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Burnt Rock Mound (26Ck3601): Late Archaic and Ceramic period human use of a northern Mojave spring mound

Hal Boyle Rager
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BURNT ROCK MOUND (26CK3601): LATE ARCHAIC
AND CERAMIC PERIOD HUMAN USE OF A
NORTHERN MOJAVE SPRING MOUND

by

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Bachelor of Science
Kansas State University
1981

A thesis submitted in partial fulfillment
of the requirements for the

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ABSTRACT

Burnt Rock Mound (26CK3601): Late Archaic and Ceramic Period Human Use of a Northern Mojave Spring Mound

by

Hal Boyle Rager

Dr. Ted Goebel, Examination Committee Chair
Assistant Professor of Anthropology
University of Nevada, Las Vegas

Archaeological excavations and geological trenching at Burnt Rock Spring Mound, 26CK3601, in the northern Mojave Desert has revealed a complex relationship between paleohydrogeology and the prehistoric human use of the site. Multiple formation, accumulation, and deflation episodes since the Late Pleistocene and Holocene correlate with regional climatic models. The mound is located on the northwest periphery of the known extent of Ancestral Puebloan and Patayan peoples. Artifacts, especially micro-debitage, recovered from Late Holocene mound deposits suggest long-term use of this vital resource by Late Archaic and Ceramic peoples.
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Lastly, I wish to thank my parents, who did not bat an eye when an eight year old pointed to a 1963 National Geographic picture of Louis Leakey holding a hominid fossil and announced, “This is what I’m going to be when I grow up!” I especially wish I could share this with my father. Thanks Mom and Dad.
CHAPTER 1

INTRODUCTION

Statement of The Problem

Most archaeological sites in the southwest Great Basin and Mojave Desert (Figure 1) are low-density surface sites resulting from the activities of small sub-band hunter-gatherer groups (d’Azevedo 1986; Grayson 1993; Thomas 1983a) and the Las Vegas Valley is no exception. Thus, the field archaeology of the Las Vegas Valley, as well as much of the surrounding area, deals with diffuse lithic scatters that lack radiometrically dateable materials.

Archaeologists have turned to a variety of methods, most especially obsidian hydration rind measurement and dating (Jones and Beck 1990; Rhode and Rager 1997), in an attempt to place site components in a chronological context. One method that has not been explored extensively is debitage analysis, the study of the debris from the manufacture of stone tools. This may be due in part to the linked factors of the amount of time involved and the lack of project funds for such analysis.

Recently, lithic analysts have been attempting to systematize this analysis (Amick 1989; Amick et al. 1988, 1989; Andrefsky 1998, 2001; Andrefsky [editor] 2001; Haynes 1996; Kelly 1988; Sullivan and Rosen 1985). Consensus, however, remains to be reached about methods or standardized measurements.

This thesis seeks to present a specific micro-debitage typological analysis of a portion of the archaeological assemblage from the year 2000 excavations at Burnt Rock Spring Mound (26CK3601) in the northern Las Vegas Valley (Figure 2). It is hoped that in the context of the difficulties in assigning a chronological reference to non-formal artifacts, it
Figure 1. Schematic Location of the Great Basin and Mojave Desert.
Figure 2. The Las Vegas Valley and Vicinity.
will prove useful to other archaeologists. A discussion of the physiographic setting, paleoenvironmental research, the history of archaeological research, and a chronology for the Las Vegas Valley are presented in Chapter 2. A brief overview of the archaeological and geological attributes of Burnt Rock Spring Mound (26CK3601) is presented in Chapter 3. The basic analytical methodology is presented in Chapter 4. Chapter 5 presents the results of the analysis. Finally, Chapter 6 contains the analysis and interpretation of Chapter 5, as well as conclusions and directions for future research.

_Archaeology in the Northern Mojave Desert/Southwest Great Basin_

This study focuses on aspects of the archaeology of Burnt Rock Spring Mound (26CK3601) in the northwest Mojave Desert (Figure 1), north-central Clark County, Nevada, in the Las Vegas Valley (Figure 2). The northwest portion of the Mojave Desert is roughly an area south of 37° North latitude and west of a north-south line extending from the border of Arizona and California (but not including the river corridor along the border), east of the Sierra Nevada of California, and north of the San Bernadino Mountains. This area is sometimes referred to as the southwest Great Basin (d’Azevedo 1986; Grayson 1993) or the eastern Mojave (Sutton 1996) in regional works. In this thesis, ‘northern Mojave’ and ‘southwest(ern) Great Basin’ are used interchangeably. When the discussion concerns the greater Mojave Desert or Great Basin, it will be stated.

The Great Basin can be defined by a variety of criteria including physiography, hydrology, floristic province, and culture area (d’Azevedo 1986; Grayson 1993; Kelly 1997). Culturally, definitions of this area vary depending on the use of subsistence, language, or environmental adaptation (d’Azevedo 1986; Grayson 1993; Kelly 1997). Each criterion or combination of criteria a researcher uses sets the boundaries slightly differently. For the purposes of this thesis, Great Basin regional boundaries are the same as those used by d’Azevedo (1986) (Figure 1). The southwest Great Basin likewise is as Warren and Crabtree (1986) defined it – the portion of the Great Basin that includes all of the Mojave Desert in
Nevada and most of it in southeast California. Traditionally, the southwest Great Basin is outside of the focus of most Great Basin archaeological research (Kelly 1997). Most research has typically centered in areas around Pleistocene Lake Lahontan and Lake Bonneville, and portions of the central Great Basin (d’Azevedo 1986; Grayson 1993; Weide 1982). Several summary works (Beck [editor] 1999; Beck and Jones 1997; Bettinger 1993; Grayson 1993; Lyneis 1982; Sutton 1996; Warren 1984; Warren and Crabtree 1986) and reports (Campbell and Campbell 1935; Campbell et al. 1937; Rogers 1929, 1939, 1945) define much of what is actually known archaeologically about the southwest Great Basin.

The Las Vegas Valley

The Las Vegas Valley is a prominent physiographic feature of the southwest Great Basin (Figure 1). Despite some summaries (i.e. Lyneis 1982; Shulter 1967) and various gray literature reports, little has been synthesized about this area’s archaeology (but see Seymour 1997). The valley is situated directly east of the Spring Mountains and south of the Las Vegas Range, north of the McCullough Range, northwest of the Black Mountains, and west of the impounded waters of Lake Mead on the Colorado River (Figure 2). Most of the original ground surface of the valley is heavily impacted by the urbanization of Clark County and cities of Las Vegas, North Las Vegas, and Henderson. What little that remains is rapidly disappearing as metropolitan Las Vegas expands.

The field archaeology of the Las Vegas Valley, as well as much of the southwest Great Basin, is typically diffuse, low-density, surface lithic scatters without dateable materials. These are the result of the activities of small sub-band hunter-gatherer groups (d’Azevedo 1986; Grayson 1993; Thomas 1983a).

Chronology-Culture History

Analytically, there “has been a striking lack of agreement on taxonomic systems and terminology” (Warren and Crabtree 1986:183) among archaeologists in the southwest
Great Basin, making comparisons and synthesis difficult. In addition, this makes it challenging to discuss relationships with other areas of the Great Basin.

Early archaeological work in the area was dominated by Elizabeth W. Crozier Campbell, William Campbell, E. Amsden, Mark R. Harrington, and Malcom J. Rogers. Rogers surveyed extensively in southern California and Nevada and proposed the first regional cultural chronology in *Early Lithic Industries* (Rogers 1939). This chronology was based largely on surface collections and prompted further research which has sought to refine, if not supplant, Rogers’ observations. Additional chronologies have been periodically proposed, and several have persisted and gained enough credence with other researchers to emerge in area summaries (Wallace 1962, 1977; Warren and Crabtree 1986). The advent of radiocarbon dating ($^{14}$C) was instrumental for providing some temporal control that, in conjunction with Jesse Jennings’ Desert Culture/Archaic concept (Jennings 1957, 1964, 1968), provided an umbrella framework for regional research in the 1950s and 1960s (Beck and Jones 1992; Bettinger 1993).

The nearest areas to the Las Vegas Valley with a long sequence of diagnostic artifacts associated with chronometrically dated materials are in the Owens Valley, California, about 200 km to the northwest (Bettinger et al. 1991), and Monitor Valley, Nevada, about 400 km to the north (Thomas 1981, 1983a, 1983b, 1985). Thomas’ (1981) metric discriminant analysis for central Great Basin projectile point formal types is the most widely used in the southern Great Basin as it is primarily derived from measurements rather than weight especially for the determination of dart versus arrow points in the Late Archaic, and because it works around some persistent rough spots in other Great Basin projectile point typologies (Bettinger and Eerkens 1999). Thomas (1981) cautions about the use of the Monitor Valley typology outside of the central Great Basin, and its use in the southwest Great Basin not only highlights that the central Great Basin has had different rainfall patterns, vegetation communities, and cultural affinities, and thus, the archaeology there differs as well. Of course there are some well known archaeological sites in the southwestern Great Basin and Mojave Desert.
including Gypsum Cave (Harrington 1933; Heizer and Berger 1970), Tule Springs (Haynes 1967; Susia 1964), the Awl Site (Basgall and Hall 1994; Jenkins and Warren 1986), Newberry Cave (Smith 1963, Smith et al. 1957), Pinto Basin (Campbell and Campbell 1935; Jenkins 1987; Jenkins and Warren 1986), and Lake Mojave (Campbell et al. 1937) that are part of the archaeological foundation of the area.

The southwest Great Basin is also the postulated homeland of Numic speaking groups. Their movement into the Great Basin, or the ‘Numic spread’ (Bettinger and Baumhoff 1982; Lamb 1958; Madsen and Rhode [editors] 1994; Sutton 1996), has been an undercurrent in Great Basin research for several decades (Beck and Jones 1992; Bettinger 1993; Madsen and Rhode [editors] 1994). Lamb (1958) postulated, based on glottochronological research, that cultural groups that spoke various member languages of the Numic family spread to the north and east from a homeland in the southwest Mojave Desert during the Middle and Late Holocene. There is general agreement about the spread of these peoples in prehistory (but see Aikins and Witherspoon 1986), but there is no consensus about the timing, speed, and mechanisms of this spread, or how it might be recognized in the archaeological record (Madsen and Rhode [editors] 1994).

Though some terms have been changed in this thesis (i.e., Late Ceramic instead of Shoshonean) to emphasize the simultaneous presence of multiple cultural groups, the chronology used by Warren and Crabtree (1986) for the southwest Great Basin is used here. This is built with few adjustments from Wallace’s chronology (1962), which served to establish a balance between the northern Great Basin centric ‘Berkeley’ chronology (Hester 1973; Heizer and Hester 1978a) and the chronologies that focused on the northern Mojave Desert (Hunt 1960; Rogers 1939, 1945). There has been much discussion, and many refinements and adjustments to the chronology of southwestern Great Basin archaeology (i.e., Lyneis 1982, 1995; Seymour 1997; Seymour and Rager 2001a; Seymour et al. 1998; Sutton 1996), including two recent regional summaries. One focused on the pre-7,000 B.P. Great Basin (Beck and Jones 1997), and the other from 7,000 B.P. to the present (Kelly...
1997); however, the northern Mojave Desert is not usually fully included in the discussion (especially see Kelly 1997). This is, in part, due to how the boundaries of the Great Basin are determined (see above), but may be largely because there are few researchers in the area publishing their work in peer-reviewed journals (but see Beck and Jones 1992 and Sutton 1996), and that aside from gray contract literature, this regional information is simply not widely available.

*Burnt Rock Spring Mound*

The archaeology at Burnt Rock Spring Mound (Figure 3), 26CK3601, appears to represent a single, focused subsistence activity at a perennial water source through at least two millennia. The mound is one of several perennial water sources in the Las Vegas Valley. A comprehensive spring mound survey has never been done, but the presence of abundant fire-cracked rock and cultural midden at Burnt Rock appears to be unique when compared to what is known about the remaining spring mounds. The permanent presence of water makes the site unusual in the desert, which is useful because we can reasonably assume that prehistoric groups would not have failed to visit this locale. Radiocarbon dates from the midden range from 1960 ± 60 radiocarbon years ago (B.P.) to 200 ± 60 B.P., and help to place the site's assemblage into a temporal perspective. Since the Las Vegas Valley is situated on the southwestern edge of the Basin and Range physiographic province and one valley to the east of the Amarogsa Desert, Burnt Rock Spring Mound might have been a place of interaction between different groups with varying economies, symbolic systems, technologies, and adaptations. Often it is difficult to make any sense of Las Vegas Valley archaeological site assemblages due to site disturbances, a lack of stratigraphy, or because cultural deposits lack depth. At Burnt Rock, however, stratigraphy was present, though subtle, there was depth to the midden, and the majority of disturbance was confined to areas on top of the mound that could be identified and excluded from analysis.
Figure 3. The Location of Known Spring Mounds in the Las Vegas Valley. Including Burnt Rock Spring Mound (26CK3601).
CHAPTER 2

ENVIRONMENTAL SETTING AND PREVIOUS RESEARCH

Physiography and Location of the Research Area

The Las Vegas Valley contains Nellis Air Force Base and the incorporated cities of Las Vegas, North Las Vegas, and Henderson, as well as a large population in unincorporated Clark County (Figure 3). At the time of this writing (2001), the Las Vegas metropolitan area has about 1.3 million residents and is one of the fastest growing metropolitan areas in the United States.

The Las Vegas Valley is bounded by the Spring Mountains to the west, the Sheep and Las Vegas Ranges to the north, Frenchman Mountain to the east, and the River and McCullough Mountains to the south (Figure 2). It encompasses about 4,000 km² (1 million acres) (Harrill 1976). The northern mountain ranges are much higher and larger than in the southern and eastern parts of the valley. The west-central part of the valley is dominated by large alluvial fans, with smaller alluvial fans on the north, south, and east sides. These surround playa-like areas in the central and eastern parts of the valley.

The peak of Mount Charleston (3,633 m) in the Spring Mountains is the highest point in the area, and where the Las Vegas Wash exits the valley is the lowest point (472 m). The climate is arid, with the valley floor receiving about 10 cm of precipitation annually. The Las Vegas Wash is the major drainage in the valley and is a tributary to the Colorado River.

Several historically important springs were oriented along the valley's central axis, the largest of which was Big Spring at the Las Vegas Springs Preserve (Figure 3). This and
other central valley springs no longer flow due to lowering of the water table in the central part of the valley. The small springs in the far northern and southern parts of the valley still flow at historic rates.

