Invoices/receipts follow only by mail.)

March 6, 2006

Dr. Richard Ahlstrom
HRA, Incorporated
3212 W. Liberty Tree Ln.
Tucson, AZ 85741
USA

RE: Radiocarbon Dating Result For Sample 26CK6146-1 FN 159

Dear Richard:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis went normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed. Thank you. As always, if you have any questions or would like to discuss the results, don’t hesitate to contact me.

Sincerely,

[Signature]

Darden Hood
<table>
<thead>
<tr>
<th>Sample Data</th>
<th>Measured Radiocarbon Age</th>
<th>13C/12C Ratio</th>
<th>Conventional Radiocarbon Age(*)</th>
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<tr>
<td>Beta - 213430</td>
<td>490 +/- 40 BP</td>
<td>-25.6 o/oo</td>
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SAMPLE: 26CK6146-1 FN 159
ANALYSIS: AMS-Studard delivery
MATERIAL/PRETREATMENT: (charred material): acid/alkali/acid
2 SIGMA CALIBRATION: Cal AD 1400 to 1460 (Cal BP 550 to 490)
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables: C13/C12 = -25; lab. mult = 1

Laboratory number: Beta-213430

Conventional radiocarbon age: 490±40 BP

2 Sigma calibrated result: Cal AD 1400 to 1460 (Cal BP 550 to 490)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1430 (Cal BP 520)

1 Sigma calibrated result: Cal AD 1420 to 1440 (Cal BP 540 to 510)
(68% probability)

Reference:
Database used
INTCAL98 Calibration Database
INTCAL98 Radiocarbon Age Calibration
Mathematics
A Simplied Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
495 S.W. 74th Court, Miami, Florida 33155 • Tel: (305) 667-3107 • Fax: (305) 663-8064 • E-Mail: beta@radiocarbon.com
FROM: Darden Hood, Director (mailto:dhood@radiocarbon.com)
(This is a copy of the letter being mailed. Invoices/receipts follow only by mail.)

June 26, 2006

Dr. Richard Ahlstrom
HRA, Incorporated
3212 W. Liberty Tree Ln.
Tucson, AZ 85741
USA

RE: Radiocarbon Dating Results For Samples 26CK6146-2, 26CK6146-3, 26CK6146-4,
26CK6146-5, 26CK6146-6, 26CK6147-1

Dear Richard:

Enclosed are the radiocarbon dating results for six samples recently sent to us. They each
provided plenty of carbon for accurate measurements and all the analyses went normally. As usual, the
method of analysis is listed on the report with the results and calibration data is provided where
applicable.

As always, no students or intern researchers who would necessarily be distracted with other
obligations and priorities were used in the analyses. We analyzed them with the combined attention of
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If you have specific questions about the analyses, please contact us. We are always available to
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The cost of the analysis was charged to the VISA card provided. A receipt is enclosed. Thank
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Sincerely,

Darden Hood
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<th>Conventional Radiocarbon Age(*)</th>
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<td>Beta - 217139</td>
<td>1900 +/- 50 BP</td>
<td>-26.5 o/oo</td>
<td>1830 +/- 50 BP</td>
</tr>
<tr>
<td>SAMPLE : 26CK6146-1</td>
<td>ANALYSIS : AMS-Standard delivery</td>
<td>MATERIAL/PRETREATMENT : (charred material): acid/allai/acid</td>
<td>2 SIGMA CALIBRATION : Cal AD 30 to 240 (Cal BP 1920 to 1710)</td>
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<td>Beta - 217140</td>
<td>2080 +/- 50 BP</td>
<td>-26.1 o/oo</td>
<td>2060 +/- 50 BP</td>
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<tr>
<td>SAMPLE : 26CK6146-2</td>
<td>ANALYSIS : AMS-Standard delivery</td>
<td>MATERIAL/PRETREATMENT : (charred material): acid/allai/acid</td>
<td>2 SIGMA CALIBRATION : Cal BC 190 to Cal AD 50 (Cal BP 2140 to 1900)</td>
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<td>Beta - 217141</td>
<td>1970 +/- 40 BP</td>
<td>-28.2 o/oo</td>
<td>1920 +/- 40 BP</td>
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<tr>
<td>SAMPLE : 26CK6146-4</td>
<td>ANALYSIS : AMS-Standard delivery</td>
<td>MATERIAL/PRETREATMENT : (charred material): acid/allai/acid</td>
<td>2 SIGMA CALIBRATION : Cal AD 10 to 150 (Cal BP 1940 to 1800)</td>
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<td>Beta - 217142</td>
<td>1980 +/- 50 BP</td>
<td>-24.2 o/oo</td>
<td>1990 +/- 50 BP</td>
</tr>
<tr>
<td>SAMPLE : 26CK6146-5</td>
<td>ANALYSIS : AMS-Standard delivery</td>
<td>MATERIAL/PRETREATMENT : (charred material): acid/allai/acid</td>
<td>2 SIGMA CALIBRATION : Cal BC 100 to Cal AD 110 (Cal BP 2050 to 1840)</td>
</tr>
<tr>
<td>Beta - 217143</td>
<td>1340 +/- 40 BP</td>
<td>-24.1 o/oo</td>
<td>1350 +/- 40 BP</td>
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<tr>
<td>SAMPLE : 26CK6146-6</td>
<td>ANALYSIS : AMS-Standard delivery</td>
<td>MATERIAL/PRETREATMENT : (charred material): acid/allai/acid</td>
<td>2 SIGMA CALIBRATION : Cal AD 640 to 710 (Cal BP 1310 to 1230) AND Cal AD 740 to 760 (Cal BP 1210 to 1190)</td>
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<td>Sample Data</td>
<td>Measured Radiocarbon Age</td>
<td>13C/12C Ratio</td>
<td>Conventional Radiocarbon Age(*)</td>
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<tr>
<td>Beta-217144</td>
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<td>1180 +/- 40 BP</td>
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SAMPLE: 26CK6147-1
ANALYST: AMS-Standard delivery
MATERIAL: PRETREATMENT: (charred material): acid/alkali/acid
2 SIGMA CALIBRATION: Cal AD 660 to 810 (Cal BP 1280 to 1140) AND Cal AD 840 to 860 (Cal BP 1110 to 1100)
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.5; lab. mult=1)

Laboratory number: Beta-217139

Conventional radiocarbon age: 1880±50 BP

2 Sigma calibrated result: Cal AD 30 to 240 (Cal BP 1920 to 1710)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 120 (Cal BP 1830)

1 Sigma calibrated result: Cal AD 70 to 220 (Cal BP 1880 to 1740)
(68% probability)

References:

Database used
- INTCAL98
- Calibration Database
- Editorial Comment
  - INTCAL98 Radiocarbon Age Calibration

Mathematics
- A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variants: C13/C12=.26.1; lab. mul=1)

Laboratory number: Beta-217140
Conventional radiocarbon age: 2060±50 BP
2 Sigma calibrated result: Cal BC 190 to Cal AD 50 (Cal BP 2140 to 1900) (95% probability)

Intercept data
Intercept of radiocarbon age with calibration curve: Cal BC 50 (Cal BP 2000)
1 Sigma calibrated result: Cal BC 160 to 10 (Cal BP 2100 to 1960) (68% probability)

References:
Database used
INTCAL98 Calibration Database
Editorial Committee
INTCAL98 Radiocarbon Age Calibration
Mathematics
A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305) 667-5167 • Fax: (305) 667-6964 • E-Mail: beta@radiocarbon.com

272
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables: C13/C12 = -28.2 (lab. mult=1)

Laboratory number: Beta-21741

Conventional radiocarbon age: 1920±40 BP

1 Sigma calibrated result: Cal AD 10 to 150 (Cal BP 1940 to 1800)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 80 (Cal BP 1870)

1 Sigma calibrated result: Cal AD 50 to 120 (Cal BP 1900 to 1830)
(68% probability)

References:

Database used

INTCAL98

Calibration Database

Editorial Comment


INTCAL98 Radiocarbon Age Calibration


Mathematics

A Simplified Approach to Calibrating C14 Dates


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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.2; lab. mult=1)

Laboratory number: Beta-217142

Conventional radiocarbon age: 1990±50 BP

2 Sigma calibrated result: Cal BC 100 to Cal AD 110 (Cal BP 2050 to 1840) (95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 20 (Cal BP 1930)

1 Sigma calibrated result: Cal BC 40 to Cal AD 70 (Cal BP 1990 to 1880) (68% probability)

References:

Database used
INTC 41.68
Calibration Database
Editorial Comment

LINTCAL98 Radiocarbon Age Calibration

Mathemati
A Simplified Approach to Calibrating C14 Dates
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = 24.1: lab. mult=1)

Laboratory number: Beta-217143

Conventional radiocarbon age: 1350±40 BP

2 Sigma calibrated results: Cal AD 640 to 720 (Cal BP 1310 to 1230) and Cal AD 740 to 760 (Cal BP 1210 to 1190)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 670 (Cal BP 1280)

1 Sigma calibrated result: Cal AD 650 to 690 (Cal BP 1300 to 1260)

References:

Database used
INTCAL98

Calibration Database

Editorial Comment
INTCAL98 Radiocarbon Age Calibration

Mathematics
A Simple Approach to Calibrating C14 Dates

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4983 S.W. 74th Court, Miami, Florida 33155 • Tel: (305) 667-5167 • Fax: (305) 667-4094 • E-Mail: beta@radiocarbon.com

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.2; lab. mulp=1)

Laboratory number: Beta-217144

Conventional radiocarbon age: 1280±40 BP

2 Sigma calibrated results: Cal AD 660 to 810 (Cal BP 1280 to 1140) and Cal AD 840 to 860 (Cal BP 1110 to 1100)

(95% probability)

Intercept data

 Intercept of radiocarbon age with calibration curve: Cal AD 710 (Cal BP 1240)

1 Sigma calibrated result: Cal AD 680 to 780 (Cal BP 1270 to 1170)

(68% probability)

References:

Database used
INTCAL 98
Calibration Database
Editorial Comment
INTCAL 98 Radiocarbon Age Calibration
Mathematics
A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305) 667-5167 • Fax: (305) 663-0964 • E-Mail: beta@radiocarbon.com
FROM: Darden Hood, Director (mailto:dhood@radiocarbon.com)
(This is a copy of the letter being mailed. Invoices/receipts follow only by mail.)

June 8, 2007

Dr. Suzanne Eskenazi
HRA, Inc.
520 S. James Blvd.
Las Vegas, NV 89107
USA

RE: Radiocarbon Dating Results For Samples 26CK6007-1, 26CK6007-2, 26CK6146-7, 26CK6146-8,
26CK6146-9, 26CK6146-10, 26CK6146-11, 26CK6147-2

Dear Dr. Eskenazi:

Enclosed are the radiocarbon dating results for eight samples recently sent to us. They each
provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual,
the method of analysis is listed on the report with the results and calibration data is provided where
applicable.

As always, no students or intern researchers who would necessarily be distracted with other
obligations and priorities were used in the analyses. We analyzed them with the combined attention of
our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to
answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed. Thank
you. As always, if you have any questions or would like to discuss the results, don’t hesitate to contact
me.

