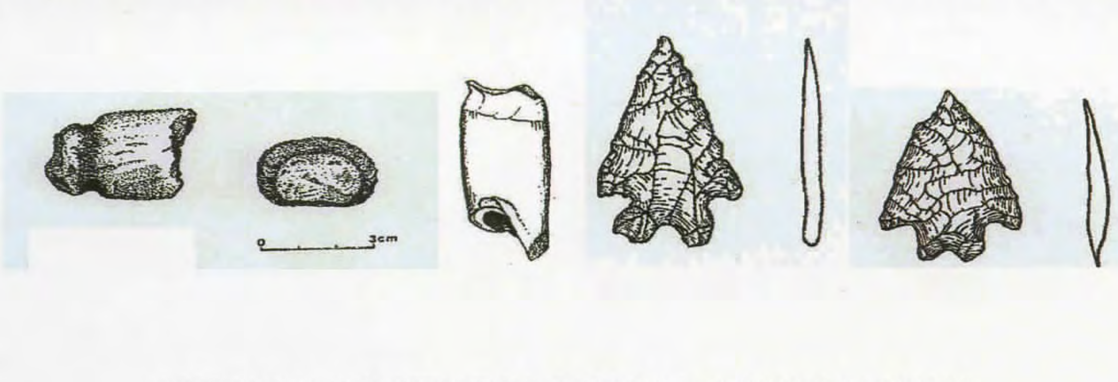
NEVADA ARCHAEOLOGIST

VOLUMES 20 & 21 2005

Mary Rusco at the Sand Island Site in Rye Patch Reservoir, ca. 1977 (Courtesy of NSM)



NEVADA ARCHAEOLOGICAL ASSOCIATION

Nevada Archaeological Association

The design for the NAA logo was adapted by Robert Elston from a Garfield Flat petroglyph.

Board of Directors

The Board of Directors of the Nevada Archaeological Association is elected annually by the membership. Board members serve one year terms. The Board of Directors elects the Association's officers from those members elected to the Board. The Board of Directors meets five times a year, once immediately prior to, and again immediately following the Annual Meeting, and once each of the remaining quarters throughout the year.

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Membership

The Nevada Archaeological Association is an incorporated, non-profit organization registered in the State of Nevada, and has no paid employees. Membership is open to any person signing the NAA Code of Ethics who is interested in archaeology and its allied sciences, and in the conservation of archaeological resources. Requests for membership and dues should be sent to the Membership Chairman at the address below. Make all checks and money orders payable to the Nevada Archaeological Association. Membership cards will be issued on the payment of dues and the receipt of a signed Code of Ethics. Active members receive subscription to the *Nevada Archaeologist* and the NAA Newsletter *In Situ*. Subscription is by membership only; however, individual or back issues may be purchased separately.

Dues

Student	$10
Active	$20
Active Family	$25
Supporting	$30
Sponsor	$50
Patron	$100
Life	$500

Future Issues

The NAA is currently updating the requirements for submitting manuscript for the *Nevada Archaeologist*. The updated requirements will be published in the next *Nevada Archaeologist* and will also be available on the NAA web site at www.nvarch.org.

General Correspondence

Inquires and general correspondence with the Nevada Archaeological Association should be directed as follows:

Nevada Archaeological Association
P.O. Box 73145, Las Vegas, Nevada, 89170-314

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Cover:
Mary Rusco at Rye Patch "Sand Island" (26PE450) ca 1977

Code of Ethics

The purpose of the Nevada Archaeological Association (NAA) is to preserve Nevada's antiquities, encourage the study of archaeology and to educate the public to the aims of archaeological research. Members and chapters of the NAA shall:

1. Uphold the purpose and intent of the NAA.
2. Adhere to all antiquities laws.
3. Seek the advice, consent and assistance of professionals in archaeology and/or history in dealing with artifacts, sites and other materials relating to antiquities.
4. Assist professionals and educators in accomplishing the objectives of the NAA.
5. Be a personal envoy of the NAA and responsible for conducting themselves in a manner so as to protect the integrity of the artifacts, sites, or other material.

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Editors' Corner

Steven E. Daron and Renee Corona Kolvet

Volumes 21 and 22 of the *Nevada Archaeologist* have been combined into one issue and are finally out. This issue is dated 2005 although Volume 21 should have been available in 2002 and Volume 22 in 2003. We apologize for the delay.

It is our pleasure to dedicate this issue to archaeologist Mary K. Rusco who was awarded the 2004 Lifetime Achievement Award at the Annual Meeting of the Nevada Archaeological Association in Winnemucca on April 17, 2004. We want to thank Dr. Margaret Lyneis for preparing the enclosed synopsis of Mary's career accomplishments. Mary set high standards for professionals working in the Great Basin. Her enthusiasm and knowledge inspired a generation of professional and amateur archaeologists who continue to benefit from her scholarly contributions.