C. Vance Haynes (1967) established the local informal divisions (A-G) of the Las Vegas Formation at Tule Springs and was the first to use the term “Eglington Scarp.” Since the 1980s, the use of Haynes' nomenclature has been expanded to be used in nearly all of the ongoing Quaternary research in southern Nevada.

Much of the geological research in the valley has been conducted in association with hydrological investigations. The most important of these from an archaeological standpoint is the overview (Maxey and Jameson 1948) that first proposed a tectonic origin for the Quaternary fault scarps, previously thought to be Pleistocene lake terraces.

Regional Geology

The geological units within the Las Vegas Valley range in age from Pre-Cambrian to Quaternary. The geology is complex and highly modified by two major tectonic episodes, Cretaceous compression and Miocene extension (Johnson et al. 1998). Frenchman Mountain, on the east side of the valley, is essentially a section of the Colorado Plateau which is now tilted about 50° to the east after Miocene extension moved this block about 80 km westward to its present location (Rowland 1987). The McCullough and River Mountains, which define the southern part of the valley, consist of Miocene volcanic and plutonic rocks lying on Pre-Cambrian gneiss and granite (Longwell et al. 1965).

Quaternary fault scarps are located throughout the central part of the valley. There are large numbers of individual segments, however, these segments are within four major escarpments designated by the Roman numerals I-IV (Cornwell 1965). The individual segments were mapped in the 1980s, and published on several geologic quadrangle maps. The Eglington Scarp is one of these individual segments (Haynes 1967).
Most of the valley alluvium is typically hundreds of meters thick, much deeper than most of the water wells. Because of this, the bedrock geology underlying the alluvium remains mostly unknown. In the eastern part of the Valley, however, the Las Vegas Valley Shear Zone and probably Basin and Range normal faulting have combined to produce very thick (2-5 km) alluvium, especially at the base of Frenchman Mountain. Presumably the bedrock underlying the northern part of Las Vegas Valley is similar to northern Spring Mountains and Sheep and Las Vegas Ranges.

The surficial and subsurface alluvial deposits have both been recently mapped and new stratigraphic names have been introduced (Johnson et al. 1998). The only units named on the Clark County geologic map (Longwell et al. 1965), however, are the Miocene Muddy Creek Formation and the late Pleistocene-Holocene Las Vegas Formation. The rest of the basin fill sediments are labeled "Qal" (Quaternary alluvium undifferentiated) (Longwell et al. 1965; Matti et al. 1987). The geometry and thickness of the alluvium inferred from a recent geophysical investigation (Langengeim et al. 1998) suggest that valley sediments have been deposited since the middle Miocene. Thus, the valley-fill sediments are both Tertiary and Quaternary in age.

The alluvial geometry beneath the Quaternary fault scarps is consistent with a tectonic origin for the fault scarps. The alluvium thickens directly beneath the scarps in response to altitude changes in the bedrock surface. The fault scarps are modern topographic features, and differential movement associated with land subsidence has been clearly demonstrated (Amelung et al. 1999). The effects of the fault scarps are documented in the surficial (Haynes 1967) and subsurface geological unit mapping (Donovan 1996; Maxey and Jameson 1948), with major changes in grain-size, bedding offsets, and differential cementation, all associated with the scarps (Donovan 1996). This is important archaeologically as the alternative explanations of lake terraces and compaction faulting for these features are not consistent with the known fault scarp attributes. There never was a Pleistocene or Early Holocene lake in the Las Vegas Valley.
Environmental Setting and Paleoenvironmental Overview

Paleoenvironmental studies using environmental proxy data can be combined with evidence from the archaeological record to construct a glimpse of human adaptation to changing environments of the Holocene. Packrat midden, fossil pollen, lake shore, and lacustrine studies of the Las Vegas Valley and surrounding southwest Great Basin help to illustrate the climatic, environmental and botanical record of the late Pleistocene and Holocene (Enzel et al. 1992; Grayson 1993; Haynes 1967; Livingston et al. 1990; Mehringer 1967, 1986; Quade 1986; Quade et al. 1998; Spaulding 1990, 1991, 1994; Spaulding et al. 1983). Several of the proxy data results as well as the cultural and geological periods are presented in graphic form (Figure 4).

Ocean levels were last at their lowest during the Wisconsin glacial maximum 18,000 years ago (B.P.) when the Beringian Land Bridge between Siberia and Alaska was also at its greatest extent. Massive glaciers extended southward from Canada to the eastern part of what is now Washington. Nevada mountain ranges witnessed limited mountain glacial advances as well. Lake Bonneville and Lake Lahontan were huge fresh water ‘pluvial’ lakes south of these continental ice masses in northern Utah and Nevada (Grayson 1993). Lake Mannix, Lake Manly, and, after 13,000 B.P., Lake Mojave, were relatively smaller fresh water lakes in the Mojave Desert in California (Grayson 1993). Utah juniper (Juniperus osteosperma) and Joshua tree (Yucca brevifolia) grew near the valley floor of Death Valley as well as throughout southern Nevada (Spaulding 1985, 1990, 1991; Spaulding et al. 1983). The more familiar creosote bush (Larrea tridentada), white bursage (Ambrosia dumosa), brittle brush (Encelia farinosa), screw bean mesquite (Prosopis pubescens), and honey mesquite (Prosopis juliflora) of today’s desert did not make their appearances for thousands of years (Spaulding 1985, 1990, 1991; Spaulding et al. 1983). Some of the Rancholabrean faunal assemblage including Columbian mammoths (Mammuthus columbi), ground sloths (Nothrotherium shastense and Megalonyx sp.), extinct horses (Equus sp.), bison (Bison sp.), and American camels (Camelops hesternus) frequented Tule Springs in the northwestern
Figure 4. Presentation of Selected Paleoenvironmental Proxy Data from the Las Vegas Valley and Surrounding Region.

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Las Vegas Valley (Mawby 1967). Ground sloths were also present at Gypsum Cave in the eastern part of the valley (Harrington 1933; Heizer and Berger 1970). From 18,000 to 12,000 B.P. the glaciers receded, climate changed, and these animals disappeared (Grayson 1993).

The beginning of the Holocene is somewhat arbitrarily placed at 10,000 B.P. (Roberts 1998:22-23). The 8,000 years between glacial maximum to the beginning of the Holocene was marked by continental and regional climate change. Ocean levels returned to near modern levels and the jet stream moved north apparently in response to the retreat of the Canadian ice sheets (Grayson 1993; Roberts 1998). The giant pluvial lakes disappeared (Grayson 1993), as did the mammoths, sloths and camels. The juniper and Joshua tree communities retreated to higher elevations (Spaulding 1985, 1990; Spaulding et al. 1983). The Las Vegas Valley and surrounding southern Great Basin continued to have abundant springs and seeps well into the Holocene (Grayson 1993; Quade et al. 1998). Likewise, the large lakes such as Lake Mojave near Baker, California, and Lake Manly in Death Valley continued to hold water through the late glacial into the early Holocene (Warren 1986).

There is evidence of this change in climate at Lake Mojave, about 280 km west of the Las Vegas Valley. Stratigraphic, sedimentary, and pedological studies of relic beach ridges and lacustrine deposits reveal a series of at least five high lake stands in the Late Pleistocene and Early Holocene, from 13,000-8,000 B.P. (Enzel et al. 1992). These Lake Mojave events correlate to the paleohydrological records from the Las Vegas Valley at locations such as Tule Springs (Haynes 1967; Quade et al. 1998), Corn Creek Flat (Quade 1983; Quade and Pratt 1987; Quade et al. 1998), Gilcrease Ranch (de Narvaez 1995), and Burnt Rock Mound (Rager and Seymour 2001; Seymour and Rager 2001a, 2001b). The oldest corresponding strata identified at Tule Springs are the culturally sterile E, and E, soil units found throughout the northern half of the Las Vegas Valley. The E unit dates from approximately 14,000 B.P. through 6,500 B.P., and shows the same sequence of alternating wet and dry periods (Enzel et al. 1992; Haynes 1967; Quade et al. 1998). Black mat formation in the Las Vegas Valley and Hidden Valley cluster in two groups. One is between 12,500
and 6,300 B.P., and the second is between 2,300 B.P. and the present (Quade et al. 1998; Rager and Seymour 2001a).

The Holocene typically is divided into three parts. Early, Middle, and Late, based on broad climatic trends. In the southwest Great Basin the Early Holocene began 10,000 B.P. (Roberts 1998) and lasted until about 6,500 B.P., the Middle Holocene occurred from about 6,500 to 4,000 B.P., and the Late Holocene from about 4,000 B.P. to the present. During the Early Holocene, but especially after about 9,300 B.P., the more homogeneous floristic communities of the Pleistocene and Pleistocene-Holocene transition became more segmented into the mosaic of communities we are familiar with today (Grayson 1993, Spaulding 1985, 1990: Spaulding et al. 1983). Seasonal variation became more pronounced as rainfall patterns shifted from a winter peak to a spring and summer monsoonal pattern (Spaulding 1991). Combined with significantly warmer summer temperatures, this meant less effective moisture was available to support existing plant communities (Grayson 1993; Spaulding 1994). This shift in precipitation patterns eventually resulted in Lake Mojave becoming too saline for human use by 9,300 B.P., as it no longer received enough water from the Mojave River to continue overflowing into Death Valley (Warren 1986).

Dependent on elevation and aspect, the mosaic of microenvironments became a patchwork of low elevation xeric to high elevation mesic communities as precipitation continued to decrease. The low elevation junipers and Joshua trees began to disappear at Tule Springs by about 12,000 B.P. (Mehringer 1967). However, just to the northeast in the Sheep Range at 9,400 B.P., a juniper woodland was present at an elevation of 1,630 m; today this area is Joshua tree habitat (Spaulding 1985). Pollen from packrat middens in Sandy Valley, Nevada, suggests that, starting about 8,500 B.P., dunes began to form and associated mesquite communities emerged (Spaulding 1994; Spaulding et al. 1994). The Las Vegas Valley is on the other (eastern) side of the Spring Mountains from Sandy Valley and it is very likely that mesquite communities appeared there at about the same time.
Changes in precipitation are more difficult to ascertain with any fine-grained resolution. Vegetation community responses are a consequence of these patterns, as is aquifer flow. The Middle Holocene has been referred to by various terms as the 'Altithermal' (Antevs 1948) or 'Neoglacial' by some researchers. This period is known to be a time when the number of mesic species declined in comparison to xeric species, and has therefore been postulated as a warmer and drier interval (Cleland and Spaulding 1992; Spaulding 1991, 1994). Haynes (1967) reports a 500 year deflationary episode beginning about 6,500 B.P. in the form of a valley-wide unconformity that separates the E and F units in the soil profile. Packrat middens in the McCullough Range, south of the Las Vegas Valley, show a decline in the number of mesophytes (mesic species) when compared to xerophytes, which indicates decreased available precipitation (Spaulding 1991). Quade’s (Quade et al. 1998) first period of black mat production ends about 6,300 B.P., indicating that sufficient aquifer recharge for spring flow must have ceased. Clearly, the conditions of the Middle Holocene are very different from the Early Holocene.

A change in the seasonality of rainfall patterns, however, would be reflected in the botanical record much as a reduction in the total amount of precipitation if the indicator plant species were sensitive to that factor. Since there is a link between precipitation, the amount of water present in subsurface aquifers, and spring and seep flow at the ground surface, data from springs can be used as an environmental proxy as well. Combining packrat midden data and paleo-spring flow data allows us to examine this question of changes in seasonality versus changes in total rainfall amounts. This could explain the gap in the soil profile, which is likely due to erosion as a result of devegetation, prior to the cessation of spring flow 1,000 years later. By 6,000 B.P., the packrats are also gone, at least no middens that date to this period have been identified, which eliminates their use as environmental proxy data (Spaulding 1991, 1994).

By around 4,000 B.P., the climate became more mesic again, more resembling the climate of the Twentieth Century (Grayson 1993). The climate, however, was not always
favorable; there were times when effective moisture decreased and aridity increased, well before 1,500 B.P. (A.D. 900) (Grayson 1993; Spaulding 1994; Warren and Crabtree 1986). Current paleoenvironmental models for the Great Basin and Mojave Desert suggest that a 400-year period of episodic droughts began about 1,050 B.P. (A.D. 900) and lasted until 650 B.P. (A.D. 1,300) (Jones et al. 1999). These researchers suggest that this regional manifestation of the larger Medieval Climatic Anomaly stressed the cultural adaptations of the area’s populations. Locales like the Las Vegas Valley with its spring mounds, and aquifer-fed perennial springs and streams would have become more attractive as the overall effective moisture decreased (Sheehan 1994).

At Holocene Lake Cahuilla (Salton Sea) in southern California, repeated cycles of infilling and desiccation directly impacted the populations that used the lake. The first period of desiccation at Lake Cahuilla occurred at 1,010 B.P. (A.D. 940), with the subsequent infilling occurring around 915-800 B.P. (A.D. 1,035-1,150) (Waters 1982:382-5, 1983a, 1983b). Population levels decreased in western Arizona around 1,000 B.P. as the climate became more arid (Geib and Keller 1987). These lacustrine events, however, may represent episodic flooding and overflowing of the Colorado River rather than correlation with regional Mojave climate change. This period of desiccation may have corresponded to a larger trend of Mojave aridity, creating additional environmental stress for the populations. When the lake held very little or no water, or water that was too saline, populations dependant on those resources relocated to other areas, including southern California’s costal ranges, or the Colorado or the Mojave Rivers (O’Connell 1971; Waters 1982).

The climate was cooler and more mesic between 1,350 and 1,050 B.P. (A.D. 600 and 900) in southern Nevada (Stone 1991:60). Dendrochronological and lake stand evidence (Enzel et al. 1992) show a precipitation increase around 400 B.P. Dendrochronological data show that 570 and 561 B.P. (A.D. 1370 and 1389) were mesic years southwest of the Las Vegas Valley in the Cronise Basin (Drover 1979). Those dates have been interpreted as a mesic period rather than two separate annual events (Warren 1986).
Fluvial episodes in springs can leave dark organic layers known as “black mats.” These have an advantage over many other proxy data sources because they directly record the presence of water. In many cases, these sediments contain sufficient organic material to be radiocarbon dated. Successive spring cycles, however, like glacial advances and retreats, often obliterate the evidence from previous cycles. In addition, the reducing nature of the environment that creates black mats destroys the stratigraphically lower humates in the active spring sediments. This greatly reduces the possible range of radiocarbon dates from a black mat to the end of a spring activity episode (Quade et al. 1998). Therefore, we can look at the endpoints of aquifer recharge episodes, but not necessarily their onsets.