Sincerely,

Darden Hood
<table>
<thead>
<tr>
<th>Sample Data</th>
<th>Measured Radiocarbon Age</th>
<th>13C/12C Ratio</th>
<th>Conventional Radiocarbon Age(*)</th>
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<td>-26.3 o/oo</td>
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<td>ANALYSIS: AMS-Standard delivery</td>
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<td>2 SIGMA CALIBRATION: Cal AD 1270 to 1400 (Cal BP 680 to 550)</td>
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<td>Beta 230254</td>
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<td>2 SIGMA CALIBRATION: Cal AD 970 to 1200 (Cal BP 980 to 750)</td>
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<td>Beta 230255</td>
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<td>2 SIGMA CALIBRATION: Cal BC 350 to 90 (Cal BP 2310 to 2040)</td>
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<tr>
<td>Beta 230255</td>
<td>420 +/- 40 BP</td>
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<td>420 +/- 40 BP</td>
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<tr>
<td>2 SIGMA CALIBRATION: Cal AD 1430 to 1520 (Cal BP 520 to 430) AND Cal AD 1590 to 1620 (Cal BP 360 to 330)</td>
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<td>Beta 230257</td>
<td>1040 +/- 40 BP</td>
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<td>2 SIGMA CALIBRATION: Cal AD 900 to 620 (Cal BP 1050 to 1040) AND Cal AD 960 to 1040 (Cal BP 900 to 910)</td>
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<td>MATERIAL: Pretreatment: (charred material): acid/alkali/acid</td>
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<td>Beta - 230259</td>
<td>1890 ± 40 BP</td>
<td>-10.5 o/oo</td>
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<td>ANALYSIS: AMS-Standard delivery</td>
<td>MATERIAL: Pretreatment: (charred material): acid/alkali/acid</td>
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<td>29C6147-2</td>
<td>ANALYSIS: AMS-Standard delivery</td>
<td>MATERIAL: Pretreatment: (seed): acid/alkali/acid</td>
<td>2 SIGMA CALIBRATION: Cal AD 880 to 1020 (Cal BP 1070 to 930)</td>
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</table>
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables: C13/C12 = -26.3; lab mult = 1

Laboratory number: Beta-230253

Conventional radiocarbon age: 650 ± 50 BP

2 Sigma calibrated result: Cal AD 1270 to 1400 (Cal BP 680 to 550)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1300 (Cal BP 660)

1 Sigma calibrated results: Cal AD 1280 to 1320 (Cal BP 670 to 630) and
(68% probability)
Cal AD 1350 to 1390 (Cal BP 600 to 560)

References:

Database used
INTCAL04

Calibration Database
INTCAL04 Radiocarbon Age Calibration


Mathematics:
A Simplified Approach to Calibrating C14 Dates:

Beta Analytic Radiocarbon Dating Laboratory
4985 SW 74th Court, Miami, Florida 33155 • Tel: (954) 667-5167 • Fax: (305) 663-0964 • E-Mail: beta@radiocarbon.com

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.3; lab.mult=1)

Laboratory number: Beta-250254

Conventional radiocarbon age: 980±60 BP

2 Sigma calibrated result: Cal AD 970 to 1100 (Cal BP 980 to 750)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1030 (Cal BP 920)

1 Sigma calibrated results: Cal AD 1010 to 1060 (Cal BP 940 to 900) and
(68% probability) Cal AD 1050 to 1150 (Cal BP 870 to 800)

References:

Dated Sample
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
Int Cal 04: Calibration curve of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics
A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Laboratory number: Beta-230255
Conventional radiocarbon age: 2160±40 BP
2 Sigma calibrated result: Cal BC 360 to 90 (Cal BP 2310 to 2040) (95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 200 (Cal BP 2150)
1 Sigma calibrated results: Cal BC 350 to 300 (Cal BP 2300 to 2260) and Cal BC 210 to 170 (Cal BP 2160 to 2120)

References:
Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
Mathematics
A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)661-0964 • E-Mail: beta@radicarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Laboratory number: Beta-23026

Conventional radiocarbon age: 420±40 BP

2 Sigma calibrated results: Cal AD 1430 to 1520 (Cal BP 520 to 430) and
(95% probability) Cal AD 1590 to 1620 (Cal BP 360 to 330)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1450 (Cal BP 500)

1 Sigma calibrated result: Cal AD 1440 to 1470 (Cal BP 510 to 480)
(68% probability)

References:
- Database used
  - INTCAL04
- Calibration Database
  - INTCAL04 Radiocarbon Age Calibration
- Mathematics
  - A Simplified Approach to Calibrating C14 Dams

Beta Analytic Radiocarbon Dating Laboratory

4985 SW 74th Court, Miami, Florida 33155 • Tel: (305)663-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Laboratory number: Beta-230257

Conventional radiocarbon age: 1030±40 BP

2 Sigma calibrated result: Cal AD 900 to 920 (Cal BP 1050 to 1040) and Cal AD 960 to 1040 (Cal BP 990 to 910)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1010 (Cal BP 940)

1 Sigma calibrated result: Cal AD 980 to 1030 (Cal BP 960 to 920)

(68% probability)

References:
- Database used
  - INTCAL04
  - calibration database
  - INTCAL04 Radiocarbon Age Calibration
- Mathematics
  - A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
4993 SW 74th Court, Miami Florida 33155 • Tel: 305-660-5167 • Fax: 305-660-0964 • E-Mail: beta@radcarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.1; lab mult=1)

Laboratory number: Beta-230258
Conventional radiocarbon age: 1850±40 BP
2 Sigma calibrated result: Cal AD 70 to 250 (Cal BP 1880 to 1700)
(95% probability)

Intercept data
Intercept of radiocarbon age with calibration curve: Cal AD 140 (Cal BP 1810)
1 Sigma calibrated result: Cal AD 120 to 230 (Cal BP 1830 to 1720)
(68% probability)

References:
- Database used
  INTCAL14
- Calibration Database
  INTCAL14 Radiocarbon Age Calibration
  intCal04: Calibration issue of Radiocarbon (Volume 46, nr 3, 2004).
- Mathematics
  A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
4985 SW 74th Court, Miami, Florida 33155 • Tel: (305) 667-5167 • Fax: (305) 663-0964 • E-Mail: beta@radiocarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-10.5; lab. mui=1)

Laboratory number: Beta-230259

Conventional radiocarbon age: 2130±40 BP

2 Sigma calibrated results: Cal BC 250 to 290 (Cal BP 2300 to 2240) and Cal BC 220 to 50 (Cal BP 2170 to 2000)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 170 (Cal BP 2120)

1 Sigma calibrated result: Cal BC 200 to 100 (Cal BP 2150 to 2050) (68% probability)

References:

Database used

IntCal04

Calibration Database

INTCAL04 Radiocarbon Age Calibration


Mathematics

A Simplified Approach to Calibrating C14 Dates


Beta Analytic Radiocarbon Dating Laboratory

4183 SW 74th Court, Miami, Florida 33155 • Tel: (305)667-3167 • Fax: (305)662-9964 • E-Mail: beta@radiocarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Laboratory number: Beta-230260

Conventional radiocarbon age: 1090±40 BP

2 Sigma calibrated result: Cal AD 850 to 1020 (Cal BP 1070 to 930) (95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 980 (Cal BP 970)

1 Sigma calibrated result: Cal AD 900 to 1000 (Cal BP 1050 to 950) (68% probability)

References:

Date as used

INTCAL04

INTCAL04 Radiocarbon Age Calibration

Mathematically

A Simplified Approach to Calibrating C14 Dates

Beta Analytic Radiocarbon Dating Laboratory
4915 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radocarbon.com
FROM: Darden Hood, Director (mailto: mailto:dhood@radiocarbon.com)
(This is a copy of the letter being mailed. Invoices/receipts follow only by mail.)

August 13, 2007

Dr. Suzanne Eskenazi
HRA, Inc.
520 S. James Blvd.
Las Vegas, NV 89107
USA

R.E: Radiocarbon Dating Results For Samples 6146-12, 6147-3, 6147-4 FN51

Dear Dr. Eskenazi:

Enclosed are the radiocarbon dating results for three samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

Note that one of the samples (6147-3, Beta-232635) does not have a Measured Radiocarbon Age and 13C/12C Ratio reported. This is because the sample was too small to do a separate 13C/12C ratio and AMS analysis. The only available 13C/12C ratio available to calculate a Conventional Radiocarbon Age was that determined on a small aliquot of graphite. Although this ratio corrects to the appropriate Conventional Radiocarbon Age, it is not reported since it includes laboratory chemical and detector induced fractionation.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the VISA card provided. A receipt is enclosed. Thank you. As always, if you have any questions or would like to discuss the results, don’t hesitate to contact me.

Sincerely,

[Signature]

288
<table>
<thead>
<tr>
<th>Sample Data</th>
<th>Measured Radiocarbon Age</th>
<th>13C/12C Ratio</th>
<th>Conventional Radiocarbon Age(*)</th>
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<tr>
<td>2 SIGMA CALIBRATION:</td>
<td>Cal AD 690 to 900 (Cal BP 1200 to 1050) AND Cal AD 910 to 950 (Cal BP 1030 to 1000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta - 232636</td>
<td>1170 +/- 40 BP</td>
<td>-26.0 o/oo</td>
<td>1250 +/- 40 BP</td>
</tr>
<tr>
<td>SAMPLE: 6147-4 FY51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANALYSIS: AMS-Standard delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATERIAL/RETREATMENT: (charred material): acid/alkali/acid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 SIGMA CALIBRATION:</td>
<td>Cal AD 670 to 880 (Cal BP 1280 to 1070)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9; lab. mult=1)

Laboratory number: Beta-23163-4

Conventional radiocarbon age: 2140±40 BP

2 Sigma calibrated results: Cal BC 360 to 290 (Cal BP 2300 to 2240) and
(95% probability) Cal BC 240 to 50 (Cal BP 2150 to 2000)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 180 (Cal BP 2130)

1 Sigma calibrated results: Cal BC 140 to 330 (Cal BP 2290 to 2280) and
(68% probability) Cal BC 200 to 150 (Cal BP 2150 to 2100) and
Cal BC 140 to 110 (Cal BP 2090 to 2060)

References:
- Database used
  - IntCal04
- Calibration Database
  - IntCal04: Radiocarbon Age Calibration
- Mathematics
  - A Simplified Approach to Calibrating Cal Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables: C13/C12 = 0.7, lab. mult = 1

Laboratory number: Beta-233635

Conventional radiocarbon age: 1200±40 BP

Two sigma calibrated results: Cal AD 690 to 900 (Cal BP 1260 to 1050) and
95% probability Cal AD 920 to 950 (Cal BP 1030 to 1000)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 810 (Cal BP 1140)

One sigma calibrated result: Cal AD 770 to 890 (Cal BP 1180 to 1060)
68% probability

References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration


Mathematical

A Simplified Approach to Calibrating C14 Dates


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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.1ab. mult=1)

Laboratory number: Beta-232616

Conventional radiocarbon age: 1256±40 BP

2 Sigma calibrated result: Cal AD 670 to 880 (Cal BP 1250 to 1070)
   (95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 770 (Cal BP 1180)

1 Sigma calibrated result: Cal AD 690 to 780 (Cal BP 1260 to 1160)
   (68% probability)

References:
- Databases
  - INTCAL04
  - INTCAL98 Radiocarbon Age Calibration
- Mathematics:
  - A Simplified Approach to Calibrating C14 Data

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APPENDIX B
CERAMIC ANALYSIS
General Note: In cases of multiple sherds in an FN lot, individual sherds are assigned subnumbers, with the largest first and then by declining size.