Quade has summarized the history of Late Glacial recharge and development of spring mounds in the Las Vegas Valley, Amargosa Desert and northern Mojave (Quade et al. 1998). Com Creek (Haynes 1967; Quade 1983. Quade et al. 1995). Gilcrease Ranch (de Narvaez 1995; Haynes 1967) and Tule Springs (Haynes 1967) are geographically the closest to Burnt Rock and a part of the hydrological system that includes Burnt Rock Mound (Figure 3). These spring mounds are rather typical of the dozens of spring mounds that formed along the Eglington Scarp in the north central Las Vegas Valley (Quade et al. 1998: Rager and Seymour 2001: Seymour and Rager 2001a).

Previous Archaeological Research

The general Mojave Desert area was initially the domain of a few researchers: Elizabeth W. Crozier Campbell, Mark R. Harrington, and Malcom J. Rogers. Campbell defined archaeological assemblages based on her findings in the Pinto Basin of California (Campbell and Campbell 1935) and along the relic shorelines of Pleistocene Lake Mojave (Campbell et al. 1937). Harrington excavated Gypsum Cave (Harrington 1933) and Lost City (Harrington 1927) in southern Nevada, and Little Lake (Harrington 1957) in the California desert, in addition to survey work in both states. Rogers worked in the Lake Mojave area (Rogers 1929), as well as ranging over much of the Mojave and southwest...
Great Basin (Rogers 1939). He violently disagreed with Campbell’s proposal (based on Antev’s work) of the early age of some of the archaeology here. Rogers defined a cultural sequence with less time depth that included an Amargosa culture from his observations (Rogers 1929). Eventually, additional research supported a deeper antiquity and Wallace (1962, 1977) joined this knowledge with Rogers’ sequence as the first useful chronology of the region. Wallace used much of Rogers’ terminology in his own sequence which, with some adjustments, was used by Warren and Crabtree (1986). Researchers continue to discuss various regional aspects, including the “Pinto problem” (Meighan 1989; Rondeau 1996; Schaefer 1994; Schroth 1994; Vaughn and Warren 1988; Warren 1980, 1986), the relationship of rejuvenation processes and projectile point morphology (Bettinger et al. 1991; Flenniken and Raymond 1986; Flenniken and Wilke 1989; Rondeau 1996; Thomas 1986b; Wilke and Flenniken 1991), and the timing and spread rate of Numic speaking groups in the Great Basin (Aikens 1994; Aikens and Witherspoon 1994; Madsen and Rhode [editors] 1994).

Cultural Historical Frameworks for the Northern Mojave Desert

Some researchers have postulated a deep antiquity for the presence of humans in the Mojave Desert. L. S. B. Leakey (Leakey et al. 1969) identified tools associated with a 200,000 year-old occupation at the Calico Early Man Site, near Barstow, California. Other surface assemblages geographically associated with extinct Pleistocene Lake Mannix and characterized by large, heavily patinated rhyolite bifaces have been reported to date to at least 20,000 B.P. (Simpson 1958, 1960, 1964). The vast majority of archaeologists, however, do not accept these dates. Rather, they view that the first human presence in the Southwest Great Basin and Mojave Desert corresponds with the archaeology of the rest of the continent during the terminal Pleistocene. about 11,300 B.P. (Figure 5).

Clovis and Lake Mojave. The Clovis complex represents this initial human population that begins about 11,300 B.P. It is characterized by distinctive projectile points, which are found across the North American continent. Though this tool style is found at a few locations
<table>
<thead>
<tr>
<th>Time (not to scale)</th>
<th>Las Vegas Valley (after Seymour and Rager 2001a)</th>
<th>Rogers/Waters</th>
<th>Warren and Crabtree 1986</th>
<th>Lyneis 1995; Shulter 1961</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,000 B.P.</td>
<td>Paleoindian/Clovis?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10,000 B.P.</td>
<td>Lake Mojave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8,000 B.P.</td>
<td>Lake Mojave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000 B.P.</td>
<td>Middle Archaic (Pinto)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,000 B.P.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,000 B.P.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,450 B.P. (A.D. 500)</td>
<td>Late Archaic (multiple groups?) (Gypsum)</td>
<td>Patayan III</td>
<td>Patayan II</td>
<td>Shoshonean</td>
</tr>
<tr>
<td>950 B.P. (A.D. 1,000)</td>
<td>Early Ceramic (multiple groups)</td>
<td></td>
<td>Patayan II</td>
<td>Saratoga Springs</td>
</tr>
<tr>
<td>450 B.P. (A.D. 1,500)</td>
<td>Late Ceramic (multiple groups, no Puebloan)</td>
<td>Patayan III</td>
<td>Patayan I</td>
<td>Saratoga Springs</td>
</tr>
</tbody>
</table>

Note: after Seymour 1997.
in southern Nevada and the northern Mojave, many consider the use of the term “Clovis” in the southwestern Great Basin to be problematic (Beck 1999; Beck and Jones 1997:162; Grayson 1993, Roberts et al. 2000:16-18; Warren and Phagan 1988). Many discussions of prehistoric cultures in the southern Great Basin generally begin about 10,500 B.P. with the assemblages first defined around the relic shorelines of Silver Lake, one of Pleistocene Lake Mojave’s component lakes (Figure 5). Amsden (in Campbell et al. 1937) first described the constellation of Lake Mojave artifacts that include the large stemmed Lake Mojave and Silver Lake projectile points that characterize the earliest industries. These are the marker point styles for the Lake Mojave period (Paleo—Archaic), the first southern Great Basin archaeological period (Beck and Jones 1997; Grayson 1993; Sutton 1996; Wallace 1977; Warren 1984, 1986; Warren and Crabtree 1986).

**Archaic.** The Lake Mojave period grades into the Archaic period about 7,000 B.P. which then lasts until about 1,500 B.P. (about 5,000 B.C.-A.D. 500). Traditionally, the Archaic has been subdivided into an Early and Late Pinto period and a Gypsum period. In this thesis, the Pinto periods have been joined into a single Middle Archaic and the Gypsum period is designated the Late Archaic. This somewhat distances the chronology from the “Pinto problem”. The slightly shouldered and wide-waisted Pinto projectile point co-occurs briefly with stemmed styles during the last part of the Lake Mojave period (Jenkins 1987; Jenkins and Warren 1984, 1986) (but see Meighan 1989 and Schroth 1994). The Pinto point is diagnostic of the Middle Archaic (Pinto period) when found without associated stemmed points. This seems to correlate well with the increasingly xeric Middle Holocene (Enzel et al. 1992; Grayson 1993; Quade et al. 1998; Spaulding 1990, 1991, 1994) and may represent a continuation of the trend towards subsistence generalization. This subsistence generalization focused on specialized hunting locales within the dispersed mosaic of diminished resources. Some well known Pinto sites in the Mojave Desert are the Awl site (Basgall and Hall 1992; Jenkins and Warren 1986), Henwood (Warren and Phagan 1988), a series of sites in the Pinto Basin (Campbell and Campbell 1935), the Stahl site (Harrington 1957), and several
sites in the Tiefort Basin at Fort Irwin (Basgall and Hall 1992, 1994; Hall 1994; Hall and Basgall 1994; McGuire and Hall 1988). In the Las Vegas Valley, the surface archaeology of Tule Springs area (Susia 1964) has a strong Pinto cultural component. Both the Pinto Basin and the Stahl site serve as Pinto type localities. The archaeological record tends to reflect an increase in individual site activity specialization, including the appearance of ground stone, at the Awl site (Jenkins and Warren 1984, 1986) and CA-SBr-525 (Hall 1994), though not all Pinto sites show this activity specialization (McGuire and Hall 1988). This may represent a further focusing of resource choices, group scheduling, and subgroup segmentation, perhaps predicated in part by seasonal resource availability (sensu Binford 1980) (Warren 1986).

The first millennium of the Late Archaic, from 4,000 to about 3,000 B.P., is the driest period in the post-Pleistocene western Great Basin climatic history, and roughly corresponds to what has been called the Altithermal climatic period. Because of the paucity of known archaeological sites that date to this period, it has been sometimes interpreted as a human abandonment of the region (Warren 1984; Warren and Crabtree 1986). However, more recent research (Basgall and Hall 1992; Basgall, et al. 1989; Hall and Basgall 1994; Sutton 1996) has cast serious doubts on this long standing notion of regional abandonment during this period, at least in the northern Mojave.

The Late Archaic (Gypsum period - 3,000 to 1,500 B.P.) is characterized by the presence of medium to large stemmed and notched Gypsum Cave points, Humboldt Concave Base points, and Elko series points that appear in the archaeological record as the xeric Middle Holocene grades into the Late Holocene (Figure 5). These are different projectile point styles from the Middle Archaic, as well as being part of a markedly different tool assemblage (Warren 1986:17; Warren and Crabtree 1986:187). It has been generally thought that this may represent the post-Altithermal repopulation of the Mojave Desert area from Great Basin groups rather than the descendants of previous California groups (Sutton 1996). These point styles have varying radiocarbon associations in the Mojave Desert and Great Basin at the Rose Spring site (Lanning 1963), Gypsum Cave (Heizer and Berger 1970).
Stuart Rockshelter (Shulter et al. 1960), and others (Warren 1984; Warren and Crabtree 1986:188). The Barnett site at Ash Meadows in the Amargosa Valley (Muto et al. 1976; Mehringer and Warren 1976) and the earliest material at Burnt Rock Mound in the northern Las Vegas Valley (Rager and Seymour 2001; Seymour and Rager 2001a, 2001b) date to this period as well.

Ceramic Period. The Ceramic Period began approximately 1,500 B.P. and marks the appearance of the oldest known ceramics in the region, an increased emphasis on ground stone technology as well as evidence of the introduction of the bow and arrow. At least three groups using ceramics that approximately correspond to later Mojave and Great Basin ethnographic peoples are identifiable in the Las Vegas Valley from this time to the appearance of Euro-Americans (Seymour 1997). The Ceramic Period is subdivided into two periods based on technological changes.

The Early Ceramic (Saratoga Springs) (1,500 to 800 B.P.) marks the introduction of pottery, the bow and arrow, and an increased emphasis on ground stone technology (Figure 5). These smaller points are of the Rosegate series (Thomas 1981). The latter part of the Early Ceramic (about 1,100 to 800 B.P.) is the period of Ancestral Puebloan influence in the Las Vegas Valley (Lyneis 1995; Seymour 1997), though certain brown and buff wares occur in addition to the gray and corrugated ceramics associated with the Ancestral Puebloans. There is a great deal of continuity with the Late Archaic: nevertheless, this period is a time of cultural change in the northern Mojave. The appearance of the Desert Series (Bettinger and Eerkens 1999; Thomas 1981) of projectile points and the abandonment of southern Nevada and the Las Vegas Valley by the Ancestral Puebloans (Lyneis 1995) marks the end of this period.

The Late Ceramic (Shoshonean) period lasts from 800 B.P. through the time of Euro-American contact, about 200 B.P. Brown and buff wares, the reuse of gray ceramic wares manufactured during the Early Ceramic, and the presence of Desert Series projectile points are indicative of this period. The Desert Series includes Desert Side-notched and
Cottonwood Triangular points (Grayson 1993; Thomas 1981; Warren 1984; Warren and Crabtree 1986).

The archaeology of the northern Mojave bears marks of the character of both the California deserts and the western and central Great Basin. As an example, the regional patterns of prehistory are generally agreed upon in the southwest Great Basin and Mojave Desert, though the analytical tools, such as projectile point typology, are borrowed from the adjacent central Great Basin and imposed upon the cultural chronology as it has been pieced together from the western and southern Mojave Desert, as well as from various sites in the central, western and southern Great Basin. This may be because the strengths of many researchers lie elsewhere in the Great Basin, California, and the Southwest. It may also be that, because of the apparent mobility of the studied groups, archaeologists feel relatively comfortable borrowing elements of better-studied sites and regions to interpret the archaeology here. Often, this gives the archaeological interpretation, and hence the regional prehistory, a feel of mixing and matching as well as the multi-hued cultural patchwork of a frontier. This may be a disservice to the area, as the modern intellectual constellation that accompanies ‘frontier’ includes transition, instability, marginality, juxtaposition, and a lack of cultural sophistication. Nevertheless, we are studying the prehistory of the same geographic area that fostered these notions in our own intellectual past.
CHAPTER 3

BURNT ROCK SPRING MOUND

Physical Site Description

Location. Burnt Rock Spring Mound (26CK3601) is located in the northern portion of the Las Vegas Valley at UTM grid 662,164 Easting, 4,014.515 Northing of Zone 11. The legal location is the SW 1/4 of the SW 1/4 of the SE 1/4 of Section 30 in Township 19 South, Range 61 East (T19S, R61E) (Figure 6).

The mound is situated on the eastern (downhill) side of the Eglington escarpment, which is one of a series of Quaternary fault scarps that trends generally southwest to northeast through the northern half of the valley (Figure 7). The soil unit surrounding the site is the Las Vegas gravelly fine sandy loam, characterized as a shallow, well drained soil on deeply dissected basin floor remnants that formed on alluvium derived dominantly from limestone and dolomite (Speck 1985:31-32). The roughly circular mound is approximately 35 m across and rises approximately 2 m above the mildly dissected plain below the scarp.

There is a small, unnamed spring mound northeast of Burnt Rock. It lacks the surface mantle of fire cracked rock or an associated cultural midden that characterizes Burnt Rock Mound. It was not examined as a part of this project.

Vegetation. The vegetation in the site vicinity (Table 1) is dominated by the Cresotebush (Larea tridentada) series of the Mojave Desertscrub community (Turner 1994:162-3). However, because of the surface water associated with the scarp, stands of Mesquite (Prosopis spp.) and Cat-claw acacia (Acaica greggii) are common below the scarp.
26CK3601 Burnt Rock Spring Mound

Figure 6. Location of Burnt Rock Mound (USGS 7.5 minute quad).
Known Spring Mounds and Mapped Faults in the Las Vegas Valley

Figure 7. Locations of Known Spring Mounds and Mapped Faults in the Las Vegas Valley.
Table 1. Present Day Burnt Rock Flora and Fauna List.

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asteraceae</td>
<td><em>Ambrosia dumosa</em></td>
<td>white bursage</td>
</tr>
<tr>
<td></td>
<td><em>Centaurea melitensis</em></td>
<td>tocalote</td>
</tr>
<tr>
<td></td>
<td><em>Chrysothamnus</em> spp.</td>
<td>rabbitbrush</td>
</tr>
<tr>
<td></td>
<td><em>Encelia virginensis</em></td>
<td>Virgin River encelia/brittlebush</td>
</tr>
<tr>
<td></td>
<td><em>Gutierrezia sarothrae</em></td>
<td>matchweed/broom snakeweed</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td><em>Lepidium fremontii</em></td>
<td>Fremont peppergrass</td>
</tr>
<tr>
<td></td>
<td><em>Stanleya viridiflora</em></td>
<td>prince's plume</td>
</tr>
<tr>
<td></td>
<td><em>Echinocereus engelmannii</em></td>
<td>Hedgehog cactus</td>
</tr>
<tr>
<td>Chenopodiaceae</td>
<td><em>Atriplex canescens</em></td>
<td>fourwing saltbush</td>
</tr>
<tr>
<td></td>
<td><em>Atriplex confertifolia</em></td>
<td>shadscale</td>
</tr>
<tr>
<td></td>
<td><em>Atriplex hymenelytra</em></td>
<td>desert holly</td>
</tr>
<tr>
<td></td>
<td><em>Salsola tragus</em></td>
<td>Russian thistle</td>
</tr>
<tr>
<td>Fabaceae</td>
<td><em>Acacia greggii</em></td>
<td>catclaw</td>
</tr>
<tr>
<td></td>
<td><em>Prosopis glandulosa torreyana</em></td>
<td>honey mesquite</td>
</tr>
<tr>
<td>Malvaceae</td>
<td><em>Sphaeralcea ambigua</em></td>
<td>apricot mallow</td>
</tr>
<tr>
<td>Papaveraceae</td>
<td><em>Arctomecon californica</em></td>
<td>Las Vegas bearpoppy</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td><em>Eriogonum corymbosum</em></td>
<td>Las Vegas buckwheat</td>
</tr>
<tr>
<td></td>
<td><em>var. glutinosum</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Eriogonum inflatum</em></td>
<td>desert trumpet</td>
</tr>
<tr>
<td>Rhamnaceae</td>
<td><em>Ziziphus obtusifolia var. canescens</em></td>
<td>graythorn</td>
</tr>
<tr>
<td>Rutaceae</td>
<td><em>Thamnosma montana</em></td>
<td>turpentine-broom</td>
</tr>
<tr>
<td>Zygophyllaceae</td>
<td><em>Larrea tridentata</em></td>
<td>creosotebush</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Sightings/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Order Odonata</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Hadrurus arizonensis</em></td>
<td>dragonfly</td>
<td>1</td>
</tr>
<tr>
<td><em>Uta stansburiana</em></td>
<td>giant desert hairy scorpion</td>
<td>exoskeleton</td>
</tr>
<tr>
<td><em>Dipodomys merriami</em></td>
<td>side-blotched lizard</td>
<td>2 F &amp; 1 M</td>
</tr>
<tr>
<td><em>Neotoma lepida</em></td>
<td>Merriam's kangaroo rat</td>
<td>15</td>
</tr>
<tr>
<td><em>Onychomys torridus</em></td>
<td>desert woodrat</td>
<td>9</td>
</tr>
<tr>
<td><em>Perognathus longimembri</em></td>
<td>southern grasshopper mouse</td>
<td>1</td>
</tr>
<tr>
<td><em>Peromyscus eremicus</em></td>
<td>little pocket mouse</td>
<td>3</td>
</tr>
<tr>
<td><em>Ammospermophilus leucurus</em></td>
<td>white-tailed antelope squirrel</td>
<td>2</td>
</tr>
<tr>
<td><em>Canis latrans</em></td>
<td>coyote</td>
<td>scat</td>
</tr>
<tr>
<td><em>Falco sparverius</em></td>
<td>American kestrel</td>
<td>found carcass by den</td>
</tr>
<tr>
<td><em>Corvus corax</em></td>
<td>common raven</td>
<td>3</td>
</tr>
<tr>
<td><em>Zenaida macroura</em></td>
<td>mourning dove</td>
<td>1</td>
</tr>
<tr>
<td><em>Athene cunicularia</em></td>
<td>burrowing owl</td>
<td>1</td>
</tr>
<tr>
<td><em>Amphispiza belli</em></td>
<td>sage sparrow</td>
<td>9</td>
</tr>
<tr>
<td><em>Auriparula flaviceps</em></td>
<td>verdin</td>
<td>3 + 1 nest</td>
</tr>
<tr>
<td><em>Zonotrichia leucophrys</em></td>
<td>white-crowned sparrow</td>
<td>5</td>
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</table>

*Note: Inventory from 2/22/2000 field visit by biologists Kristen Bardeen and Russ Harrison.
*Additional field data from small mammal trapping (80 traps) on 5/5-6/2000 by biologists K. Bardeen and Zane Marshall.
*Abundant rabbit scat on site.
*Abundant dens, possibly coyote, kit fox, and/or gray fox, and tortoise burrows.
and through the nearby ephemeral wash. The mound itself had very few plants present on the ground surface at the time of this project.

**Geological and Paleohydrological Spring Investigations**

The mound is a result of Late Pleistocene and Holocene age hydrogeological processes and was not constructed by humans. Humans did, however, use the mound as a focus for an, as yet, undetermined activity that produced a charcoal rich midden that is up to 85 cm thick.

The Quaternary age faulting interrupted the aquifer flow from the Spring Mountains to the east and the Las Vegas Range to the north into the Las Vegas Valley. Quade and others (Quade 1983, 1986; Quade and Pratt 1989; Quade et al. 1995, 1998) have discussed this phenomenon in the Las Vegas Valley, Indian Springs Valley, and Amargosa Valley. Late Quaternary age springs and spring mounds in the northern Mojave Desert, however, remain largely unanalyzed.

Two backhoe trenches were dug at Burnt Rock Spring Mound after the archaeological field work was completed to recover dateable black mat sediments and to investigate the spring stratigraphy (Figure 8). Trench 1 was the deepest. It ran from the east side of the spring throat to the mound’s western edge. It was dug to a depth of 12.5 m at its deepest in the spring throat. A schematic profile shows the successive cycles of black mat formation and the locations where radiocarbon samples were taken (Figure 9). The radiocarbon results are presented in Table 2.

The spring mound is formed of \( E_1 \), \( E_2 \), and \( F \) sediments on the older \( D \) horizon. The oldest black mat is a relic of an earlier \( E_1 \) age deposit that dates to \( 12.530 \pm 60 \) B.P. (Beta-146475; 15.510-14.220 B.P. [2Σ]). This predates the earliest published black mat date from the northern Mojave from Corn Creek Flat (A-4988; 11.800 \( \pm \) 180 B.P.) (Quade et al. 1998: Table 1) and may represent the onset of Late Pleistocene spring activity in the Las Vegas Valley. This relic black mat material was nearly totally replaced by later \( E_2 \) mats except for
Figure 8. Plan Map of Burnt Rock Spring Mound (26CK3601).
Figure 9. Schematic Profile of Burnt Rock Mound and the North Wall of Trench 1.
Table 2. Burnt Rock Mound $^{14}$C Dates From Geological Contexts.

<table>
<thead>
<tr>
<th>Sample Id</th>
<th>Material</th>
<th>$\delta^{13}$C Value</th>
<th>Conventional Radiocarbon</th>
<th>Calibrated$^a$ Radiocarbon (2$\sigma$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-143474</td>
<td>Organic Sediment</td>
<td>-21.7%o</td>
<td>4,020 ± 40 B.P.</td>
<td>4,570-4,410 B.P.</td>
</tr>
<tr>
<td>Beta-143475</td>
<td>Organic Sediment</td>
<td>-22.4%o</td>
<td>12,530 ± 60 B.P.</td>
<td>1,5510-1,4220 B.P.</td>
</tr>
<tr>
<td>Beta-143476</td>
<td>Organic Sediment</td>
<td>-25.1%o</td>
<td>9,680 ± 60 B.P.</td>
<td>9,010-8,820 B.P.</td>
</tr>
<tr>
<td>Beta-143477</td>
<td>Organic Sediment</td>
<td>-23.0%o</td>
<td>6,340 ± 40 B.P.</td>
<td>7,325-7,220 B.P.</td>
</tr>
<tr>
<td>Beta-143478</td>
<td>Organic Sediment</td>
<td>-24.5%o</td>
<td>6,470 ± 40 B.P.</td>
<td>7,440-7,300 B.P.</td>
</tr>
<tr>
<td>Beta-143479</td>
<td>Organic Sediment</td>
<td>-25.3%o</td>
<td>9,610 ± 60 B.P.</td>
<td>11,175-10,715 B.P.</td>
</tr>
</tbody>
</table>

$^a$ INTERCAL98 Radiometric Age Calibration. (Stuvier et al. 1998).

Table 3. Burnt Rock Spring Mound Artifact Recovery.

<table>
<thead>
<tr>
<th>Location</th>
<th>Bone</th>
<th>Ground Stone</th>
<th>Ceramics</th>
<th>Lithics</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>39</td>
<td>125</td>
<td>194</td>
<td>751</td>
<td>1109</td>
</tr>
<tr>
<td>Subsurface</td>
<td>1939</td>
<td>205</td>
<td>143</td>
<td>5883</td>
<td>8168</td>
</tr>
<tr>
<td>Totals</td>
<td>1978</td>
<td>330</td>
<td>337</td>
<td>6641</td>
<td>9277</td>
</tr>
</tbody>
</table>

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a small, thin lens high in the profile and is conspicuously darker in color than the subsequent mat. This later brown-green clay yielded two dates, 9,610 ± 60 B.P. (2σ) (Beta-143476) and 9,680 ± 60 B.P. (2σ) (Beta-143476). Since the other springs and spring mounds in the northwest Las Vegas Valley (for example, Tule Springs, Gilcrease Ranch. and Corn Creek) draw from the same aquifer, it is likely that the fortuitous preservation of the earlier sample represents a previously unrecorded sequence of regional aquifer and spring activity rather than an isolated event at Burnt Rock.

**Site Analysis**

Approximately 9,277 items were inventoried from the surface collection, archaeological test excavations, and geological trenching at Burnt Rock Spring Mound (Table 3). This amount includes samples taken for pollen, radiocarbon, flotation analysis, and bulk soil samples.

**Ground Stone.** Three hundred thirty (330) ground stone fragments were recovered, two from deep in the spring throat, 125 from the surface, and 205 from the archaeological test excavations. With the exception of the two sandstone grinding slabs found in the spring throat, all of the ground stone were small, fragmentary specimens. Most of these pieces had multiple heat fracture faces, implying that their final use was in stone boiling activities. Raw ground stone material types include volcanic rocks such as vesicular basalt and basalt, and coarse-grained sedimentary rocks such as sandstone and travertine from the spring's cornice.

**Fauna Bone.** A total of 1,978 individual pieces of fauna bone were recovered from the surface and subsurface of Burnt Rock Mound. Though they have not been subjected to rigorous osteoarchaeological analysis, species identified during artifact accessioning include Mojave Desert Tortoise (*Gopherus agassizii*) and Desert Pocket Mouse (*Chaetodipus penicillatus*) (Olsen 1964, 1968). None of the bone was from large animals or appeared to be culturally modified. All but 17 were small mammal and reptile bones. These had metal saw cuts and were recovered from the 0-10 cm level of test unit 9 on the top of the mound.
It is likely that these are either from a pothunter’s picnic or from the abundant recent trash present on the site at the time of this project.

**Radiocarbon Dates & Cultural Chronology.** The oldest archaeological radiocarbon dates ($^{14}$C), 2,030-1,795 B.P. (Beta 143484) and 2,000-1,720 B.P. (Beta 152722), are from the Late Archaic (Table 4). For the analysis presented in Chapter 5, I defined artifact samples based on levels defined by these $^{14}$C dates. These groups roughly correspond to prehistoric periods defined in chapter 2, but I refer to them as Artifact Periods (AP#) so there is no confusion with the terminology of the regional chronology.

The Late Archaic (Figure 5) begins about 4,000 B.P. Diagnostic projectile points from this period are the Elko series, Gatecliff Contracting-stem (Gypsum), and Humboldt concave base. There was a significant increase in ground stone usage (Grayson 1993; Lyneis 1995; Sutton 1996; Warren 1984; Warren and Crabtree 1986) during the Late Archaic. All levels with radiocarbon dates within this time span were assigned to Artifact Period I (AP#). The Early Ceramic follows the Archaic at about 1,450 B.P. and lasts until 1,100 B.P. when the Rosegate series, a smaller point style (Bettinger and Eerkens 1999; Grayson 1993; Lyneis 1995; Sutton 1996; Thomas 1981; Warren 1984; Warren and Crabtree 1986), appears in the archaeological record. This implies that the bow and arrow was introduced, as the larger dart points used in conjunction with the atlatl are found in lower frequencies. Ceramics make their earliest known appearance in the northern Mojave during this period.

The $^{14}$C dates from Burnt Rock Mound indicate that human occupation of the mound spanned from 1960 ± 60 B.P. to 200 ± 60 B.P. This period covers the Late Archaic to the Ethnohistoric period.

**Burnt Rock Ceramics**

Burnt Rock Spring Mound is similar to most sites in the Las Vegas Valley because it contains ceramic wares generally affiliated with Ancestral Puebloan groups, Patayan, and the Southern Paiute (Seymour 1997; Seymour and Rager 2001a). A small number of intrusive
Table 4. Burnt Rock Mound $^{14}$C Dates Related to Archaeological Occupations.