Table B.1. Patayan (Paddle-and-Anvil-Thinned) Sherds from the Larder Site (26CK6146).

<table>
<thead>
<tr>
<th>FN</th>
<th>Temper</th>
<th>Form and Part</th>
<th>Thinning Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>9</td>
<td>A</td>
<td>jn; IAD=7 cm</td>
<td>p/a</td>
</tr>
<tr>
<td>11-1</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>11-2</td>
<td>A</td>
<td>?</td>
<td>p/a?</td>
</tr>
<tr>
<td>13</td>
<td>A&lt;sup&gt;1&lt;/sup&gt;</td>
<td>jb</td>
<td>p/a?</td>
</tr>
<tr>
<td>14-1</td>
<td>N&lt;sup&gt;2&lt;/sup&gt;</td>
<td>?</td>
<td>p/a?</td>
</tr>
<tr>
<td>14-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>14-3</td>
<td>A</td>
<td>too eroded</td>
<td>too eroded</td>
</tr>
<tr>
<td>30</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>37</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>64</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>66</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>67</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-1</td>
<td>A</td>
<td>jr; IAD=7 cm</td>
<td>p/a</td>
</tr>
<tr>
<td>68-2</td>
<td>A&lt;sup&gt;1,3&lt;/sup&gt;</td>
<td>jr; no IAD</td>
<td>p/a</td>
</tr>
<tr>
<td>68-3, same as 68-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-4, same as 68-1</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-5, same as 68-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-6, same as 68-1</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-7, same as 68-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-8, same as 68-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>68-9, same as 68-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>87</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>92</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>108</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>116-1</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>116-2</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>119</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>212</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>229</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>290-1&amp;290-2&lt;sup&gt;4&lt;/sup&gt;</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
<tr>
<td>290-3</td>
<td>A</td>
<td>jb</td>
<td>p/a</td>
</tr>
</tbody>
</table>
### Table B.2. Pueblo Sherds from the Larder Site (26CK6146).

<table>
<thead>
<tr>
<th>FN</th>
<th>Temper</th>
<th>Form and Part</th>
<th>Classification: Ware and Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>“olivine”¹</td>
<td>jb</td>
<td>Moapa Gray Ware: Moapa Brown</td>
</tr>
<tr>
<td>61</td>
<td>“olivine”¹</td>
<td>jb</td>
<td>Moapa Gray Ware: Moapa Brown</td>
</tr>
<tr>
<td>227</td>
<td>mostly quartz²</td>
<td>jb</td>
<td>TGW³, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>231</td>
<td>mostly quartz²</td>
<td>jb</td>
<td>TGW³, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>235</td>
<td>mostly quartz²</td>
<td>jb</td>
<td>TGW³, Virgin Series: North Creek Gray</td>
</tr>
</tbody>
</table>

Notes:

¹The clay in these sherds is very dark gray, suggesting that they are from the earlier part of Moapa Gray Ware production; FN 61 is unusually thick, 0.7 mm with poorly smothered surfaces.

²The constituents of this temper resemble that of Temper A in Patayan sherds, but grain size is smaller, sherds are sub-vitrified with exterior reddening.

³TGW stands for Tusayan Gray Ware (Colton 1952:19).
Table B.3. Sherds from Scorpion Knoll (26CK6147)

<table>
<thead>
<tr>
<th>FN</th>
<th>Temper</th>
<th>Form and Part</th>
<th>Context and Provenience</th>
<th>Ware and Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-1</td>
<td>xr</td>
<td>jb</td>
<td>s: 494N 368E</td>
<td>Moapa Gray Ware: Moapa Brown</td>
</tr>
<tr>
<td>25-2</td>
<td>q</td>
<td>jb</td>
<td>s: 494N 368E</td>
<td>TGW, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>26</td>
<td>q</td>
<td>jb</td>
<td>s: 495N 385E</td>
<td>TGW, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>52</td>
<td>q/gr</td>
<td>jb</td>
<td>e: F4, S1, L1</td>
<td>TGW, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>58-1</td>
<td>xr</td>
<td>jn</td>
<td>e: F4, S1, L2</td>
<td>Moapa Gray Ware: Moapa Brown</td>
</tr>
<tr>
<td>58-2</td>
<td>q</td>
<td>jb</td>
<td>e: F4, S1, L2</td>
<td>TGW, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>62</td>
<td>x</td>
<td>jb</td>
<td>e: F4, S1, L1</td>
<td>Moapa Gray Ware: Moapa Brown</td>
</tr>
<tr>
<td>63</td>
<td>q</td>
<td>jb</td>
<td>e: F4, S1, L2</td>
<td>TGW, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>72</td>
<td>q</td>
<td>jb</td>
<td>e: F4, S2, L4</td>
<td>TGW, Virgin Series: North Creek Gray</td>
</tr>
<tr>
<td>77</td>
<td>x</td>
<td>jb</td>
<td>s: 495.6N 364.4E</td>
<td>Moapa Gray Ware: Moapa Brown</td>
</tr>
<tr>
<td>97</td>
<td>q</td>
<td>jb</td>
<td>e: F4, S1, L1</td>
<td>TGW, Virgin Series, North Creek Gray</td>
</tr>
<tr>
<td>104-1</td>
<td>q/gr</td>
<td>jb</td>
<td>e: F4, S1, L1</td>
<td>TGW, Virgin Series, North Creek Gray</td>
</tr>
<tr>
<td>104-2</td>
<td>q/gr</td>
<td>jb</td>
<td>e: F4, S1, L1</td>
<td>TGW, Virgin Series, North Creek Gray</td>
</tr>
<tr>
<td>112</td>
<td>q/gr</td>
<td>jb</td>
<td>e: F4, S1, L1</td>
<td>TGW, Virgin Series, North Creek Gray</td>
</tr>
<tr>
<td>125.1</td>
<td>q</td>
<td>jb</td>
<td>e: F4, S2</td>
<td>TGW, Virgin Series, North Creek Gray</td>
</tr>
<tr>
<td>130-1</td>
<td>q</td>
<td>jb</td>
<td>e</td>
<td>TGW, Virgin Series, North Creek Gray</td>
</tr>
<tr>
<td>130-2</td>
<td>?</td>
<td>too small</td>
<td>e</td>
<td>too small</td>
</tr>
</tbody>
</table>

Temper categories:
- x = “olivine”; x is really for xenolith
- xr = reddened olivine temper
- q = quartz is what is visible
- q/gr = quartz, perhaps with other minerals from crystalline, “granitic” rock.
Table C.1. Ground Stone Artifacts from the Larder (26CK6146) and Scorpion Knoll (26CK6147) Sites.

<table>
<thead>
<tr>
<th>FN</th>
<th>Prov.</th>
<th>Context (mbd)</th>
<th>Type</th>
<th>Wear Intensity</th>
<th>Material</th>
<th>Discard State</th>
<th>L (cm)</th>
<th>W (cm)</th>
<th>Th (cm)</th>
<th>Cross Section</th>
<th>Striations</th>
<th>Ground Area (cm²)</th>
<th>Shaped Edges</th>
<th>Secondary Battering</th>
<th>W (g)</th>
<th>Battering of ground surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larder Site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>193</td>
<td>148.5N 499E</td>
<td>S1, L4 (.30-.35)</td>
<td>frag</td>
<td>mod</td>
<td>conglomerate</td>
<td>&lt;1/2</td>
<td>5.8</td>
<td>3.5</td>
<td>2</td>
<td>flat</td>
<td>none</td>
<td>3.64</td>
<td>yes</td>
<td>light</td>
<td>46</td>
<td>none</td>
</tr>
<tr>
<td>8</td>
<td>138N 519E</td>
<td>surface</td>
<td>mano frag</td>
<td>indet</td>
<td>basalt</td>
<td>&lt;1/2</td>
<td>6.4</td>
<td>4.1</td>
<td>4.6</td>
<td>indet</td>
<td>indet</td>
<td>yes</td>
<td>mod</td>
<td>134</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>155N 522E</td>
<td>surface</td>
<td>mano frag</td>
<td>light</td>
<td>basalt</td>
<td>&lt;1/2</td>
<td>4.2</td>
<td>3.5</td>
<td>3.6</td>
<td>convex</td>
<td>none</td>
<td>9.52</td>
<td>yes</td>
<td>none</td>
<td>62</td>
<td>none</td>
</tr>
<tr>
<td>158</td>
<td>148.5N 499E</td>
<td>(0.46)</td>
<td>mano frag</td>
<td>light</td>
<td>sandstone</td>
<td>&lt;1/2</td>
<td>7.6</td>
<td>4.3</td>
<td>3</td>
<td>convex</td>
<td>none</td>
<td>6.96</td>
<td>yes</td>
<td>light</td>
<td>100</td>
<td>none</td>
</tr>
<tr>
<td>38</td>
<td>219N 500E</td>
<td>surface</td>
<td>mano frag</td>
<td>light</td>
<td>basalt</td>
<td>&lt;1/2</td>
<td>6.2</td>
<td>2.8</td>
<td>3.5</td>
<td>convex</td>
<td>none</td>
<td>4.18</td>
<td>none</td>
<td>indet</td>
<td>52</td>
<td>none</td>
</tr>
<tr>
<td>27</td>
<td>177N 523E</td>
<td>surface</td>
<td>mano frag</td>
<td>mod</td>
<td>basalt</td>
<td>&lt;1/2</td>
<td>7</td>
<td>4.9</td>
<td>2.8</td>
<td>convex</td>
<td>none</td>
<td>11.89</td>
<td>possibly</td>
<td>light</td>
<td>90</td>
<td>none</td>
</tr>
<tr>
<td>32</td>
<td>181N 510E</td>
<td>surface</td>
<td>metate frag</td>
<td>heavy</td>
<td>basalt</td>
<td>half</td>
<td>15.5</td>
<td>11.2</td>
<td>12</td>
<td>slightly concave</td>
<td>none</td>
<td>56.61</td>
<td>none</td>
<td>heavy</td>
<td>1855</td>
<td>none</td>
</tr>
<tr>
<td>184</td>
<td>132N 490E</td>
<td>surface</td>
<td>metate frag</td>
<td>light</td>
<td>basalt</td>
<td>&lt;1/2</td>
<td>6.5</td>
<td>4</td>
<td>2.2</td>
<td>flat</td>
<td>none</td>
<td>6.48</td>
<td>none</td>
<td>light</td>
<td>61</td>
<td>none</td>
</tr>
<tr>
<td>Scorpion Knoll Site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Feat. 2</td>
<td>S1, L1</td>
<td>mano frag</td>
<td>mod</td>
<td>quartzite</td>
<td>&lt;1/2</td>
<td>5.5</td>
<td>4.5</td>
<td>4.1</td>
<td>convex</td>
<td>none</td>
<td>7.04</td>
<td>yes</td>
<td>light</td>
<td>86</td>
<td>none</td>
</tr>
<tr>
<td>131</td>
<td>F. 4, Unit 2</td>
<td>(.25-.35)</td>
<td>metate frag</td>
<td>light</td>
<td>caliche</td>
<td>&lt;1/2</td>
<td>5</td>
<td>3.2</td>
<td>3.2</td>
<td>flat</td>
<td>none</td>
<td>4.84</td>
<td>none</td>
<td>none</td>
<td>58</td>
<td>none</td>
</tr>
<tr>
<td>101</td>
<td>F. 4, Unit 1</td>
<td>S1, L3, floor fill (.32-.42)</td>
<td>pallet</td>
<td>light</td>
<td>limestone</td>
<td>&lt;1/2</td>
<td>2.1</td>
<td>1.2</td>
<td>0.5</td>
<td>flat</td>
<td>long</td>
<td>1.1</td>
<td>one</td>
<td>none</td>
<td>2</td>
<td>none</td>
</tr>
</tbody>
</table>
APPENDIX D

BOTANICAL ANALYSES
Table D.1. Provenience Data for Samples from Sites 26CK6007, 26CK6146, and 26CK6147.