<table>
<thead>
<tr>
<th>Sample Id.</th>
<th>Material</th>
<th>$\delta^{14}$C Value</th>
<th>Location</th>
<th>Conventional Radiocarbon</th>
<th>Calibrated Radiocarbon (2$\sigma$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-143480</td>
<td>Charred material</td>
<td>-17.5‰</td>
<td>Trench 2</td>
<td>460 ± 80 B.P.</td>
<td>550-435 cal B.P. AND 360-330 cal B.P.</td>
</tr>
<tr>
<td>Beta-143481</td>
<td>Charred material</td>
<td>-20.6‰</td>
<td>Trench 2</td>
<td>460 ± 60 B.P.</td>
<td>500-290 cal B.P.</td>
</tr>
<tr>
<td>Beta-143482</td>
<td>Charred material</td>
<td>-25.8‰</td>
<td>U2/1-20</td>
<td>320 ± 50 B.P.</td>
<td>1620-1325 cal B.P.</td>
</tr>
<tr>
<td>Beta-143483</td>
<td>Charred material</td>
<td>-25.3‰</td>
<td>U2/50-60</td>
<td>1590 ± 70 B.P.</td>
<td>2030-1795 cal B.P.</td>
</tr>
<tr>
<td>Beta-143484</td>
<td>Charred material</td>
<td>-25.3‰</td>
<td>U1/40-50</td>
<td>1960 ± 60 B.P.</td>
<td>235-65 cal B.P.</td>
</tr>
<tr>
<td>Beta-143485</td>
<td>Charred material</td>
<td>-24.4‰</td>
<td>U8/10-20</td>
<td>200 ± 60 B.P.</td>
<td>235-65 cal B.P.</td>
</tr>
<tr>
<td>Beta-143486</td>
<td>Charred material</td>
<td>-25.7‰</td>
<td>U8/40-50</td>
<td>980 ± 50 B.P.</td>
<td>970-755 cal B.P.</td>
</tr>
<tr>
<td>Beta-143487</td>
<td>Charred material</td>
<td>-24.6‰</td>
<td>U8/50-60</td>
<td>1280 ± 60 B.P.</td>
<td>1300-1065 cal B.P.</td>
</tr>
<tr>
<td>Beta-143488</td>
<td>Charred material</td>
<td>-25.0‰</td>
<td>U8/60-70</td>
<td>1160 ± 80 B.P.</td>
<td>1270-930 cal B.P.</td>
</tr>
<tr>
<td>Beta-143489</td>
<td>Charred material</td>
<td>-26.1‰</td>
<td>U9/10-20</td>
<td>310 ± 50 B.P.</td>
<td>495-285 cal B.P.</td>
</tr>
<tr>
<td>Beta-143490</td>
<td>Charred material</td>
<td>-26.1‰</td>
<td>U9/30-40</td>
<td>380 ± 50 B.P.</td>
<td>520-305 cal B.P.</td>
</tr>
<tr>
<td>Beta-143491</td>
<td>Charred material</td>
<td>-25.3‰</td>
<td>U1/10-20</td>
<td>660 ± 70 B.P.</td>
<td>700-530 cal B.P.</td>
</tr>
<tr>
<td>Beta-143492</td>
<td>Charred material</td>
<td>-25.3‰</td>
<td>U5/20-30</td>
<td>580 ± 50 B.P.</td>
<td>520-425 cal B.P. AND 390-320 cal B.P.</td>
</tr>
<tr>
<td>Beta-152721</td>
<td>Charred material</td>
<td>-23.0‰</td>
<td>U14/20-30</td>
<td>1270 ± 40 B.P.</td>
<td>1280-1080 cal B.P.</td>
</tr>
<tr>
<td>Beta-152722</td>
<td>Charred material</td>
<td>-25.0‰</td>
<td>U1/30-40</td>
<td>1930 ± 60 B.P.</td>
<td>2000-1720 cal B.P.</td>
</tr>
<tr>
<td>Beta-152723</td>
<td>Charred material</td>
<td>-25.0‰</td>
<td>U8/20-30</td>
<td>230 ± 50 B.P.</td>
<td>430-380 cal B.P. AND 320-260 cal B.P.</td>
</tr>
<tr>
<td>Beta-152724</td>
<td>Charred material</td>
<td>-25.0‰</td>
<td>U8/30-40</td>
<td>540 ± 50 B.P.</td>
<td>640-510 cal B.P.</td>
</tr>
<tr>
<td>Beta-152725</td>
<td>Charred material</td>
<td>-25.0‰</td>
<td>U9/40-50</td>
<td>350 ± 50 B.P.</td>
<td>510-300 cal B.P.</td>
</tr>
<tr>
<td>Beta-152726</td>
<td>Charred material</td>
<td>-25.0‰</td>
<td>U9/50-60</td>
<td>580 ± 50 B.P.</td>
<td>650-520 cal B.P.</td>
</tr>
</tbody>
</table>

* INTERCAL98 Radiometric Age Calibration, (Stuiver et al. 1998).

*b estimated
wares from southern Utah and central Arizona, including Prescott Gray and San Juan Red Ware, were also identified (Seymour and Rager 2001a). These are frequently found on sites throughout southern Nevada (Seymour 1997). In general, it is difficult to make any sense of local archaeological site ceramic assemblages due to disturbances, a lack of stratigraphy, or lack of depth to deposits. However, at Burnt Rock, stratigraphy was present but subtle, there was depth to the midden, and the majority of disturbance was confined to areas that could be identified on top of the mound.

A total of 645 sherds from Burnt Rock Spring Mound were analyzed (Tables 5-7) (Seymour and Rager 2001a, 2001b). UNLV archaeologists collected 297 sherds during a 1970s surface collection and archaeologists from the Las Vegas Springs Preserve collected the remaining 348 in 2000.

The earlier surface collection and the recent subsurface assemblages are similar, but the two surface assemblages show some differences. In the UNLV collection, 60 percent of the total sherds were gray or red wares, while 71 percent were recovered in 2000. Patayan tradition and Southern Paiute Brown wares were recovered in lower frequencies during the 2000 investigations, 17 and eight percent, compared to the previous collection’s 22 and nine percent. This difference is likely the result of illegal digging and artifact collecting differentially removing the more visible Buff and Gray ware sherds (Seymour and Rager 2001a, 2001b).

Surface sherd counts, in general, were highest in disturbed areas of the site on the top of the mound. Undisturbed subsurface ware percentages are similar to pre-disturbance surface collection numbers from the 1970s. Gray and red wares represented 60 percent of both assemblages, which is what would be expected if the differential removal hypothesis was valid. One difference between the two sherd groups is the lower subsurface counts of Southern Paiute Brown ware, which is consistent with area studies that model Brown ware ceramics being manufactured later than the other wares (Lyneis 1995; Seymour 1997; Seymour and Rager 2001a, 2001b).
Table 5. Ceramics From 2000 Burnt Rock Spring Mound Excavations.

<table>
<thead>
<tr>
<th>Area</th>
<th>Pueblan Tradition Buff/Brown</th>
<th>Pueblan Gray</th>
<th>Southern Paiute Brown</th>
<th>Prescott Gray</th>
<th>Fremont Gray</th>
<th>Unidentified*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Side</td>
<td>29</td>
<td>70</td>
<td>15</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>126</td>
</tr>
<tr>
<td>North Side</td>
<td>13</td>
<td>75</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>13</td>
<td>109</td>
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<tr>
<td>Subsurface-N/S</td>
<td>28</td>
<td>84</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>16</td>
<td>143</td>
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<tr>
<td>Surface-N/S 1972</td>
<td>52</td>
<td>178</td>
<td>66</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>296</td>
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<tr>
<td>Surface-N/S 2000</td>
<td>16</td>
<td>145</td>
<td>18</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>205</td>
</tr>
<tr>
<td>Site Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>645</td>
</tr>
</tbody>
</table>

*Too Small for Identification.

Note: Data from Seymour and Rager 2001a.
Table 6. Patayan Ceramics From Selected Sites in the Las Vegas Area.

<table>
<thead>
<tr>
<th>Site No. 26CK</th>
<th>Topoc Buff</th>
<th>Parker Buff</th>
<th>Las Vegas Buff</th>
<th>Colorado Buff</th>
<th>Salton Buff</th>
<th>Palomas Buff</th>
<th>Tumco Buff</th>
<th>Unident. Buff</th>
<th>Tizon Brown</th>
<th>Total</th>
<th>Site Totals</th>
</tr>
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<tr>
<td>3601&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>4</td>
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<td>0</td>
<td>23</td>
<td>52</td>
<td>645</td>
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<tr>
<td>948/949&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>265</td>
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<td>2</td>
<td>0</td>
<td>40</td>
<td>80</td>
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<td>1</td>
<td>67</td>
<td>273</td>
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<tr>
<td>1447</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>99</td>
</tr>
<tr>
<td>1527</td>
<td>58</td>
<td>6</td>
<td>10</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>12</td>
<td>94</td>
<td>1013</td>
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<tr>
<td>Mormon Fort</td>
<td>78&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>8</td>
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<td>0</td>
<td>0</td>
<td>27</td>
<td>128</td>
<td>254</td>
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<tr>
<td>Willow Beach</td>
<td>1184</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>109</td>
<td>1293</td>
<td>1346</td>
</tr>
<tr>
<td>AZ:F:2:80</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>5</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>AZ:F:2:81</td>
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<td>17</td>
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<td>0</td>
<td>0</td>
<td>12</td>
<td>285</td>
<td>431</td>
</tr>
</tbody>
</table>

*Note: Data from Seymour 1997.*

<sup>a</sup> Combined 1972 and 2000 Projects.

<sup>b</sup> Both Sites Combined (Seymour and Warren 1998; Seymour et al. 1998; Warren et al. 1972).

<sup>c</sup> Includes Pyramid Gray.
Table 7. Grey and Brown Ware Ceramic Assemblages From Selected Archaeological Sites in the Las Vegas Area.

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Southern Paiute</th>
<th>North Creek Gray Ware</th>
<th>Logandale Gray Ware</th>
<th>Moapa Gray Ware</th>
<th>Arizona Intrusives*</th>
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Note: Data from Seymour 1997, Seymour and Rager 2001a.
*bBoth Sites Combined (Seymour and Warren 1998; Seymour et al. 1998; Warren et al. 1972)
Eleven of the 14 excavation units contained ceramics (Figure 8). Five of those 11 produced more than ten sherds. Four of these five units were located on the south aspect of the mound. The exception is Unit 14 on the north side. However, a single North Creek Gray vessel may represent the majority of the sherds recovered from that unit (Seymour and Rager 2001a, 2001b).

Eighty percent of the sherds came from the upper 40 cm of the test excavations. The 0-30 cm levels produced approximately 60 percent of the subsurface assemblage. An additional 20 percent came from the next lower level (30-40 cm). However, the relative ware percentages were fairly constant from level to level, from the surface to 80 cm. This would suggest that all three culture groups that are commonly identified as present in the valley during prehistoric times visited this mound throughout the Ceramic period (Seymour and Rager 2001a, 2001b).

Discussion

Burnt Rock Spring Mound, 26CK3601 (Figure 6), is not the ideal site to begin an examination of the Las Vegas Valley and the surrounding region since it was not obviously stratified, did not have preserved organics or perishable goods, and parts of the site were not in pristine condition. However, there are many positive things about this site that make investigations here worthwhile. There was good horizontal and vertical control during the excavations and impressive amounts of small debitage were recovered. In addition, the rich midden deposits allowed radiocarbon samples to be collected from all excavation levels.

The site itself is not very rich in formal artifacts; however, it appears to represent a single, focused subsistence activity through at least two millennia at a perennial water source. Though the presence of permanent water makes the site unusual in the desert, that is useful because we can reasonably assume that prehistoric groups would not have failed to visit this locale. Radiocarbon dates from the midden range from 1960 ± 60 B.P. to 200 ± 60 B.P., and help to place the site’s assemblage into a temporal perspective. Since the Las Vegas
Valley is situated on the southwestern edge of the Basin and Range physiographic province and one valley to the east of the Amargosa Desert. Burnt Rock Spring Mound was likely an area of interaction between different groups with varying economies, symbolic systems, technologies, and adaptations.
CHAPTER 4

ARCHAEOLOGICAL ANALYSIS METHODOLOGY

Introduction

This chapter explains the methodology used in this analysis of the Burnt Rock Spring Mound archaeological inventory, including the types and possible origins of the raw material used to make the cultural items. These materials were collected during February, March, and April of 2000. The artifacts were accessioned into the Las Vegas Springs Preserve (LVSP) collections as a series prefixed with 2000-2-. Serial specimen numbers were assigned to individual artifacts from the surface collection, to bulk samples for 14C flotation and pollen analysis, to artifacts identified during analysis and curation, and to unit level bags from the excavation. Artifacts identified during this analysis were assigned new specimen numbers by appending serial numbers to the end of the original numbering system (e.g., 2000-2-1-1).

The range of materials recovered from Burnt Rock includes faunal bone, gastropod shell, prehistoric ceramics, and various sedimentary, metamorphic, and igneous rocks. The assemblage analyzed for this thesis is curated at the Las Vegas Springs Preserve in Las Vegas, Nevada.

Site Analysis

When appropriate, all artifacts were ranked according by size. A paper template with a series of squares with side lengths of .3 cm (size grade 1), .6 cm (size grade 2), 1.2 cm (size grade 3), 1.9 cm (size grade 4), 2.6 cm (size grade 5), and 5 cm (size grade 6) was used...
to determine these sizes. Thus, an artifact measuring less than 1.2 by 1.2 cm in length and width was assigned a size grade of 3. An artifact measuring greater than 1.9 by 1.9 cm but less than 2.6 by 2.6 cm in length and width was assigned a size grade of 5, and an artifact measuring greater than 2.6 by 2.6 cm but less than 5 by 5 cm in length and width was assigned a size grade of 6. Artifacts greater than 5 cm in length or width were assigned a size grade of 7.

**Lithic Analysis**

**Artifact Typology.** The analytical tool used for this study is largely a monothetic, divisive morphological typology that recognizes nominal scale attributes. This typology deviates from this scheme during the determination of hafted and unhafted bifaces when metric variables are used to define the class members. These are discussed below.

The initial analytical decision was to distinguish between culturally modified stone and non-cultural stone, then to further distinguish culturally modified stone between chipped stone material and non-chipped stone material. Chipped stone was further divided into debitage, core, and flaked tool categories. Non-chipped stone material includes ground stone types and hammer stones.

**Debitage.** Debitage is used here as the inclusive term for the non-tool debris from stone tool manufacture. Debitage is stratified based on the presence or absence of a striking platform and bulb of percussion. Debitage with both criteria are further stratified based on a polythetic criteria suite consisting of platform size, platform angle, flake morphology, and bulb of percussion size. Debitage without a striking platform or bulb of percussion is stratified based on the retention of other flake characteristics. These criteria resulted in debitage retaining a feathered flake margin, or a discernible dorsal and ventral face being typed as indeterminate flake fragments, and debitage lacking those characteristics being typed as angular shatter.
Decortication and Core Reduction Flakes. Those flakes that retain the unmodified exterior of the raw material on their dorsal surface are typed as decortication or cortical flakes (DCF). Core reduction flakes (CRF) are removed from the object core for several purposes. These include preparation for additional flake removals, to produce flakes usable as expedient tools, to produce flakes that will be further processed into formal tools, or to further reduce the unsuitable material present on the nodule of raw material. When evidence of post-detachment utilization such as expedient cutting and/or scraping tools was noted, these were typed as one of several types of utilized flakes (discussed below) based on the presence of this expedient utilization retouch.

Retouch Type 1 and 2 Flakes (Biface Thinning and Pressure Flakes). Biface thinning flakes (BTF) and pressure flakes (PRF) are two types of retouch flakes that are typically the result of tool manufacture rather than material reduction. They can generally be identified by the removal angle, platform size, platform lipping, and sometimes size. These flakes are typically very small (often less than 1.2 cm) and usually the result of the striking of the object to initiate a flake removal with a soft hammer or billet, or the direct application of pressure that removes a flake due to bending forces. Pressure and biface thinning flakes have been noted as representing final blank preparation or maintenance of a formal unifacial or bifacial edge or tool. (Amick et al. 1988; Flenniken and Raymond 1986). Andrefsky (1998:114-115) notes that it can be difficult to reliably characterize these flakes representing tool maintenance from biface thinning flakes that are part of the reduction trajectory.

No attempts were made during this study to replicate debitage types using raw materials found at Burnt Rock. Since it cannot be said with confidence that flakes recovered with 'retouch' morphologies resulted from techniques such as soft hammer percussion or pressure flaking, these terms are not used during the data presentation and analytic discussion. The term 'Retouch type 1' was used for debitage with 'biface thinning' morphology and 'Retouch type 2' was used for debitage with 'pressure flake' morphology. This also removes...
some of the embedded meaning associated with the terms biface thinning flake and pressure flake.

**Retouch Type 1 (Biface Thinning Flakes).** Retouch type 1 (biface thinning) flakes have distinct striking platforms, often with a distinct dorsal platform lip, a distinct bulb of percussion, and often have platform facets present. These platform facets are flake removal scars (faces) from previous tool edge finish work. Occasionally, this flake type is termed a rejuvenation flake because of these platform facets.

**Retouch Type 2 (Pressure Flakes).** Retouch type 2 (pressure) flakes do not have a prominent platform or dorsal platform lipping, lack platform facets, and the bulb of percussion is diffuse and subtle. Unless other flake types produced by direct percussion (striking the core or objective stone with a hammer stone or bilet) are present in the lithic assemblage, it is difficult to determine which debitage is produced by bending (pressure) forces.

**Indeterminate Flakes.** When a flake was not otherwise typeable because it lacked a platform or bulb of percussion due to breakage, but a dorsal and ventral surface was identifiable, it was typed as an indeterminate flake fragment (IND).

**Utilized Flakes.** Occasionally, suitable flakes were used as expedient tools for a variety of purposes including scraping, cutting, and gouging. When this utilization caused small flakes to be unintentionally removed from the edges as a consequence of their use and these flake scars were recognized during analysis, these flakes were typed as utilized flakes (UTF). Utilized flakes were further typed based on the number of discontinuous utilized edges on the flake, the shape of those edges (straight, convex, concave, or complex), and the length of each individual utilization. It is worthwhile to note that a utilized flake can have multiple utilized areas present (when they are discontinuous) and can include both unifacial and bifacial utilization. No utilized flakes with discontinuous edges were observed in the Burnt Rock inventory.

**Flaked Stone Tools.** Flaked stone tools are deliberately modified cobbles and rock fragments that exhibit conchoidal fracture characteristics. Typically raw materials include
cryptocrystalline silicates (such as chert, chalcedony, and jasper), quartzite, certain volcanic rocks (such as obsidian, rhyolite, basalt, and dacite), and silica-indurated sandstone and limestone. The morphology of purposefully modified flake tools can range from relatively informal unifacial tools to various formal hafted bifaces typically referred to as projectile points, drills, or knives. Note that these terms are used here in a morphological sense, not as functional category descriptions. Hard and soft percussion and pressure techniques were used that are familiar to archaeological lithic analysts worldwide. All measurements were taken with a set of digital calipers and entered into a FileMaker Pro computer database.

Flake tools include bifaces and unifaces. Unifaces (UNI) have flake removals from only one face of the flake edge. A biface (BIF) has had flakes removed from both faces of an edge. Bifaces are classified as either hafted or nonhafted. Hafted bifaces are further classified into recognized Great Basin morphological forms based on hafting element attributes (Thomas 1981; Wallace 1977; Warren 1984; Warren and Crabtree 1986). Nonhafted bifaces are typed into an ordinal stage scheme based on a polythetic criteria suite. These criteria include edge sinuosity, margin flake invasiveness, original flake margin retention, presence and amount of secondary and tertiary edge flaking, and original flake cross section profile retention. Nonbifaces were stratified into deliberately modified flakes and utilized flakes. Deliberately modified flakes were separated into bifacially modified flake tools and unifacially modified flake tools.

Bifaces. Bifaces in the Great Basin and Mojave receive a great deal of attention partly because the typically temporally and culturally sensitive projectile point is a member of this artifact type. The use of projectile points as chronological markers is not without difficulties however, as was noted in the discussion on Previous Archaeological Research (Chapter 2).

A stage 1 biface has a continuously worked bifacial edge. These tools are very rough in form, without a developed working edge or flake removals that extend into the
biface's interior. When viewed in cross-section, stage 1 bifaces are thick and blocky, and the flaked edges have not markedly affected the shape of the original flake cross-section.

Stage 2 bifaces also have continuously flaked edges, though these are still quite irregular and sinuous. The flake removals may occasionally extend into the flake's interior, but not consistently. The cross-section of these bifaces are becoming shaped by their flake removals, but continue to retain much, if not most, of the parent flakes' profile.

Stage 3 bifaces have flake removals that are routinely invasive to the tool's interior and whose edges are still sinuous, but are beginning to approach a uniform working edge. Cross-sections are generally diamond-shaped, though the ratio of width to thickness is still higher than later stages. This biface stage may retain the original parent flake platform, though the original flake margin has been extensively modified.

A stage 4 biface has numerous secondary, and perhaps tertiary, flake removals as the biface's thickness is further reduced and the edge is refined. The cross-section of this tool is generally much wider than thick, though certain tool trajectories such as drills may have width/thickness ratios that approach a value of 1.

Stage 5 bifaces can be regarded as non-diagnostic formal tools that are finished in regards to edge linearity and are typically very thin in relation to their width. They only lack specific proximal features like corner-notching or other hafting elements and final edge preparation to be a typeable projectile point or other formal tool such as a drill.

**Temporally Diagnostic Tools.** These are tools that are diagnostically typical of a morphological, rather than functional, category such as drills, gravers, spokeshaves and projectile points. The category terms are inherited from an earlier era of archaeological analysis when the function was implicit in the naming conventions. Terms such as scraper, knife, projectile point, drill, etc., are retained here because of their common usage and ample published precedent for their descriptive utility as morphological shape descriptions separate from the function a term implies.
Projectile point dimensions were measured with digital calipers, weighed to the nearest .1 g using a digital scale, and coded for analysis using Thomas’ (1981) metric discriminant typology. A tool constructed of polar-coordinate graph paper mounted on foam core board with an indicator string attached to the graph center was used for some of the measurements.

**Cores.** Cores (COR) are stone cobbles or rock fragments that have been deliberately struck to produce flakes. A core with a single flake removal was scored as an assay core. If multiple flakes were removed from only one face then the artifact was scored as a unifacial core. A multidirectional core has had removals from multiple directions from multiple platforms. They can be typed as single directional (SIN) or multidirectional (MUL) based on how flakes were removed. Other formal core types including prismatic, radial, and bifacial cores, that, based on their morphology, would imply specific lithic manufacture trajectories, strategies, and techniques. These other core types are not present in the Burnt Rock Spring Mound assemblage. This is noteworthy, as this subset of core types is likely representative of a site-specific technological choice predicated by resource recovery strategies.

**Ground Stone. Hand Stones and Object Stones.**

**Ground stone.** Ground stone is defined as culturally modified stone material that have striations from grinding or abrading, or have been shaped and prepared for use as a grinding tool (Adams 1996; Schneider 1996; Wright 1992). For this study, the ground stone type includes artifacts that were likely used for processing foodstuffs and possibly pigments, and hammer stones. These artifacts were used for activities including grinding, crushing, and pulverizing seeds and other vegetal materials, possibly animal meat and bone. other subsistence activities, and some aspects of flaked tool production. No evidence of pigment processing was noted in the collection from Burnt Rock. The inclusion of hammer stones with ground stone rather than flaked stone is problematic. Historically this has been a challenge in ground stone analysis as ground stone often is shaped by flaking, pecking, and
grinding in the manufacturing process, and from use, while hammer stones are often expedient forms (Adams 1996; Schneider 1996; Wright 1992). This remains an area of typological uncertainty that is only partially addressed in most current archaeological analysis.

There are many potential ground stone artifact categories (Wright 1992), but for this study hand stones, object stones, and miscellaneous ground stone are sufficient. The initial typological stratification is between hand stones, hand-held forms which include manos and pestles, and object stones, the forms that materials were ground on such as metates, mortars, and milling stones.

Hand Stones. Tools that were held in the hand and directed against a material that was resting on an object stone to crush, pulverize, or grind that material are either pestles (PES), which are typically used in combination with an often steeply concave surfaced object stone, such as a mortar (MOR) or bowl (BOWL), or manos (MAN), which were usually used in conjunction with a flat to mildly concave object stone such as a metate (MET) or milling stone (MIL). Tools that were held in the hand to affect other stones during the production of flaked stone tools or to shape ground stone tools are hammer stones (HAM). Hammer stones typically start as unmodified cobbles or sometimes shaped pieces of various rocks with a suitable roughness, hardness, and size that are recognizable as tools when their use in lithic manufacture leaves abrasion patterns and step fractures that are atypical of natural processes. This evidence ranges from an abraded surface from contact with the toolstone raw material, perhaps with associated step fracturing, to grinding and pecking to shape the hammer stone much like might be observed with some ground stone forms. Note that the presence of only a ground and pecked surface would place a worked cobble in the mano category. abrasion typical of hammer stone use must be present to be typed in this category.

Object Stones. Metates (MET) typically have a flat to slightly concave grinding surface that show striations and a working surface that progressively becomes ground smoother from use. Often these are made from coarser rocks such as silica-indurated
sandstone and quartzite, as well as various igneous rocks such as andesite, basalt, granite and dacite. Metates were scored a numerical value based on their degree of use, 0 (zero) for shaped, but never used surfaces, to 3 for extended use that breaks through the bottom surface of the metate. Milling stones are more fine grained and typically seem to be thinner than metates. At Burnt Rock and elsewhere in the northern Mojave, they are often bifacial, ground on both sides. These were scored 0 to 3 based on their degree of use.

Other Artifact Attributes Studied

Raw Material. The rock type of each artifact was noted and entered in a database. Cryptocrystalline silicates were scored as chert, jasper, and chalcedony. Volcanic rocks such as obsidian, basalt, rhyolite, dacite, and welded tuff were scored accordingly. Metamorphic rocks such as quartzite, shale, and schist, as well as indurated and unindurated sedimentary rocks such as sandstone and limestone were scored. These identifications we made by visual examination, often using a 10X hand lens.

Cobble Cortex. The presence of original cobble surface on the dorsal surface of a flake was visually checked for and scored “Y” if greater than 50 percent of the dorsal surface was cortex or “N” if the amount present was less than 50 percent. This can be difficult to determine on flake sized specimens. Obsidian and CCS raw materials had to have a definite rind or skin, while the presence of quartzite cortex was occasionally based on evidence of abrasion by geomechanical processes, color difference, or other textural variation from the flake’s ventral surface.

Projectile Point Metrics. The measurements used for the Monitor Valley typology were taken on all identified projectile points (Thomas 1981:11-14). These included Maximum Length, Maximum Width, Maximum Thickness, Proximal Stem Angle, Notch Opening Index, Basal Indentation Ratio, Distal Shoulder Angle, and Weight.
Faunal Analysis

All of the faunal bone recovered from the surface and subsurface contexts at Burnt Rock were from small rodents and tortoise (likely *Gopherus agassizii*) bone, or from metal saw-cut bone from larger mammals that was inventoried, but not analyzed. All of the remaining faunal bone was inventoried and macroscopically examined for evidence of cut marks, smashing, other breakage, or 'pot polish' from food processing activities, or any evidence of use of the bones as tools. No cultural modification to the bone was identified. No human bones or grave goods were recovered during this investigation.

Ceramic Analysis

Burnt Rock Mound and several other archaeological sites in the Las Vegas Valley were surface collected by Claude Warren of UNLV in the 1970s. The analysis of the sherds from that collection were a portion of the data used in a previous analysis of the Las Vegas Valley ceramics (Seymour 1997). These data were used with the analysis of prehistoric ceramics recovered during this investigation at Burnt Rock Mound by Archaeologist Gregory Seymour of the Las Vegas Springs Preserve. A portion of his analysis is included in the Chapters 5 and 6. The full results of those ceramic investigations are presented elsewhere (Seymour and Rager 2001a).

Obviously, this idealized constellation of attributes is a useful scheme in which to place the actual Burnt Rock site artifacts. These types are not rigid as any suite of artifacts contains members that don't fit into these neatly defined typological boundaries.

The results of using this analysis methodology on the assemblage at Burnt Rock Spring Mound is presented in Chapter 5. the next chapter. Discussion and conclusions of this analysis are presented in Chapter 6.
CHAPTER 5

ARCHAEOLOGICAL DATA PRESENTATION

Objectives

The results from the archaeological surface collection and 14 test excavations at Burnt Rock Spring Mound, 26CK3601, are presented in Chapter 3. A variety of archaeological materials were recovered, including ground stone, ceramics, stone tools, the debris from the manufacture and maintenance of stone tools (debitage), and non-cultural fauna bone. Only the debitage from four test excavation units used in the analysis will be discussed here.

Site Analysis

Ground Stone. Three hundred thirty (330) ground stone fragments were recovered, two from the spring throat, 125 from the surface, and 203 from the subsurface archaeological test excavations. With the exception of the two grinding slabs made from sandstone found in the spring throat, all of the ground stone were small, broken specimens. Many of these pieces had multiple heat fracture faces. Raw material types include volcanic rocks such as vesicular basalt and basalt, and coarse-grained sedimentary rocks such as sandstone, or tufa and travertine from the spring's cornice.