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Sample No.</th>
<th>Feature No.</th>
<th>Stratum/Level</th>
<th>Provenience/Description</th>
<th>Radiocarbon Date (2σ 95%)</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>26CK6146</td>
<td>464</td>
<td></td>
<td></td>
<td>Surface control sample</td>
<td>Pollen</td>
<td>Pollen</td>
</tr>
<tr>
<td></td>
<td>312</td>
<td>7</td>
<td></td>
<td>Basal fill and floor from a bowl-shaped pit</td>
<td>Pollen</td>
<td>Pollen</td>
</tr>
<tr>
<td></td>
<td>156</td>
<td>12</td>
<td></td>
<td>Basal fill and floor from a bell-shaped pit</td>
<td>AD 1400-1460</td>
<td>Pollen</td>
</tr>
<tr>
<td></td>
<td>153</td>
<td>Level 5</td>
<td></td>
<td>Lower fill from a bell-shaped pit</td>
<td>Pollen</td>
<td>Macrofloral</td>
</tr>
<tr>
<td></td>
<td>327</td>
<td>14</td>
<td></td>
<td>Ashy basal fill and floor from a deep sloping-sided pit</td>
<td>Pollen</td>
<td>Pollen</td>
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<tr>
<td></td>
<td>374</td>
<td>20</td>
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<td>Overlying A Horizon from an irregular bowl-shaped pit</td>
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<td>Pollen</td>
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<td>Middle fill from an irregular bowl-shaped pit</td>
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<td></td>
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<td>Ashy basal fill and floor from a bell-shaped pit</td>
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<td>396</td>
<td>37</td>
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<td>Basal fill and floor from a deep bell-shaped pit</td>
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<td>Pollen</td>
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<td>218</td>
<td>49</td>
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<td>51</td>
<td>Strat. 2 Level 3</td>
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<td>100 BC-AD 110</td>
<td>Pollen</td>
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<td>265</td>
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<td>Strat. 2 Level 3</td>
<td>Basal fill and floor in a globular, bowl-shaped pit</td>
<td>Pollen</td>
<td>Macrofloral</td>
</tr>
<tr>
<td>Site No.</td>
<td>Feature No.</td>
<td>Stratum/Level</td>
<td>Provenience/Description</td>
<td>Radiocarbon Date (2σ 95%)</td>
<td>Analysis</td>
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<tr>
<td>26CK6146</td>
<td>435</td>
<td>55B</td>
<td>Basal fill and floor from a small shallow roasting pit; the upper of two superimposed pits</td>
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<td>Pollen</td>
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<td>439</td>
<td>55A</td>
<td>Basal fill and floor from a bowl-shaped pit; the lower of two superimposed pits</td>
<td>AD 640-760</td>
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<td>436</td>
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<td>Macrofloral</td>
<td></td>
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<tr>
<td>26CK6147</td>
<td>46</td>
<td>1</td>
<td>Fill from the floor in the north half of a pithouse</td>
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<td></td>
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<td>Basal fill and floor from a pithouse</td>
<td>AD 660-860</td>
<td>Pollen</td>
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<td>28</td>
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<td>Macrofloral</td>
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<td>Basal fill and floor from a deep sloping-sided pit</td>
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<td>Pollen</td>
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Strat. = Stratum

Table D.2. Macrofloral Remains from Site 26CK6146.

<table>
<thead>
<tr>
<th>Sample No.</th>
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<th>Charred</th>
<th>Uncharred</th>
<th>Weights/Comments</th>
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<tbody>
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<td>Light Fraction Weight</td>
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<td></td>
<td>0.85 L</td>
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<td>FLORAL REMAINS:</td>
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<td></td>
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<tr>
<td></td>
<td>Prosopis ≥ 1 mm</td>
<td>Endocarp</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prosopis &gt; 1 mm</td>
<td>Seed</td>
<td>2</td>
<td>99</td>
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<tr>
<td></td>
<td>Prosopis pubescens</td>
<td>Seed</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHARCOAL/WOOD:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total charcoal ≥ 2 mm</td>
<td></td>
<td>1.88 g</td>
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<tr>
<td></td>
<td>cf. Acacia</td>
<td>Charcoal</td>
<td>8</td>
<td>0.27 g</td>
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<tr>
<td></td>
<td>Prosopis</td>
<td>Charcoal</td>
<td>32</td>
<td>0.97 g</td>
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<tr>
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<td>NON-FLORAL REMAINS:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bone</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rock/Gravel</td>
<td></td>
<td>X</td>
<td>Few</td>
</tr>
<tr>
<td>Sample No.</td>
<td>Identification</td>
<td>Part</td>
<td>Charred W</td>
<td>Charred F</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>------</td>
<td>-----------</td>
<td>-----------</td>
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<tr>
<td>240</td>
<td>Liters Floated</td>
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<td>Feature 49</td>
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**FLORAL REMAINS:**

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<th>Species</th>
<th>Part</th>
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<th>Charred F</th>
<th>Uncharred W</th>
<th>Uncharred F</th>
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</thead>
<tbody>
<tr>
<td>Atriplex</td>
<td>Seed</td>
<td>1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cactaceae</td>
<td>Spine</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosopis</td>
<td>Endocarp</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Prosopis</td>
<td>Seed</td>
<td>16</td>
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**CHARCOAL/WOOD:**

<table>
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<tr>
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<th>Charcoal</th>
<th>Charcoal</th>
<th>Charcoal</th>
<th>Charcoal</th>
<th>Charcoal</th>
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<tbody>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>0.05</td>
<td>7.03</td>
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</tbody>
</table>

**NON-FLORAL REMAINS:**

| Bone                  | 2         |           |           |           |
| cf. Flake             | 1         |           |           |           |
| Gypsum rosette crystals - black | X       | Few       |           |           |
| Insect                | Chitin    | X         | Few       |           |
| Insect                | Clump of eggs | X       | X         | Few       |
| Insect                | Puparia   | X         | X         | Few       |
| Rock/Gravel           | X         | Few       |           |           |
| Rodent fecal pellets  | X         | X         | Few       |           |
| Sand                  | X         |           |           |           |

| Feature 51 | Light Fraction Weight |      |           |           |             |             | 17.27 g         |

**FLORAL REMAINS:**

<table>
<thead>
<tr>
<th>Species</th>
<th>Part</th>
<th>Charred W</th>
<th>Charred F</th>
<th>Uncharred W</th>
<th>Uncharred F</th>
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<tbody>
<tr>
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<tr>
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<td>Perisperm</td>
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<tr>
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<td>Fruit</td>
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<tr>
<td>Atriplex</td>
<td>Seed</td>
<td>4</td>
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<tr>
<td>Prosopis</td>
<td>Seed</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vitrified tissue</td>
<td>X</td>
<td>Few</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rootlets</td>
<td></td>
<td>X</td>
<td>Few</td>
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**CHARCOAL/WOOD:**

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<th>Charcoal</th>
<th>Charcoal</th>
<th>Charcoal</th>
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<td>Uncharred</td>
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<tr>
<td>------------</td>
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<td>------</td>
<td>----------</td>
<td>---------</td>
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<tr>
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<td>Prosopis</td>
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<td></td>
<td>W</td>
<td>F</td>
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<tr>
<td>Insect ≥ 0.5 mm</td>
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<td>Insect &lt; 0.5 mm</td>
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<tr>
<td>Insect fecal pellet</td>
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<td></td>
<td>X</td>
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<tr>
<td>Rock/Gravel</td>
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<td></td>
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<td>X</td>
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<tr>
<td>Rodent fecal pellet</td>
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<td></td>
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<td>Sand</td>
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<td>436</td>
<td>Litters floated</td>
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<td>Light fraction weight</td>
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<td>FLORAL REMAINS:</td>
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<tr>
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<td>Prosopis ≥ 1 mm</td>
<td>Endocarp</td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td>Prosopis ≥ 1 mm</td>
<td>Seed</td>
<td></td>
<td></td>
<td>2</td>
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<tr>
<td>Rootlets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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<td>CHARCOAL/WOOD:</td>
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<td>3</td>
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<td>Gypsum rosette crystals</td>
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<td>X</td>
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<tr>
<td>Insect fecal pellets</td>
<td>Clump of eggs</td>
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<td>X</td>
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<tr>
<td>Rock/Gravel</td>
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<td>Sand</td>
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<td></td>
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<td>Worm casts</td>
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Table D.3. Macrofloral Remains from Site 26CK6147.

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Identification</th>
<th>Part</th>
<th>Charred W</th>
<th>Charred F</th>
<th>Uncharred W</th>
<th>Uncharred F</th>
<th>Weights/Comments</th>
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<tr>
<td>51</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>2.00 L</td>
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<td></td>
<td></td>
<td></td>
<td>13.23 g</td>
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</table>

**FLORAL REMAINS:**

- Cheno-am: Perisperm 1
- *Atriplex*: Seed 1
- *Chenopodium*: Seed 2
- *Prosopis*: Seed 9
- *Amaranthus*: Seed 2
- *Descurainia*: Seed 1
- *Sesuvium*: Seed 1
- Buds: X Few
- Leaf: X Few
- Rootlets: X Numerous

**CHARCOAL/WOOD:**

- Total charcoal ≥ 2 mm: 0.28 g
- *cf. Acacia*: Charcoal 1 <0.01 g
- *Atriplex*: Charcoal 1 <0.01 g
- *Prosopis*: Charcoal 18 0.09 g

**NON-FLORAL REMAINS:**

- Bone: 1
- Flake: 1
- Insect ≥ 0.5 mm: Chitin 24
- Insect < 0.5 mm: Chitin X Few
- Insect Puparia: 6
- Ant: 10 36
- Rock/Gravel: x
- Sand: x
- Worm casts: x

W = Whole  F = Fragment  X = Presence noted in sample  L = Liters  g = grams
## INTENSIVE SCAN MICROSCOPY OF SAMPLES FROM SITES 26CK6007, 26CK6146, AND 26CK6147

Richard G. Holloway  
Quaternary Services

Table D.4. Pollen Analysis, Clark County, Nevada.

<table>
<thead>
<tr>
<th>Site</th>
<th>Bag #</th>
<th>Structure</th>
<th>Level</th>
<th>Feature</th>
<th>Type</th>
<th>Period</th>
<th>Age</th>
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<tr>
<td>26CK6146</td>
<td>fn 173</td>
<td>pit:storage:basin</td>
<td>18</td>
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<td>Ceramic</td>
<td>AD 30-240</td>
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<td>26CK6146</td>
<td>fn 371</td>
<td>middle feat fill</td>
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<td>AD 900-1040</td>
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<td>AD 660-1020; AD 800-1000</td>
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</tr>
<tr>
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<td>fn 96</td>
<td>bottom fill floor</td>
<td>7</td>
<td>storage:irregular</td>
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<td>depression</td>
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<td>AD 660-1020; AD 800-1000</td>
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</table>

<table>
<thead>
<tr>
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ANALYSIS OF FLOTATION AND CHARRED-MATERIAL SAMPLES

David Rhode
2 March 2007

Heidi Roberts
HRA, Inc.
Las Vegas, NV

Dear Heidi:

Enclosed you will find the results of flotation of 23 sediment samples, and identification of charred plant materials from six other samples, obtained from archaeological sites 26Ck6146 and Ck6147 in Clark County, Nevada. Site 26Ck6146 is represented by 17 floated sediment samples and a single sample of seeds and charcoal. Site 26Ck6147 is represented by four floated sediment samples and five charcoal samples primarily from construction posts or beams.