Fauna Bone. A total of 1,978 individual pieces of small mammal and reptile bones were recovered. Though they have not been subjected to rigorous osteoarchaeological analysis, species identified during artifact accessioning include Mojave Desert Tortoise (Gopherus agassizii) and Desert Pocket Mouse (Chaetodipus penicillatus) (Olsen 1964, 1968). Many of the bones are burned, though none appear to have been deliberately culturally
modified. There were some bone with metal saw cuts recovered from a krotovena in the 0-10 cm level of test unit 9 on the top of the mound. It is likely that these are either from a pothunter’s picnic or from the abundant trash present on the site at the time of this project.

**Burnt Rock Ceramics**

Burnt Rock Spring Mound is similar to most Ceramic period sites in the Las Vegas Valley because it contains ceramic wares generally affiliated with three groups, Ancestral Puebloan (Virgin Anasazi), Patayan, and the Southern Paiute (Seymour 1997; Seymour and Rager 2001a). A small number of intrusive southern Utah and central Arizona wares were identified at Burnt Rock; however, this is also typical of sites in the valley.

A total of 645 sherds, 297 from a 1970s University of Nevada, Las Vegas surface collection, and 348 from this project were analyzed by Archaeologist Gregory Seymour of the Las Vegas Springs Preserve (Seymour and Rager 2001a, 2001b) (Tables 5-7).

The surface counts, in general, were highest in disturbed areas of the site on the top of the mound. Gray and red wares were 60 percent of the assemblage. One difference between the surface and subsurface assemblages is the lower subsurface counts of Southern Paiute Brown ware. This is consistent with the prevailing view that Brown ware ceramics were manufactured later than the other wares (Seymour 1997; Seymour and Rager 2001a, 2001b).

Ceramics were not recovered from all 14 excavation units. Eleven of the 14 excavation units (79 percent) contained ceramics, with five of those 11 (46 percent of the ceramic units, 36 percent of all units) excavation units producing more than ten sherds each. Four of these units with more than ten sherds were situated on the south-facing slope of the mound. Unit 14, an extension of Unit 1, was the exception on the north side. Most of the ceramics recovered from that unit, however, may be from a single North Creek Gray vessel (Seymour and Rager 2001a, 2001b).

Relative inter-ware ratios were constant from surface to 80 cm. Eighty percent of the sherds by count came from the upper 40 cm with approximately 60 percent of the
subsurface assemblage coming from the upper 30 cm and an additional 20 percent from the
30-40 cm levels. This suggests that all three culture groups commonly identified as inhabiting
the valley during prehistoric times visited this mound throughout the ceramic period (Seymour
and Rager 2001a, 2001b).

Lithic Analysis

Overview. The vast majority of the lithic assemblage is small, late stage reduction
debitage of variously colored cryptocrystalline silicates (CCS) such as flint, chert, and
chalcedony. Very few formal or expedient tools were identified from the surface collection
or from subsurface contexts. Forty-four very fragmentary bifaces were recovered, four from
the surface and 40 from the subsurface. Seven broken, but typeable, projectile points were
recovered from the mound. Six came from the subsurface archaeological test units and one
was found on the surface of the mound (Table 8). Three were typed as Elko Eared points
(Elko series), a late Archaic style. Three more were typed as members of the Desert series
which dates to the late Ceramic. These three were a single Cottonwood Triangular point and
two Desert Side-notched points. The remaining projectile point was typed as a Gatecliff
Contracting Stem point which dates to the Early Ceramic. A gray chert Elko Eared (artifact
number 2000-2-1058) was recovered on the surface of the south side of the mound in unit
12 (Figure 8). The other two Elko series points also were recovered from the north side of
the mound in unit 1 (artifact number 2000-2-1059) and unit 7 (artifact number 2000-2-1057).
The three Desert series points were recovered from the south side of the mound from
units 11 and 13 (Table 8).

A total of 6,641 pieces of debitage were recovered from Burnt Rock. 5,835 (88
percent) from subsurface contexts. All have vertical provenience derived from the arbitrary
10 cm levels of the 1 x 1 m excavation units. The radiocarbon date ranges returned from the
Burnt Rock excavations span the end of the Late Archaic to the Ethnohistoric. The continuous
series of ^14C dates from excavation units 1 and 8 provides an uncommon opportunity to
Table 8. Projectile Points Recovered from Burnt Rock Mound.

<table>
<thead>
<tr>
<th>Artifact Number (2000-2-n)</th>
<th>Period</th>
<th>Point Type</th>
<th>Unit</th>
<th>Level (cm)</th>
<th>Material¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>501</td>
<td>Early</td>
<td>Gatecliff</td>
<td>13</td>
<td>30-40</td>
<td>Gray/White CCS</td>
</tr>
<tr>
<td></td>
<td>Ceramic</td>
<td>Contracting-stem</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>517</td>
<td>Late</td>
<td>Cottonwood</td>
<td>13</td>
<td>20-30</td>
<td>Buff CCS</td>
</tr>
<tr>
<td></td>
<td>Ceramic</td>
<td>Triangular</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>595</td>
<td>Late</td>
<td>Desert Side</td>
<td>11</td>
<td>0-10</td>
<td>Gray CCS</td>
</tr>
<tr>
<td></td>
<td>Ceramic</td>
<td>Notched</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>Late</td>
<td>Desert Side</td>
<td>8</td>
<td>0-10</td>
<td>Gray CCS</td>
</tr>
<tr>
<td></td>
<td>Ceramic</td>
<td>Notched</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1057</td>
<td>Late</td>
<td>Elko Eared</td>
<td>7</td>
<td>30-40</td>
<td>Gray CCS</td>
</tr>
<tr>
<td></td>
<td>Archaic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1058</td>
<td>Late</td>
<td>Elko Eared</td>
<td>12</td>
<td>Surface</td>
<td>Gray CCS</td>
</tr>
<tr>
<td></td>
<td>Archaic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1059</td>
<td>Late</td>
<td>Elko Eared</td>
<td>1</td>
<td>40-50</td>
<td>Red-Brown</td>
</tr>
<tr>
<td></td>
<td>Archaic</td>
<td></td>
<td></td>
<td></td>
<td>CCS</td>
</tr>
</tbody>
</table>

¹ CCS = Crypto-crystalline Silicate
examine the artifacts from these units in a chronological context (Figure 10). The artifacts in those 10 cm levels can be examined in the context of our assumptions about lithic or ceramic traditions by associating an excavation level with a temporal segment of the commonly accepted chronology.

The initial lithic and ceramic analysis suggested that it would be advantageous to concentrate on test units 1 and 8 as these two units yielded the most debitage. An Elko point was recovered from the 30-40 cm level of unit 1 and yielded no ceramics and unit 8 had the most ceramics. Thus, it seemed promising to compare the two units. Additional \(^{14}C\) samples were processed to establish a completely dated column for excavation test units 1 and 8. When it was confirmed that no radiocarbon sample for the 20-30 cm level of Unit 1 had been taken during fieldwork, the sample from the 20-30 cm level of adjacent Unit 14 was processed.

Initial lithic and ceramic analysis suggested that there were anomalies between the data sets of the two units. The debitage technological type ratios appeared to vary with depth and further seemed to vary with the cultural chronology. As proportional amounts of Retouch Type 1 debitage seemed to be greatest in the Late Archaic and lowest during the latter Early Ceramic. As well, the proportion of Retouch Type 2 debitage seemed to be greatest during the later Early Ceramic and lowest during the Late Archaic.

The ceramics, however, did not show this same variance through time. Specifically, since it is assumed that Ancestral Puebloan Gray ware ceramics ceased to be manufactured in the area after about 800 B.P. (A.D. 1,150) (Lyneis 1995), this type should have disappeared from the archaeological record. It appeared that Gray ware ceramics persisted in the archaeological record into Ethnohistoric Period (Figure 5). Clearly, since the lithic and ceramic analyses from the same unit did not seem to support each other, the orderly superpositioned radiocarbon dates of Units 1 and 8 became suspect.

To examine this, groups of artifacts from the subsurface test units below 10 cm were assigned to an Artifact Period based on the radiocarbon dates from that level. These Artifact
Groups chosen subdivided the cultural chronology presented earlier in Chapter 2. These groups were arbitrarily called Artifact Periods (AP#) so there would be no confusion with the regional chronology (Figure 5). The subdivision occurs in the Early Ceramic when the Virgin Anasazi disappear from the archaeological record (Lyneis 1995).

The Late Archaic begins about 5,000 B.P. (Table 5). Diagnostic projectile points from this period include the Elko series, Gatecliff Contracting Stem (Gypsum), and Humboldt concave base. There was a significant increase in ground stone usage (Grayson 1993; Lyneis 1995; Sutton 1996; Warren 1984; Warren and Crabtree 1986) during the Late Archaic. All levels with radiocarbon dates within the Late Archaic (5,000 - 1,600 B.P.) were assigned to Artifact Period 1 (AP1). The Early Ceramic follows the Archaic at about 1,600 B.P. and lasts until 1,100 B.P. when ceramics and the Rosegate projectile point series (Grayson 1993; Lyneis 1995; Sutton 1996; Thomas 1981; Warren 1984; Warren and Crabtree 1986) appear in the archaeological record. The Rosegate series is smaller in size than the Late Archaic styles which implies that the bow and arrow had been adopted, as the larger dart points used in conjunction with the atlatl are no longer as abundant. All levels with radiocarbon dates within this time span were assigned to Artifact Period 2 (AP2). During the latter part of the Early Ceramic (1,100-800 B.P.), the distinctive Ancestral Puebloan ceramic styles occur in this region (Lyneis 1995). Any excavation levels that produced radiocarbon dates within this time span were assigned to the Artifact Period 3 (AP3). One expectation is that this scheme would separate what is assumed a less residentially mobile subsistence from the earlier gathering economy and later collecting economy. All levels producing dates younger than 800 B.P. were assigned to Artifact Period 4 (AP4) (Table 9).

Assumptions and Expectations. Any analysis is undertaken with a constellation of assumptions and expectations. One expectation for the results of this analysis is that the percentages of debitage in typological categories will vary through time as the technological trajectory varies. This is based on the assumption that during the Archaic (AG1), groups were more residentially mobile, so the debitage ratios should show a greater dependence on
formal tool manufacture from a curated bifacial core tool kit. As groups began to focus more on specific resources, groups became 'tethered' (*sensu* Binford 1980) to the specific places in the landscape where those resources were available. There is a relationship between mobility and lithic technology.

As group mobility decreases, so does the amount of formal tool manufacture, replaced by the use of expedient tools (Bettinger 1991; Kuhn 1995; Rasic and Andrefsky 2001). Therefore, the debitage from AG1 levels should have a higher percentage of Retouch Type 1 compared to Retouch Type 2 (Figure 12) (Chapter 4). As groups become less mobile, and presumably, groups during AG3 times were the least mobile, the amount of biface reduction and maintenance would decrease while expedient tool use increased, resulting in a decrease in the percentage of Retouch Type 1 in relation to Retouch Type 2 flakes. As well, there should be a greater percentage of indeterminate flakes (IND) compared to production shatter (SHA) since the relative amount of expedient tool production to formal tool production is expected to be much lower for mobile hunter-gatherer subsistence groups (Andrefsky 1998; Kelly 1988).

The AG3 (800-1,250 B.P.) population is expected to show the greatest divergence from the Archaic population. If the assumption that groups utilizing the resources at Burnt Rock Mound during that time period were less residentially mobile agriculturists who came to the mound for a targeted resource is accurate, then the debitage should still reflect the lithic technology of the group. Therefore, the debitage from the group’s activities would have the highest percentage of expedient retouch flakes. These will be small pressure flakes, probably of size grades 1 and 2. Additionally, percentages of shatter should be the highest in this population as AG3 groups are thought to have the least emphasis on lithic technology. Therefore, knappers would have been more likely to apply inappropriate forces and techniques, resulting in a greater amount of shatter.
Figure 10. Units 1 and 8 Excavation Levels Correlated to Radiocarbon Dates.

Table 9. Artifact Groups Correlated to Chronological Period.

<table>
<thead>
<tr>
<th>B.P.</th>
<th>B.C./A.D.</th>
<th>Projectile Points</th>
<th>Artifact Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-800</td>
<td>1150-1950</td>
<td>DSN</td>
<td>AG4</td>
</tr>
<tr>
<td>800-1100</td>
<td>850-1150</td>
<td>Rosegate</td>
<td>AG3</td>
</tr>
<tr>
<td>1100-1600</td>
<td>350-850</td>
<td>Late Archaic</td>
<td>AG2</td>
</tr>
<tr>
<td>&gt; 1600 B.P.</td>
<td>&lt; A.D. 350</td>
<td>Late Archaic</td>
<td>AG1</td>
</tr>
</tbody>
</table>

* B.P. year 0 = A.D. 1950

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Conclusions

The four debitage groups can be informally described here on the basis of several characteristics. The AG1 (Archaic) levels have the absolute highest percentage of Retouch Type 1 flakes and the lowest percentage of manufacture shatter. This group also has the highest ratio of Retouch Type 1 to Retouch Type 2 technological types and almost no (n=3) size grade 1 debitage (Figure 11). This is similar to what would be expected for highly residentially mobile, sub-band hunter-gatherers. It is interesting to contrast this with the AG3 levels as they have the least ratio of Retouch Type 1 to Retouch Type 2 flake types (Figure 11).

The AG2 levels have a slight increase in the percent of Retouch Type 2 and a decline in the percentage of Retouch Type 1, making the Retouch Type 2/Retouch Type 1 ratio approach 1:1. Production shatter appears as a significant percentage of the debitage for the first time. Indeterminate flake (IND) percentages remain similar to the Late Archaic. In addition, the relative ratios of debitage size grade between the Archaic and Ceramic I populations are nearly identical.

Debitage from the AG3 (Ancestral Pueblo) levels have over twice the percentages of Retouch Type 2 debitage compared to the Late Archaic. The Retouch Type 2/Retouch Type 1 ratio is the highest for this sample (> 2:1). The highest percentage of size grade 1 debitage is also found during this period.

The AG4 levels have Retouch Type 2/Retouch Type 1 ratios slightly greater than 1:1, approximately the same percentage of IND debitage as the Archaic levels, while the percentages of shatter debitage are consistent with other Ceramic levels. Approximately the same ratios of size grade 2 and 3 debitage as AG2 and AG1 levels.