The sediment samples consisted of ~1.3 - 5.7 liters each of loose silty sand with few pebbles and small to moderate amounts of organic materials. Flotation proceeded easily. After weighing and volumetric measurement each sample, it was mixed into a water bath, then swirled to float the organic materials and lighter sediments; heavier sands and silts were allowed to settle briefly, and the lighter materials were then poured off the top into 0.5 mm mesh screen. Swirling, settling, and skimming were repeated until all floating organics (the light fraction) were removed. The residue in water was then poured through 2 mm mesh screen; coarse sands and gravels were trapped on the screen as a heavy fraction, while silts and sands passed through and were discarded. Both light and heavy fractions were air-dried and then weighed.

The light fraction of the floated samples, and the six wood and seed samples, were then examined using a Nikon binocular dissecting microscope (10-80X). Fraction contents were described, and identifiable plant materials that were not obviously modern (rootlets, modern seeds, etc.) were segregated for identification. Identification of materials was made using reference voucher specimens in my collection.

Results are attached in several tables. Tables 1a and 1b presents descriptive data for each flotation sample from sites 26Ck6146 and 26 Ck6147, respectively, including weight and volume of the total sample and the weights of the light and heavy fractions. Tables 2a and 2b presents descriptions of seeds, charcoal, and other plant materials found in the light fraction of the flotation samples from 26Ck6146 and 26Ck6147, respectively. Finally, Table 3 presents results of identifications of the six wood and seed samples from other contexts.

Overall, the results provide strong evidence of collection and processing of fruits from both honey mesquite (Prosopis glandulosa) and screwbean (Prosopis pubescens). The fruits and seeds of both plants were important ethnographically-known foods within the trees' ranges of distribution. Nine flotation samples from site 26Ck6146 contain remains of mesquite while seven contain remains of screwbean, two samples contain both. (Remains that could be either mesquite or screwbean are simply called Prosopis in Table 2). One sample (HRA #365) also contained abundant charred remains of bruchid beetles, which infest mesquite pods. A few other seed fragments were found in several samples from 26Ck6146, but the condition of these charred seed fragments prevented their identification. A single sample from 26Ck6147 contained two
possible *Prosopis* seeds, but otherwise the flotation samples from 26Ck6147 contained virtually no identifiable potential dietary remains.

Wood charcoal in the sediment samples predominantly of two hardwood types. Angiosperm A (cf. *Prosopis*) has large vessels and thin rays, generally ring-porous (having more vessels along the early wood, though they are not larger than late-wood vessels), and is consistent with mesquite wood. It is found in 9 sediment samples. Angiosperm B has numerous smaller vessels, is semi-ring-porous, and has thick aggregate rays. It is found in 4 samples. I am not sure what wood this is. In addition, saltbush (*Atriplex*) charcoal was found in two samples, and one sample contained abundant maize cob fragments. Among the post and beam samples, all are tentatively identified to *Prosopis*.

I hope you find these results useful. If you have any questions or comments regarding these results, please do not hesitate to contact me.

Sincerely,

\[Signature\]

David Rhode, Ph.D.
### Table D.5a. Description of Sediment Samples from 26CK6146.

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<th>Total Weight (g)</th>
<th>Heavy Fraction Weight</th>
<th>Light Fraction Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>1</td>
<td>Light brown sand with a few charcoal flecks, small carbonate pebbles</td>
<td>5.7</td>
<td>8346.1</td>
<td>1525.3</td>
<td>5.95</td>
</tr>
<tr>
<td>74</td>
<td>4</td>
<td>Light brown sand with a few charcoal flecks, small carbonate pebbles</td>
<td>5</td>
<td>6696.8</td>
<td>1454.6</td>
<td>2.65</td>
</tr>
<tr>
<td>76</td>
<td>4</td>
<td>Light brown sand with a few charcoal flecks, small carbonate pebbles</td>
<td>4</td>
<td>5712.9</td>
<td>893.2</td>
<td>4.74</td>
</tr>
<tr>
<td>79</td>
<td>3</td>
<td>Light brown sand with a few charcoal flecks, small carbonate pebbles</td>
<td>2.6</td>
<td>3413.5</td>
<td>504.4</td>
<td>9.43</td>
</tr>
<tr>
<td>FN #</td>
<td>Feature Description</td>
<td>Light Fraction</td>
<td>Charcoal</td>
<td>Seeds and Fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------------------</td>
<td>----------------</td>
<td>----------</td>
<td>------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>Abundant rootlets, charcoal to 1 cm, sand</td>
<td>Charcoal: Abundant rootlets, charcoal to 1 cm, sand</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>3 charred seed fragments, probably screwbean; 1 charred small seed, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>271</td>
<td>Abundant rootlets, charcoal to 6 mm</td>
<td>Charcoal: Abundant rootlets, charcoal to 6 mm</td>
<td>Unidentified angiosperm B: thick-rayed, numerous vessels semi-ring porous</td>
<td>8 charred seed fragments, probably screwbean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>276</td>
<td>Abundant charcoal to 2 mm</td>
<td></td>
<td>Too small to ID</td>
<td>1 small charred seed, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>288</td>
<td>Abundant fine rootlets, charcoal to 1 cm</td>
<td>Charcoal: Abundant fine rootlets, charcoal to 1 cm</td>
<td></td>
<td>1 charred fruit with seed enclosed, mesquite; 23 charred seeds and seed fragments, mesquite; 8 charred pod fragments, mesquite; 14 charred seed fragments, probably mesquite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>291</td>
<td>Abundant fine rootlets, charcoal to 8 mm</td>
<td>Charcoal: Abundant fine rootlets, charcoal to 8 mm</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>3 charred seed fragments, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>309</td>
<td>Fine rootlets, sand, charcoal to 6 mm</td>
<td>Charcoal: Fine rootlets, sand, charcoal to 6 mm</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>5 charred pod fragments, mesquite; 11 charred seed fragments, probably mesquite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>323</td>
<td>Abundant charcoal, charcoal to 5 mm, a few rootlets, sand</td>
<td>Too small to ID</td>
<td></td>
<td>1 charred pod fragment, probably mesquite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>355</td>
<td>Abundant charcoal mostly finely divided but with chunks to 2 cm</td>
<td>Charcoal: Abundant charcoal mostly finely divided but with chunks to 2 cm</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>2 large charred seed pod fragments, cf. mesquite; 2 charred seed and seed coat fragments, cf. screwbean; 1 fragment charred large seed, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>365</td>
<td>Abundant charcoal mostly finely divided but with chunks to 2 cm, numerous beetle parts, insect egg cases</td>
<td>Charcoal: Abundant charcoal mostly finely divided but with chunks to 2 cm, numerous beetle parts, insect egg cases</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>1 charred seed with fruit coat, mesquite; 2 charred seed with fruit coat fragments, mesquite; 4 large charred seeds, mesquite; 2 charred small seeds, <em>Prosopis</em>; 1 charred bruchid beetle; 10 charred pod fragments, <em>Prosopis</em>; 7 charred seed fragments, <em>Prosopis</em>; 1 charred spine mesquite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FN #</td>
<td>Feature Description</td>
<td>Light Fraction</td>
<td>Charcoal Description</td>
<td>Seeds and Fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>370</td>
<td>Abundant modern rootlets, finely divided charcoal</td>
<td>31</td>
<td>Unidentified angiosperm B; thick-rayed, numerous vessels semi-ring porous</td>
<td>1 charred seed/fruit fragment, screwbean; 2 charred pod fragments, mesquite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>373</td>
<td>Abundant fine rootlets, sand, charcoal finely divided to 5 mm</td>
<td>20</td>
<td>Cf. <em>Atriplex</em></td>
<td>1 charred grass stem fragment; 2 charred seed fragments, unidentified; 1 charred fragment frothy plant tissue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>387</td>
<td>Abundant charcoal, fewer rootlets</td>
<td>36</td>
<td>Cf. <em>Atriplex</em></td>
<td>3 charred flattend pod fragments, mesquite; 2 charred seed fragments, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>411</td>
<td>Very small amount finely divided charcoal, rootlets, sand</td>
<td>43</td>
<td>Too small to ID</td>
<td>No seeds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>426</td>
<td>Abundant charcoal to 1.5 cm</td>
<td>52</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>1 charred pod fragment, mesquite; 2 charred possible seed coat fragments, mesquite; 1 charred seed fragment, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>432</td>
<td>Abundant finely divided charcoal, small amount rootlets</td>
<td>55B</td>
<td>Too small to ID</td>
<td>52 charred seed and seed fragments, cf. screwbean; 20 charred seed coat or pod fragments, cf. screwbean; 1 charred ovoid seed, unidentified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>Moderate rootlets, sand, finely divided charcoal to 6 mm</td>
<td>61</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>4 charred large seed fragments, cf. screwbean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>462</td>
<td>Abundant charcoal to 1 cm, mostly finely divided</td>
<td>61</td>
<td>Angiosperm A (cf. <em>Prosopis</em>): large vessels ring porous with thin rays</td>
<td>1 charred seed, screwbean; 1 charred fruit part, screwbean; 1 charred seed fragment, cf. mesquite; 2 charred pod fragments, mesquite; 1 charred seed fragment, unidentified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table D.6b. Light Fraction Contents from Sediment Samples, 26CK6147.

<table>
<thead>
<tr>
<th>FN #</th>
<th>Feature Description</th>
<th>Charcoal</th>
<th>Seeds and Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>1 Finely divided vegetal material, small amount sand, rodent pellets, rootlets, finely divided charcoal to 3 mm</td>
<td>Unidentified angiosperm B: thick-rayed, numerous vessels semi-ring porous</td>
<td>1 modern seed, Chenopodium; 1 modern seed, Solanaceae; 1 charred seed fragment, unidentified</td>
</tr>
<tr>
<td>74</td>
<td>4 Abundant uncharred rootlets, small amount sand, numerous modern Solanaceae seeds, finely divided charcoal to 3 mm</td>
<td>Unidentified angiosperm</td>
<td>Numerous modern Solanaceae seeds (not collected)</td>
</tr>
<tr>
<td>76</td>
<td>4 Abundant uncharred fine rootlets, sand, rodent pellets, insect parts (ant heads), finely divided charcoal to 4 mm</td>
<td></td>
<td>No seeds</td>
</tr>
<tr>
<td>79</td>
<td>3 Abundant finely divided charcoal to 1 mm but a few chunks to 5 mm</td>
<td>Two types of hardwood (angiosperm) charcoal: (A) large-vesseled, relatively few vessels, thin-rayed: cf. Prosopis; (B) thick-rayed many vesseled semi-ring porous</td>
<td>2 charred seed fragments, possibly Prosopis</td>
</tr>
</tbody>
</table>

Table D.7. Identification of Wood and Charcoal Samples.

<table>
<thead>
<tr>
<th>FN #</th>
<th>Feature #</th>
<th>Site # (26CK__)</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>268</td>
<td>45</td>
<td>6146</td>
<td>1 burned cf. Prosopis seed, cf. Prosopis charcoal</td>
</tr>
<tr>
<td>339</td>
<td>21</td>
<td>6146</td>
<td>Charcoal, angiosperm, too small to ID</td>
</tr>
<tr>
<td>69</td>
<td>4</td>
<td>6147</td>
<td>Charcoal, cf. Prosopis</td>
</tr>
<tr>
<td>132</td>
<td>4</td>
<td>6147</td>
<td>Charcoal, cf. Prosopis</td>
</tr>
<tr>
<td>137</td>
<td>4</td>
<td>6147</td>
<td>Charcoal, cf. Prosopis</td>
</tr>
<tr>
<td>138</td>
<td>4</td>
<td>6147</td>
<td>Charcoal, cf. Prosopis</td>
</tr>
</tbody>
</table>
APPENDIX E

PETROFACIES MODELING
Brown ware pottery recovered in the Clark County Wetlands Park contains fine grained sand-sized temper. HRA, Inc. requested petrofacies analysis to determine whether the sand-sized grains found in the pottery could be used to determine the location of manufacture of the pottery. To accomplish a provenance study of this nature, it was necessary to collect sand samples from Wetlands Park and the surrounding area. By establishing a petrofacies model—a map of sand texture and composition available in the area—the locale of manufacture of the pottery can be established based on sand temper found in potsherds. Twenty-five sand and rock samples were collected within the Las Vegas Valley to help establish sand-sample compositions available both at the sites and in the surrounding valley.

**PHYSIOGRAPHIC SETTING AND BACKGROUND**

To create a petrofacies model, it is necessary to consider the geology of the project area, the surficial geomorphology and drainage patterns, and soil-formation processes. Clark County Wetlands Park is located within the Las Vegas Basin along Las Vegas Wash, just upstream and west of the wash’s entrance into Lake Mead. The petrofacies model starts in this area, but includes the bulk of the Las Vegas Valley, from Lake Mead on the east to the bajada of the Spring Mountains on the west, from the foothills of the McCullough Mountain Range on the south to the southern end of the Sheep Range to the north.

**Geologic Background**

The Las Vegas Valley in southern Nevada is located in the Basin and Range province of the western United States. It has a deep geologic history, with exposures of early Proterozoic basement rocks in the Frenchman Mountain area, extensive exposures of Paleozoic and Mesozoic sedimentary rocks, Tertiary volcanics, and extensive Quaternary basin fill deposits.

**STRUCTURE AND DRAINAGE PATTERN**

There are a number of major fault systems in the Las Vegas Valley, varying in age from Mesozoic to Quaternary. The first set comprises thrust faults that originated during the Cretaceous Sevier orogeny (mountain-building episode). The dominant direction of these faults is from northeast to southwest, representing shortening toward the southeast. The faults are largely in the Spring and Sheep ranges, outside of the modeled area, but juxtaposition of rock units due to faulting affects lithologic contribution to sediments within the petrofacies model. The faulting also exhibits some structural control on the drainage pattern, which will be discussed in the individual petrofacies descriptions.

The second major set of faults in the Las Vegas Valley is that related to Late Tertiary extension, which created the familiar basin and range pattern seen today. This “stretching” of the earth’s crust resulted in both strike-slip and normal faulting. Las Vegas Wash follows the Las Vegas Valley shear zone; this appears to be the dominant drainage-pattern control in the modeled area. In addition to the structural control on the drainage pattern, the extensional regime resulted in Tertiary volcanism, and a number of landslide deposits can be attributed to the volcanic and tectonic activity.
Finally, there are a number of small Quaternary age faults in the Las Vegas Valley. These faults often resulted in spring discharge, contributing to localized compositional changes in the sedimentary deposits available at the ground surface.

Because of the numerous cross-cutting fault systems, the drainage pattern in the Las Vegas Valley is skewed from the sort of strictly dendritic pattern that might be expected when a major wash traverses the center of a basin between two mountain ranges. Tributaries to the Las Vegas Wash enter at oblique angles from a number of directions, the wash itself is skewed to the north and east in the valley, and it is deflected around various rock units. The resulting sedimentary compositional units take on a variety of shapes, and the preliminary petrofacies map has a series of wedge-shaped petrofacies that have a nearly radial pattern.

**BEDROCK LITHOLOGY AND GEOLOGIC HISTORY**

The extensive geologic history in the Las Vegas Valley rivals that seen in the Grand Canyon, except that the rock units are exposed on the earth’s surface. Whereas the Grand Canyon shows the geologic history of the Southwest in celebrated “layer cake” fashion, the units in the Las Vegas Valley resemble that layer cake after it has been carelessly sliced, then dumped off a plate into a jumble on the floor.

The oldest units in the valley are at Frenchman Mountain, where 1.7 Ga (billion years ago) gneissic crystalline basement rocks are exposed. These are equivalent to the Vishnu schist at the base of the Grand Canyon. An unconformity separates the basement rock from overlying Cambrian age sandstone and quartzite units (Page et al. 2005).

Paleozoic sedimentary units are widespread throughout the Las Vegas Valley. Earlier units at the base of the sequence represent a near-shore continental margin environment. They generally comprise clastic rocks such as conglomerate, sandstone, and siltstone, representing sediments eroded from the continent and deposited in the ocean through alluvial, fluvial, and aeolian processes. Through time, the ocean became deeper and sedimentation became increasingly fine, eventually changing from clastic deposits (silt, sand, clay) to precipitated deposits (limestone, gypsum). The latter are frequently fossiliferous. Limestone deposits as early as the Ordovician are seen. Carbonate deposition continues throughout the Paleozoic, though incursions of shale and siltstone occur through time, indicating fluctuation in sea levels and probably proximity and volume of terrestrial clastic sediment sources.

In the Permian period, at the end of the Paleozoic era, the seas retreated and clastic sedimentary rocks were deposited. The Thumb Formation redbeds are a result of this process, which continued through the Triassic (Moenkopi Formation) and the Jurassic (Kayenta Formation, Aztec Sandstone) periods of the Mesozoic Era (Bell and Smith 1980; Page et al. 2005). By the Cretaceous period, mountain building related to the Sevier Orogeny began. Rocks from this period are not preserved in the Las Vegas Valley.

In the Tertiary period, movement along extensional faults led to the development of relief as mountains and basins grew in opposite directions. Deep basin fill deposits, which are sedimentary units derived from the erosion of the rock units of the surrounding mountain ranges, began to fill the valleys. Along with the tectonic movement came volcanic activity, resulting in the emplacement of lava and tuff with the mix of sedimentary and basement rocks. Volcanic and sedimentary lithologies are combined in both the basin fill deposits and in volcanic breccias resulting more directly from the eruptive events. By the Pleistocene, springs were developing along active fault zones, providing one more unique source of sediment for the basin (Page et al. 2005). Rapid tectonic change has continued to the present time, with three major erosional cycles occurring in the last 500,000 years (Finley et al. 2006).
Table E.1. Inventory Data for the Sands.

<table>
<thead>
<tr>
<th>Sample</th>
<th>7.5' Map</th>
<th>Facies</th>
<th>Zone</th>
<th>1927 Northing</th>
<th>1927 Easting</th>
<th>Sample type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVB-01</td>
<td>Henderson</td>
<td>A</td>
<td>11</td>
<td>3996540</td>
<td>685230</td>
<td>Sand</td>
</tr>
<tr>
<td>LVB-02</td>
<td>Henderson</td>
<td>A</td>
<td>11</td>
<td>3996540</td>
<td>685230</td>
<td>Sand</td>
</tr>
<tr>
<td>LVB-03</td>
<td>Henderson</td>
<td>A</td>
<td>11</td>
<td>3996110</td>
<td>684330</td>
<td>Sand</td>
</tr>
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<td>11</td>
<td>3996110</td>
<td>684330</td>
<td>Silty-Clay</td>
</tr>
<tr>
<td>LVB-05</td>
<td>Henderson</td>
<td>A</td>
<td>11</td>
<td>3996110</td>
<td>684330</td>
<td>Rock</td>
</tr>
<tr>
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<td>11</td>
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<tr>
<td>LVB-07</td>
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<td>11</td>
<td>3993310</td>
<td>659820</td>
<td>Sand</td>
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<tr>
<td>LVB-08</td>
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<td>11</td>
<td>3993310</td>
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<td>Silty-Clay</td>
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<tr>
<td>LVB-09</td>
<td>Blue Diamond</td>
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<td>11</td>
<td>4006750</td>
<td>654930</td>
<td>Sand</td>
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<tr>
<td>LVB-10</td>
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<td>650420</td>
<td>Sand</td>
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<tr>
<td>LVB-11</td>
<td>Gass Peak</td>
<td>E</td>
<td>11</td>
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<td>661070</td>
<td>Sand</td>
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<td>E</td>
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<td>Frenchman Mtn</td>
<td>C</td>
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<tr>
<td>LVB-18</td>
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<td>3990940</td>
<td>665610</td>
<td>Sand</td>
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<td>3990940</td>
<td>665610</td>
<td>Sand</td>
</tr>
<tr>
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</tr>
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<td>681640</td>
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</tr>
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<td>LVB-25</td>
<td>Las Vegas, SE</td>
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<td>11</td>
<td>3998420</td>
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<td>Sand</td>
</tr>
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</table>

**DEVELOPMENT OF THE PRELIMINARY PETROFACIES MODEL**

Examination of the geologic map, drainage patterns, and street maps led to selection of sample locations for the preliminary petrofacies map. Initial assessment suggested that four or five petrofacies would be defined. The first sample collection effort was designed to get several samples (five or six) from each of the probable compositional areas, with higher sample density near Wetlands Park. Development in the Las Vegas valley proved to be the primary limiting factor in selecting sample locations on the ground: ground disturbance (bulldozing, filling, and excavation), ground coverage (construction of building and roads), drainage disruption/diversion, and access restrictions were the most common problems encountered during the collection effort, in order from the most difficult to mitigate to the least.
At total of 25 samples was collected in October 2007 (Table E.1). Based on the map data and sample collection, seven petrofacies have been identified at this stage. They have been examined under low-power magnification, but point counting is not complete (Table E.2). Each petrofacies is described below in terms of its geologic background and composition. A preliminary petrofacies map has been constructed, based on sample texture and mineralogy, geologic history, and drainage pattern analysis (Figure E.1).

**Henderson Petrofacies (A)**

The Henderson Petrofacies is an area in the southeastern Las Vegas basin, comprising most of Henderson, east to Lake Mead, north to the Las Vegas Wash wetlands, and with an as-yet-undetermined southern boundary. It encompasses the River Mountains. Composition of samples collected from the Henderson Petrofacies (LV-01 through LV-05) is lithic-arkosic, comprising a mixture of volcanic rocks, limestone, chert, siltstone, quartz, feldspars, and other minerals. Grain sizes range from clay to coarse sand and gravel. Geologic source units include fault-juxtaposed volcanics in the River Mountains (lava flows, mud flow breccias, pyroclastic deposits) small deposits of the Thumb Formation (Tertiary redbeds and limestone) and alluvium, soils, and fluvial deposits derived from these units (Bell and Smith 1980).