The AG3 period is significant as a time of expedient tool production as shown by the lowest percentages of Retouch Type 1 debitage and highest percentages of Retouch Type 2 debitage. Figure 10 is a 100 percent stacked bar graph for debitage type plotted against chronological period for this data. Pearson Chi-Square ($\chi^2$) test results ($\chi^2=13.447$):
Pearson Chi-Square ($\chi^2$) Tests (SPSS Student version 8.0)

$\chi^2$ Value = 13.447, df = 3, $p = 0.004$
Number of Valid Cases = 480

0 cells (0%) have an expected count less than 5. The minimum expected count is 15.11.

Figure 11. Stacked Bar Chart Showing the Relationship Between Retouch Type 1 and Retouch Type 2 Debitage.

Figure 12. Illustration Showing the Morphological Differences of Retouch Type 1 and Retouch Type 2 Debitage.

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df=3, \( p=.004, n=480 \) were generated using the SPSS statistical application (student version 8.0). Since \( p < .05 \), the null hypothesis of 'no difference' can be rejected (Shennan 1997; Thomas 1986a). However, we can not reasonably infer that this is actually the result of a shift to an expedient tool trajectory from the curated biface strategy of the Late Archaic levels. A primary reason is that, in the context of this analysis, it is impossible to differentiate expedient scraper maintenance debitage from bifacial edge finishing and rejuvenation debitage at size grade 1 (Andrefsky 1998). However, the distribution of size grades does not vary significantly through time. When the same flake population is segregated into members of size grade 1 and all other size grades, the visual results of the 100 percent stacked histograms are promising. However, insufficient numbers of size grade 1 debitage were recovered from Late Archaic levels to statistically test this hypothesis (Figure 13).

This finding of significance supports the hypothesis that there are differences between the four populations when grouped according to radiocarbon dates. The differences are the greatest between the AG1 (most residentially mobile) and AG3 (least residentially mobile) lithic debitage populations.

Several debitage attributes recorded during analysis can be used to discriminate between artifact populations at an archaeological site. One that has shown promise is the comparison of biface-thinning flakes to pressure flakes (Retouch Types 1 and 2 in this study) (Amick 1989; Rasic and Andrefsky 2001). At Burnt Rock, the two highest dated levels in Unit 1 (10-20 and 20-30 cm) were compared to the sum of the dated levels in Unit 8. Based on the radiocarbon dates these populations should be chronologically equivalent and have approximately the same ratios of biface-thinning to pressure/retouch flakes. As a control, the lower two levels of Unit 1 (30-40 and 40-50 cm) were also plotted. It was assumed that the AG1 (Archaic) population has a different lithic manufacturing strategy and will be divergent from the Ceramic period population (AG2, AG3, and AG4).

The 100% stacked histograms contrasting the Late Archaic of Unit 1 and Ceramic Period of Unit 8 are very satisfying because there is a visible difference (Figures 13 and 14).
Figure 13. 100% Stacked Histogram of Debitage Size Grade Distribution in the Four Artifact Groups, Units 1 and 8.

Figure 14. 100% Stacked Histogram of Debitage Technological Types in the Four Artifact Groups, Units 1 and 8.
This disappears when the Ceramic Periods of Unit 1 and Unit 8 are compared. There is a difference between the debitage populations of Unit 1 and 8. However, it is uncomfortable to assign chronology (and therefore archaeological culture change) as a primary factor here since the lithic strategy during the Late Archaic of Unit 1 is not significantly different from the Ceramic. It is evident that there is a difference in the lithic reduction and maintenance strategies at Burnt Rock. However, it is possible that it may be due to spatial organization of tasks at the mound rather than a chronological difference.
CHAPTER 6

DISCUSSION AND CONCLUSIONS

This chapter presents discussion and conclusions from the archaeological surface collection and test excavations at 26CK3601, Burnt Rock Spring Mound. A variety of archaeological materials were recovered by the project during February, March, and April 2000 (Table 3). These materials included ground stone, ceramics, stone tools, the debris from the manufacture and maintenance of stone tools (debitage), and fauna bone. However, because this thesis focused on micro-debitage analysis and relied on radiocarbon dates as a part of the analysis only the debitage from test excavation units 1 and 8 which had radiocarbon dating of all levels are discussed in detail here.

Lithic Analysis

Overview. The vast majority of the lithic assemblage is small, late stage reduction debitage of variously colored cryptocrystalline silicates (CCS) including flint, chert, and chalcedony. Very few (less than 0.007 percent) formal or expedient tools were identified from the surface collection or from subsurface contexts. Forty-four biface fragments were recovered, four from the surface and 40 from the subsurface. Seven of those bifaces are typeable projectile points.

A total of 5,883 pieces of debitage were recovered with vertical and horizontally provenience from subsurface contexts at Burnt Rock. The radiocarbon date ranges returned from the Burnt Rock excavation unit levels span the end of the Late Archaic to the Ethnohistoric. The series of \(^{14}C\) dates from excavation units one and eight provides an
uncommon opportunity to examine the artifacts from these units in a chronological context. The artifacts in those 10 cm levels can be examined in the context of our assumptions about lithic or ceramic traditions by associating an excavation level with a segment of the commonly accepted cultural chronology (Table 10).

The oldest \(^{14}\)C dates, 2,030-1,795 B.P. (Beta 143484) and 2,000-1,720 B.P. (Beta 152722), are from the Late Archaic (Table 8). The Late Archaic begins about 5,000 B.P. Diagnostic projectile points from this period are the Elko series, Gypsum (Gatecliff Contracting-stem type), and Humboldt concave base type. The Early Ceramic follows the Archaic at about 1,600 B.P. and lasts until 1,100 B.P. when the Rosegate series, a smaller point style (Thomas 1982), appears in the archaeological record. This implies that the bow and arrow were introduced, as the larger points used in conjunction with the atlatl are no longer found. Ceramics make their earliest known appearance in the northern Mojave during this segment of the Early Ceramic (AG2). All levels with radiocarbon dates within this time span were assigned to Artifact Group 2. The distinctive Ancestral Puebloan ceramic styles occur in this region from 1,100-800 B.P. Any excavation levels that produced radiocarbon dates within this time span were assigned to Artifact Group 3. In addition, this would separate what is assumed a semi-sedentary subsistence from the prior gathering economy and later collecting economy. All levels producing dates younger than 800 B.P. were assigned to Artifact Group 4.

Conclusions

Prehistoric group mobility and sedentism (residential mobility) through time has been a research direction in Great Basin archaeology since Jesse Jennings proposed the Desert Archaic (Beck [editor] 1999; Beck and Jones 1992; Bettinger 1991. 1993; Grayson 1993; Kelly 1988, 1997; Madsen and Rhode [editors] 1994; Sutton 1996). Archaeological sites in southern Nevada, including Late Holocene habitation sites, are typically multicomponent surface assemblages. Because of this, few intensive debitage analyses to
examine diachronic and synchronic change have been attempted in the Las Vegas Valley or southern Nevada. Fewer have had subsurface $^{14}$C dates associated with excavation levels. Burnt Rock Mound offers an unusual opportunity to examine subtle differences in residential mobility through the analysis of discrete radiocarbon-dated debitage assemblages. The results of this analysis can now be tested against other sites in the Las Vegas Valley and elsewhere.

Ceramic production and a reduction in residential mobility are generally considered to have coevolved throughout the Southwest. Most hunter-gatherer groups had little use for ceramics, preferring more durable, lighter, but much more labor-intensive basketry. Researchers have defined a link throughout the Southwest between the first manufacture of ceramics and a transition away from higher residential mobility to a less residentially mobile existence. This sort of ‘tethered’ existence is typically focused on plant cultivation (Crown and Wills 1995). Cultivation typically requires a less residentially mobile strategy. The Virgin Anasazi practiced agriculture in southern Nevada (Lyneis 1995): however no evidence of this has been found in the Las Vegas Valley.

Current paleoenvironmental models for the Southwest and southern Nevada suggest that a period of aridity had begun about 1,050 B.P. and lasted until 650 B.P. (Jones et al. 1999). It has been suggested that this climactic anomaly stressed cultural adaptation in these populations (Jones et al. 1999). During periods such as this, when overall effective moisture decreases, areas with aquifer fed perennial springs, spring mounds, and streams such as the Las Vegas Valley would become more attractive (Sheehan 1994).

Because ceramic wares in equivalent percentages are represented from all ceramic period levels at Burnt Rock, we would be tempted to infer that mixing of cultural midden had occurred. This appears, however, not to be the case based on the debitage analysis.

It is interesting to note what is absent from the Burnt Rock assemblage. Ground stone and formal flaked tools are almost absent, as are cores, discarded manufacture failures and exhausted tools. Further, one aspect of the latter part of the Early Ceramic, the marked rise in the relative abundance of production shatter, may be indicative of the discard of
expedient tools due to breakage during attempts to rejuvenate their working edges. This would be indistinguishable from the shatter produced from the manufacture of formal tools by other groups. In other words, the abundance of shatter in the latter Early Ceramic is functionally equivalent to discarded exhausted tools during the Late Archaic. But we assume that less mobile groups do not curate their exhausted tools for later rejuvenation or remanufacture into other formal tools as the more mobile (Late Archaic) groups did.

The morphological difference in debitage produced by edge rejuvenation from soft-hammer blows rather than informal retouch of an edge by removing small flakes by bending pressure is slight. However, when the relative proportions change through time, those differences are statistically significant, and the time periods of their production correspond to a known change in the levels of group mobility as they do at Burnt Rock (Rager and Seynour 2001). These small morphological differences may represent a useful analytical technique. This experimental result should be archaeologically tested elsewhere southern Nevada and the northern Mojave.

The introduction of ceramics about 1,450 B.P. and the subsequent decline in terms of raw debitage counts during the latter part of the Early Ceramic may be indicative of a shift to ceramics from lithics for the performance of certain tasks at Burnt Rock Spring Mound. Conversely, it may be that the resource at Burnt Rock was less utilized by these groups. This unknown resource may have been partially or completely processed at Burnt Rock. Further, it is likely that this site, unusual in the desert because of the year-round presence of water, provided that essential component (water) that was not available elsewhere. Somehow, fires were necessary and the fire-cracked rock fragments that gave this mound its name are the remnants of many processing sessions.

The stratigraphy of Burnt Rock Mound shows evidence of successive, cyclic, spring activity punctuated by episodes of desiccation and erosion. Groundwater has a high oxidizing capacity, which acts within the reducing environment necessary for black mat formation to eliminate organic material from older portions of the record. Because of this, 14C dates
derived from preserved black mats will represent only the final period of spring discharge rather than the entire episode (Quade et al. 1998:133-134). Using this as a guideline, there are three distinct episodes of black mat formation at Burnt Rock Mound. The earliest black silt-clay black mat (Beta-143475, 12,530 ± 60 B.P.) has nearly been obliterated by the subsequent green silt-clay black mat. This earliest black mat does fall slightly outside the area’s established radiocarbon date range for spring activity onset. This episode also occurs prior to the radiocarbon dating of the Younger Dryas/Clovis Drought climatic event. What remains of this mat lies directly on the parent D horizon soils making an earlier mat formation episode unlikely. The later mat, around 9,640 B.P., is the largest observed at Burnt Rock Mound in regards to strata thickness and extent. The greenish color and ^14C dates (Beta-143476, 9,680 ± 60 B.P.; Beta-143479, 9,610 ± 60 B.P.) of this strata correspond to Quade’s (Quade et al. 1998) discussion of E2 unit mats at several locations in the Pahrump and Las Vegas Valley. This is also within 300 radiocarbon years of one of the Lake Mojave high stands (Enzel et al. 1992). The final black mat date (Beta-143477, 6,340 ± 40 B.P.) corresponds with the end of the first group of black mat formation in the region at 6,300 B.P. (Quade et al. 1998). As a group, the later three black mat ^14C dates at Burnt Rock Mound correspond to the first group of black mat activity (Quade et al. 1998).

The dates from the spring vent represent two spring activity episodes. The oldest (Beta-143478, 6,470 ± 40 B.P.) is the same as the final black mat. The later date (Beta-143474, 4,200 ± 40 B.P.) stands outside Quade’s (Quade et al. 1998) chronology of black mat formation in the area. It may be that this represents a period of rejuvenated spring flow after the postulated middle Holocene drought. Though the flow was insufficient to produce a black mat, it was doubtless critical to wildlife, and perhaps humans, at this time.

The only statistical test that proved to be significant is shown in Figure 11 which is a stacked bar chart of debitage technological types plotted against chronological periods in the form of Artifact Groups. The Pearson Chi-Square ($\chi^2$) test results ($\chi^2=13.447; \text{df}=3$).
$p = .004, n = 480$) were generated using the SPSS statistical application (student version 8.0). Since $p < .05$, the null hypothesis of 'no difference' can be rejected.

This finding of significance supports the hypothesis that there are differences between the four populations when grouped according to radiocarbon dates. The differences are the greatest between the Artifact Group 1 (Late Archaic) and AG3 (latter Early Ceramic) lithic debitage populations. However, we can not reasonably infer that this is actually the result of a shift to an expedient tool trajectory from the curated biface strategy of the Late Archaic levels. A primary reason is that, in the context of this analysis, it is impossible to differentiate expedient scraper maintenance debitage from bifacial edge finishing and rejuvenation debitage at size grade 1 (Andrefsky 1998). However, the distribution of size grades does not vary significantly through time.

Summary

The hydrological history of Burnt Rock Mound appears to correlate well with the published sequences of the Late Pleistocene and Holocene in the northern Las Vegas Valley and northern Mojave. An examination of the micro-debitage produced statistically significant differences when the ratios of two morphological debitage types were analyzed based on the radiometric ages of the excavation levels they came from. These differences compare favorably to the levels of residential mobility suggested by the regional cultural chronology.

It is tempting for researchers to place the environment in the form of the systemic response of the aquifers and the availability of surface water with the last 12,000 years of variation in regional and continental rainfall patterns as a primary determinant for the variety of human adaptation through prehistory. Spring mounds and spring-fed stream deposits do however, provide an additional source of environmental proxy data for continuing to test and refine what is known about the history of climate and cultural continuity and change. Southern Nevada archaeological sites will hopefully continue to contribute to what is known
about human adaptation and the responses to those environmental changes before they are lost to the rapidly expanding cities in the Las Vegas Valley.
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