**Sunrise Petrofacies (B)**

The Sunrise Petrofacies encompasses much of the Sunrise Mountain Recreation area, including Frenchman Mountain and most of the Rainbow Gardens. Composition of samples collected from the Sunrise Petrofacies (LVB-22 through LVB-25) is lithic arkosic, comprising mixed metamorphic, volcanic, and clastic sedimentary rocks along with limestone, minor quartz and feldspars, and gypsum. Three of the samples have grain sizes in the coarse silt to coarse sand range; the fourth is finer, comprising silt to fine sand.

Geologic source units at the southern end of the petrofacies, south of Frenchman Fault, include the Tertiary Muddy Creek, Horse Springs, and Thumb formations along with Quaternary fan deposits from Frenchman Mountain. Gypsum deposits occur within these units, as do gneissic and granitic clasts (Bell and Smith 1980). North of the Frenchman Fault the bulk of the petrofacies comprises sedimentary units from the Mississippian Redwall Limestone through the Triassic Moenkopi Formation (Castor et al. 2000). The boundaries of this petrofacies are drawn to encompass the Paleozoic and Mesozoic sedimentary rocks and to show the extent to which these rocks influence the composition of sands down to Las Vegas Wash. Volcanic lithics in this petrofacies originate in the Tertiary volcanics of Rainbow Gardens (Bell and Smith 1980:map unit “Tvr”) and in volcanics interbedded with the Tertiary sedimentary units south of Frenchman Fault. The western portion of the petrofacies encompasses the “Great Unconformity Interpretive site” where Proterozoic gneissic rocks are exposed in contact with Paleozoic sedimentary rocks. This is the one area within the basin that is likely to have a higher concentration of sands containing “granitic” rocks and coarse quartz and feldspars derived from such rocks.

**Gale Hills Petrofacies (C)**

The Gale Hills Petrofacies is bounded on the south by Lake Las Vegas and the confluence of Lake Mead and Las Vegas Wash, and the north shore of Lake Mead. It extends north toward the Gale Hills. It is not well-defined, having only a single sand sample (LVB-17). It is inferred to have a mixed lithic composition but may, in fact, be divisible into smaller units. Access beyond private mining lands and to Federal recreation lands will be required to better sample and define this area. LVB-17 has limestone, clastic sedimentary, and metamorphic lithic grains, with possible igneous rock fragments as
<table>
<thead>
<tr>
<th>Sample</th>
<th>Petrofacies</th>
<th>Sample type</th>
<th>Composition</th>
<th>Composition of lithic fragments</th>
<th>Notes</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVB-01</td>
<td>A</td>
<td>Sand</td>
<td>Lithic arkosic</td>
<td>Intermediate-mafic volcanic</td>
<td>—</td>
<td>Fine to medium sand</td>
</tr>
<tr>
<td>LVB-02</td>
<td>A</td>
<td>Sand</td>
<td>Lithic arkosic</td>
<td>Intermediate-mafic volcanic</td>
<td>Same loc. as 1</td>
<td>Coarse silt to coarse sand</td>
</tr>
<tr>
<td>LVB-03</td>
<td>A</td>
<td>Sand</td>
<td>Lithic arkosic</td>
<td>Intermediate-mafic volcanic; limestone, siltstone, chert</td>
<td>—</td>
<td>Fine to medium sand</td>
</tr>
<tr>
<td>LVB-04</td>
<td>A</td>
<td>Silty-Clay</td>
<td>Lithic arkosic</td>
<td>Intermediate-mafic volcanic; limestone, siltstone, chert</td>
<td>Same loc. as 3</td>
<td>Indurated clay</td>
</tr>
<tr>
<td>LVB-05</td>
<td>A</td>
<td>Rock</td>
<td>Lithic arkosic</td>
<td>Intermediate-mafic volcanic; limestone, siltstone, chert</td>
<td>Same loc. as 3</td>
<td>Siltstone</td>
</tr>
<tr>
<td>LVB-06</td>
<td>G</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Coarse silt to coarse sand</td>
</tr>
<tr>
<td>LVB-07</td>
<td>G</td>
<td>Sand</td>
<td>Lithic</td>
<td>Sedimentary, conglomeratic with calcareous cement</td>
<td>—</td>
<td>Fine to medium sand</td>
</tr>
<tr>
<td>LVB-08</td>
<td>G</td>
<td>Silty-Clay</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Indurated clay</td>
</tr>
<tr>
<td>LVB-09</td>
<td>F</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Fine to medium sand</td>
</tr>
<tr>
<td>LVB-10</td>
<td>F</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-11</td>
<td>E</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-12</td>
<td>E</td>
<td>Clay</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Indurated clay</td>
</tr>
<tr>
<td>LVB-13</td>
<td>E</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-14</td>
<td>E</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-15</td>
<td>E</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-16</td>
<td>D</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td>—</td>
<td>Fine to medium sand</td>
</tr>
<tr>
<td>LVB-17</td>
<td>C</td>
<td>Sand</td>
<td>Lithic, minor</td>
<td>Mixed: mmic, mixed sedimentary,</td>
<td>—</td>
<td>Coarse silt to coarse sand</td>
</tr>
<tr>
<td>Sample</td>
<td>Petrofacies</td>
<td>Sample type</td>
<td>Composition</td>
<td>Composition of lithic fragments</td>
<td>Notes</td>
<td>Texture</td>
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<tr>
<td>---------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>---------------------------------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>LVB-18</td>
<td>G</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone,</td>
<td></td>
<td>Fine to medium sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>chert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LVB-19</td>
<td>G</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td></td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-20</td>
<td>G</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td></td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-21</td>
<td>G</td>
<td>Sand</td>
<td>Lithic</td>
<td>Mixed sedimentary, limestone</td>
<td></td>
<td>Silt to fine sand</td>
</tr>
<tr>
<td>LVB-22</td>
<td>B</td>
<td>Sand</td>
<td>Lithic, minor arkosic</td>
<td>Mixed: mmic, sedimentary, limestone, volcanic, gypsum</td>
<td></td>
<td>Coarse silt to coarse sand</td>
</tr>
<tr>
<td>LVB-23</td>
<td>B</td>
<td>Sand</td>
<td>Lithic, minor arkosic</td>
<td>Mixed: mmic, sedimentary, limestone, volcanic, gypsum</td>
<td>Abundant gypsum</td>
<td>Coarse silt to coarse sand</td>
</tr>
<tr>
<td>LVB-24</td>
<td>B</td>
<td>Sand</td>
<td>Lithic, minor arkosic</td>
<td>Mixed: mmic, sedimentary, limestone, volcanic, gypsum</td>
<td></td>
<td>Coarse silt to coarse sand</td>
</tr>
<tr>
<td>LVB-25</td>
<td>B</td>
<td>Sand</td>
<td>Lithic, minor arkosic</td>
<td>Mixed: mmic, sedimentary, limestone, volcanic, gypsum</td>
<td></td>
<td>Silt to fine sand</td>
</tr>
</tbody>
</table>
Figure E.1. Preliminary petrofacies map.
well. Grain sizes range from coarse silt to coarse sand. Geologic source units are primarily the Tertiary Muddy Creek Formation, generally with a gypsum component (Castor et al. 2000). Sedimentary units from the Paleozoic and Mesozoic occur along the boundary with the Sunrise Petrofacies. Discontinuous exposures of volcanic rocks of the Rainbow formation occur in the petrofacies, most often at and near Lava Butte in the southwestern quadrant (Bell and Smith 1980, Castor et al. 2000).

The Dunes (D)

The Dunes Petrofacies is inferred by drainage patterns in the northeastern Las Vegas Valley, from the Las Vegas Dunes Recreation lands to the northern end of the Sunrise Mountain Natural area. It encompasses the small southeastern-most unit of Nellis Air Force Base. Composition of a single sample collected from the Dunes Petrofacies (LVB-16) is mixed sedimentary clastic rocks and limestone, with limestone dominant. Grain sizes range from fine to medium sand. Geologic source units include those seen in the Sunrise Petrofacies, with the addition of large Quaternary and Tertiary sandstone units, plus limestone megabreccia, derived from the earlier Paleozoic through Mesozoic sequence. The limestone member of the Muddy Creek Formation also occurs in this area, but Tertiary volcanics are rarely seen. The Paleozoic units, especially the Mississippian Redwall Limestone and Pennsylvanian/Permian units, are more exposed in this area than are the Mesozoic units such as the Kaibab Limestone and Moenkopi Formation. Lack of volcanic lithics, differential exposure of the rock units, and extensive re-working of the sediments in the Tertiary and Quaternary all change the compositional and textural character of this petrofacies from that seen in the Sunrise Petrofacies, leading to its definition as a separate unit.

Gass Petrofacies (E)

The Gass Petrofacies comprises the northern Las Vegas Valley including the Gass Peak area, the southern foothills of the Sheep Range, Fossil Ridge, the southern Las Vegas Range, and drainages extending from these ranges down to Las Vegas Wash. The compositional influence of these ranges may extend south of the modern course of Las Vegas Wash based on drainage patterns and surficial geology units. Composition of samples collected from the Gass Petrofacies (LVB-11 through LVB-15) is lithic, comprising clastic sedimentary rocks, limestone, chert, and quartzites. Clastic lithic fragments (sandstones, quartzites) are dominant over evaporites such as limestone. Grain sizes range from silt to fine sand, with one indurated clay sample collected as well. Geologic source units at the eastern margin of the petrofacies include upper Paleozoic sedimentary rocks of the Bird Spring Formation and associated units in the Las Vegas Range. These change abruptly across the Gass Peak Thrust Fault, along the western margin of the Las Vegas Range, to late Proterozoic to Ordovician clastic sedimentary units. In the central part of the petrofacies, the Tertiary Horse Spring formation is preserved along Fossil Ridge, stratigraphically and topographically above the early Paleozoic sedimentary rocks. Proceeding west, older Quaternary alluvial sediments are preserved in the Yucca Forest, while sedimentary rocks of Cambrian through lower Mississippian age crop out at the southern end of the Sheep Range. The petrofacies itself primarily comprises the Quaternary sediments derived from these units and deposited in the Las Vegas wash, which runs along the Las Vegas fault in this area. The samples collected do not include the Corn Creek Dunes area, which could well be a natural endpoint of the petrofacies.

La Madre Petrofacies (F)

La Madre Petrofacies is on the western edge of the Las Vegas Valley and includes the foothills of the Spring Mountains in the La Madre Mountain area and the alluvial fans and basin-fill deposits originating from La Madre Mountain. Composition of samples collected from the La Madre Petrofacies (LVB-09 through LVB-10) is lithic, comprising mixed limestone and clastic sedimentary rocks. Grain sizes range from silt to medium sand. Geologic source units are primarily the Quaternary alluvium and basin-fill rocks of the western Las Vegas Valley. Paleozoic sedimentary units occur on the western margin, but are more distant from the sediment sources than in most of the other petrofacies.
Spring Valley Petrofacies (G)

The Spring Valley Petrofacies comprises the southwestern portion of the Las Vegas Valley, including the Blue Diamond Hills and the Cottonwood Pass area, eastward to the west edge of Henderson. Duck Creek is included in this petrofacies. The Spring Valley Petrofacies abuts the Henderson Petrofacies, but as of this writing there are no samples defining the boundary between the two. It is possible that the boundary should move east or west, or that there is another small compositional zone between the two representing the output of the McCullough Mountains and associated basin-fill deposits.

Composition of samples collected from the Spring Valley Petrofacies (LVB-06 through 08 and LVB-18 through 21) is mixed lithic, comprising sedimentary clastic rocks, limestone, and occasional chert visible in hand sample or with very low magnification, along with varying proportions of intermediate volcanics, plagioclase, and mafic minerals visible using medium magnification. Gypsum may occur locally. One sample was an indurated clay; the remaining sediment samples had textures ranging from moderately sorted silt to fine sand or fine to medium sand to poorly sorted coarse silt to coarse sand (one sample). Geologic source units include the widespread pediment and alluvial deposits to the south and west of Henderson (primarily very recent Quaternary alluvium), the fine-grained Quaternary/Tertiary basin fill deposits exposed as terraces along Duck Creek, and the volcanics of the southern end of the McCullough Mountains, including the Mount Davis and Patsy Mine volcanics (Bell and Smith 1980; Page et al. 2005).

PETROFACIES COMPOSITION SUMMARY

Overall, the compositions available in the Las Vegas Valley are rich in sedimentary rocks, generally fine-grained clastic rocks plus carbonate rocks. Volcanic rocks and gypsum are locally available, and arkosic materials eroded from continental igneous and sedimentary rocks are widespread but only locally dominant. Textures tend to stay on the fine end of the scale: medium and fine sand are present in some areas, but coarse sand to small pebble-sized materials are not common. Where they do occur, they are made up of fine-grained materials that break into fine sand, silt, or clay size grains upon weathering and transport. Plutonic igneous materials, coarse metamorphic rocks, and coarse sedimentary rocks, in which the constituent minerals are larger than medium sand, are lacking in this basin.

The overall makeup of sediments from the Las Vegas Valley can be characterized as fine-grained, carbonate-rich, and having been through at least one weathering cycle if not more. Material that appears coarse, crushed, or unmixed with carbonates is not likely to come from the Las Vegas Valley proper. This is significant, in that many pottery types in the region have material variously described as “crushed” or “weathered” granitic sand, with few or no intermixed carbonate materials. These are unlikely to have originated in the Las Vegas Valley.

APPLYING THE PETROFACIES MODEL TO PREVIOUSLY ANALYZED MATERIALS

Several years ago, Carpenter (2005) conducted a petrographic analysis of 25 thin-sectioned sherds recovered from Site 26CK1139 in the Clark County Wetlands Park. These sherds ran the gamut of ceramic wares available at the site. Most have granitic (or plutonic) sand tempers, but a few sedimentary, volcanic, and grog-tempered sherds were included as well. The clays are described as “carbonate-rich.” Comparison of Carpenter’s data to the petrofacies model allows some conclusions to be drawn, with the caveat that these deductions are no substitute for comparison of the sherd and sand thin sections under the petrographic microscope.

Table E.3 provides an inventory of the thin sections, their wares, and a short temper description as provided by Carpenter. Her temper descriptions are lumped into groups in this table, for ease of additional comparison. Note that most of the sherds have some variety of “granitic” temper. (For the purposes of this analysis, the “dioritic” tempers will be lumped with the granitic tempers. Diorite is a more mafic plutonic rock,
while granite is a felsic plutonic rock. Differences in composition indicate provenance differences, but probably do not indicate technological differences.) As noted by Carpenter (2005), these rock types are available in the region, but not in the Las Vegas Valley proper.

Table E.4 provides the grain size data for the thin-sectioned sherds. Sand proportion ranges from 15 to 39 percent. The mean is 25, the mode is 24, and the standard deviation is 7.4. A quick review of the data suggests that there is no apparent correlation of grain size by temper group or ware, but the sample is very heterogeneous—many wares were selected for analysis, and the relationship of the sample to the overall collection is not indicated. Carpenter (2005) reports the fineness modulus of the samples determined from the point count data. They vary from 2.80 to 3.80.

For samples that contain sand, the “coarse” sand fraction is generally the most populated, and the samples are slightly skewed toward the coarse end. This comports well with the “granitic” temper found in most samples. The widespread granite and granite-gneiss deposits of the desert Southwest generally have a coarse texture. Sand derived from these deposits tends to be coarse and subangular, leading it to be interpreted as crushed, weathered, or otherwise derived from the outcrop, when, in fact, it may simply be coarse alluvial sand. Be that as it may, only the northwest part of the Sunrise Petrofacies, near the Great Unconformity, is a likely source of “granitic” sands in the Las Vegas Valley. Unless collected right at the outcrop, these sands would be mixed with finer sedimentary rocks and carbonates. It appears unlikely that the temper in these sherds could be considered local to the Wetlands Park area. (In this context, “local” is taken to mean sand temper available within 3 km of the production site [e.g., Heidke et al. 2002].)

Table E.5 shows the Carpenter’s point count data, which were derived using a traditional point count method. These data are “lumped” from her original data sheets, that is, all granite types were combined, all basalt types were combined, and sedimentary rock types were reduced to a small number of rock types. Table E.6 shows only summary data: total mineral counts and totals in the sedimentary, volcanic, and plutonic rock types. Note that only four samples have more than a few percent of sedimentary rocks: the single sample with “carbonate” temper, the three samples with mixed granitic and carbonate temper ± volcanics, and a sample that appears to be mixed tuff and carbonates.

Given the widespread sedimentary rocks, especially carbonates, in the Las Vegas Valley, it is impossible to interpret the provenance of the bulk of these thin sections as “local”, that is, within 3 km. Only the five samples rich in sedimentary rocks bear further scrutiny to see if they match the mineralogical and textural features found in Las Vegas Valley sands (A江门1139-06, -07, -08, -10, and -14). The provenance of the remaining samples should be sought outside of the valley, in at least two areas rich in plutonic rocks (one granitic and one more mafic or dioritic). Of the five samples, one, A江门1139-14, is rich in tuff and minerals in addition to the sedimentary rocks. It would be worth comparing this sample to sands from the Henderson and Sunrise Petrofacies, to evaluate the possibility that it originated in or near the Clark County Wetlands project area.
Table E.3. Inventory of 25 Sherd Thin Sections Point Counted by Carpenter (2005).

<table>
<thead>
<tr>
<th>Sample Number*</th>
<th>Full T.S. No/Specimen No</th>
<th>Date Counted</th>
<th>Ware</th>
<th>Short Temper Description</th>
<th>Temper Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>AJC1139-01</td>
<td>26CR1139-0470</td>
<td>12/08/02</td>
<td>Topoc Buff</td>
<td>Crushed biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-02</td>
<td>26CR1139-0658-2</td>
<td>12/14/02</td>
<td>Topoc Buff</td>
<td>Weathered granitic (var. quartz-diorite)</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-03</td>
<td>26CR1139-1080-2</td>
<td>12/07/02</td>
<td>Tizon/Topoc intergrade</td>
<td>Crushed biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-04</td>
<td>26CR1139-1080-4</td>
<td>12/10/02</td>
<td>Topoc Buff</td>
<td>Crushed biotite granite</td>
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</tr>
<tr>
<td>AJC1139-05</td>
<td>26CR1139-0653-3</td>
<td>12/07/02</td>
<td>Southern Paiute Brown</td>
<td>Muscovite granite plus sherd</td>
<td>Granitic+grog</td>
</tr>
<tr>
<td>AJC1139-06</td>
<td>26CR1139-0384-1</td>
<td>12/14/02</td>
<td>Las Vegas Buff</td>
<td>Carbonate mudstone, natural inclusions</td>
<td>Carbonate</td>
</tr>
<tr>
<td>AJC1139-07</td>
<td>26CR1139-1180</td>
<td>12/08/02</td>
<td>Topoc Buff</td>
<td>Granitic, carbonate sand</td>
<td>Granitic &amp; carbonate, +/-volcanic</td>
</tr>
<tr>
<td>AJC1139-08</td>
<td>26CR1139-1175</td>
<td>12/08/02</td>
<td>Topoc Buff</td>
<td>Granitic, volcanic, carbonate sand</td>
<td>Granitic &amp; carbonate, +/-volcanic</td>
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<tr>
<td>AJC1139-09</td>
<td>26CR1139-0093-3</td>
<td>12/08/02</td>
<td>Topoc Buff</td>
<td>Crushed biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-10</td>
<td>26CR1139-1156</td>
<td>12/08/02</td>
<td>Topoc Buff (Desert)</td>
<td>Granitic, volcanic, carbonate sand</td>
<td>Granitic &amp; carbonate, +/-volcanic</td>
</tr>
<tr>
<td>AJC1139-11</td>
<td>26CR1139-0060</td>
<td>12/10/02</td>
<td>Topoc Buff</td>
<td>Weathered biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-12</td>
<td>26CR1139-0259</td>
<td>12/07/02</td>
<td>Southern Paiute Brown</td>
<td>Weathered or crushed biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-13</td>
<td>26CR1139-0093-1</td>
<td>12/07/02</td>
<td>Tizon Brown</td>
<td>Crushed olivine diorite</td>
<td>Dioritic</td>
</tr>
<tr>
<td>AJC1139-14</td>
<td>26CR1139-0843</td>
<td>12/14/02</td>
<td>S. Paiute Brown Corr.</td>
<td>Welded tuff, andesite</td>
<td>Tuff</td>
</tr>
<tr>
<td>AJC1139-15</td>
<td>26CR1139-0314-1</td>
<td>12/08/02</td>
<td>Topoc Stucco</td>
<td>Weathered or crushed biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-16</td>
<td>26CR1139-0667</td>
<td>12/10/02</td>
<td>Topoc Buff (rim)</td>
<td>Weathered microcline granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-17</td>
<td>26CR1139-0637</td>
<td>12/08/02</td>
<td>Topoc Buff</td>
<td>Crushed biotite-muscovite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-18</td>
<td>26CR1139-0967</td>
<td>12/07/02</td>
<td>Topoc Buff</td>
<td>Crushed or weathered biotite-aegerine quartz diorite</td>
<td>Dioritic</td>
</tr>
<tr>
<td>AJC1139-19</td>
<td>26CR1139-1018-1</td>
<td>12/08/02</td>
<td>Topoc Stucco</td>
<td>Weathered microcline granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-20</td>
<td>26CR1139-0869</td>
<td>10/11/02</td>
<td>Topoc Buff</td>
<td>Crushed biotite-augite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-21</td>
<td>26CR1139-0268-1</td>
<td>12/09/02</td>
<td>Topoc Buff</td>
<td>Weathered or crushed biotite granite</td>
<td>Granitic</td>
</tr>
<tr>
<td>AJC1139-22</td>
<td>26CR1139-0353</td>
<td>12/14/02</td>
<td>Topoc Buff</td>
<td>Sherd temper</td>
<td>Grog</td>
</tr>
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CONCLUSIONS

The Las Vegas Valley is a complex fault-generated basin with a deep and complex geologic history. The basin is filled with interfingering sedimentary rocks, disrupted by Tertiary volcanics and underlain by Proterozoic crustal material. The rocks and sediments filling the basin have been cut and recycled by numerous events through geologic time. The repeated cycles of erosion, deposition, fracturing, and weathering have resulted in a basin fill that is tilted toward the finer grains, with abundant carbonate deposits. In addition, drainage patterns exhibit strong structural control, and rock units can be exposed in multiple places.

The result of this complex history is a number of similar yet unique petrofacies, each representing limited aspects of the geology of the region. It is to be hoped that additional sampling and microscopy can help define expected textural and mineralogical aspects of the Las Vegas Valley. However, even without additional study, it is possible to assess the likelihood of provenance within the valley based on gross mineralogical and textural characteristics of pottery recovered from sites in Las Vegas.
REFERENCES CITED

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