We are also pleased with the fresh ideas and new data presented in the following papers. Four articles discuss historic topics in the central and southern portions of Nevada. Valentine's article on the Standard Mine examines how national issues affected a mine company and its employees in rural Nevada. The Hartwell et al. article combines archaeological and historic research to tell the story of the Austin and Reese River Transportation Company Toll Road. Johnson provides a historic overview of the Hot Creek Valley based on his research of underground nuclear testing. Lastly, Wriston discusses the material remains at two ethnohistoric sites at Carson Lake and the need for additional, in-depth studies at post-contact sites.

This issue contains several thought-provoking papers on a variety of prehistoric topics. Seymour and A. Rager's article outlines their in-depth study on the development of the ceramic type known as Lower Colorado Buff Ware. Seymour and H. Rager's article shares new data from Burnt Rock Spring Mound and examines post-mid-Holocene continuity at this Vegas Valley site. McLane et al. illustrate how rock art can be used to address cultural and environmental issues by comparing the petroglyphs at the Rock City Site to an extinct form of pronghorn. Slaughter et al. document the occurrence of roof sticks in several rock shelter sites in southern Nevada. The authors are seeking information from other sites to better understand this cultural phenomenon. Finally, Smith examines variations in the mobility patterns of Paleoarchaic people by examining lithic procurement practices at various Black Rock Desert sites.

We would also like to thank Les Paige and Anne McConnell. Their computer abilities and technical editing skills were invaluable to the production of this combined volume. Thanks also go to the Nevada State Museum, specifically Maggie Brown, for providing the cover photograph and contributing toward production costs.

Lifetime Achievement Award Presented to Mary K. Rusco at 2004 Annual Meeting

The Nevada Archaeological Association is honored to present its first Lifetime Achievement Award to Mary Kiehl Rusco. We celebrate her dedication to Nevada prehistory, history, and the concerns of Native Americans in her career of more than 30 years.

Many of us have benefited from Mary's generosity in sharing data and supporting graduate students. We have enjoyed working with her, and learning from collaborations. She has brought unusual warmth to all these professional relationships.

With an M.A. from the University of Nebraska, she began her work in Nevada in spring 1967 managing site records for the Nevada Archaeological Survey, Desert Research Institute, and the University of Nevada. Serving as staff archaeologist at the Nevada State Museum from 1974 to 1983, Mary completed numerous cultural resources management (CRM) projects. Subsequently, she worked as an independent contractor.

Two of her CRM projects while at the Nevada State Museum are especially noteworthy. She pioneered historical archaeological studies in Nevada with her work on the Lovelock Chinatown, a highway salvage project. As she developed her research, Mary contacted other scholars and became one of the group of early researchers of the overseas Chinese in the American West. We believe that she is the only Nevada archaeologist to find a pot of gold. She and her team recovered a cache of 112 U.S. gold coins under the floor of a dwelling at Lovelock.

Mary directed excavations along the Humboldt River at Rye Patch Reservoir. A key part of these studies was investigating a possible association between people and extinct animals. It might have been misread, but careful, critical study of the geomorphologic context with her colleague and friend Jonathon Davis revealed that evidence did not support the coexistence of early Native Americans and Pleistocene fauna at this site.

More recent work that Mary modestly characterizes as "independent contractor doing compliance-related anthropological research" included two long-term collaborations. One was with Catherine Fowler, who was charged with Nevada's assessment of the Yucca Mountain Nuclear Waste Repository's potential impacts on Native American communities. Mary worked primarily with the Southern Paiute groups of Moapa and Las Vegas. An outgrowth of Kay and Mary's Yucca Mountain studies was collaboration with the Timbisha Shoshone people of Death Valley. It culminated in the acquisition of 9,000+ acres set aside for the Tribe by President Clinton in November of 2000.

During these same years Mary worked on dozens of projects with Ed Stoner of Western Cultural Resources Management, Inc. (WCRM) as it developed into one of the leading contracting firms in Nevada. She facilitated numerous Native American consultations; and wrote ethnographic backgrounds, data recovery and treatment plans, cultural resource inventory and data recovery reports, and professional papers.

With this award, we celebrate more than Mary's many accomplishments. She is a professional of great warmth and integrity, high ethical standards, a concern for all she has worked with. She has enriched our discipline and Association with her many contributions.

A Standard Mining Story

David Valentine
Nevada Bureau of Land Management

A definition of ore is, "A mineral of sufficient value as to quality and quantity which may be mined with profit" (Fay 1947:475). There are many natural, economic, technological, and political factors that determine whether or not a concentration of minerals is an ore. A relatively recent example stems from 1972 when the Federal government removed price controls that had long been maintained for gold. The price of gold soared, resulting in a significant gold mining boom in Nevada (Tingley et al. 1993:39). Utilizing open-pit mining methods and cyanide heap leach processing, rock containing as little 0.006 ounces of gold per ton was considered ore as long as the price of gold stayed at a minimum price of $375 per ounce (Round Mountain Gold 1994). Large, open-pit mines appeared throughout Nevada as a result of the combination of technology and high gold prices. This modern gold rush was not the first time Nevada experienced the right combination of technology and increase in gold prices. The Standard Mine in the Humboldt Range, Pershing County, Nevada, is an excellent example of how changes in price, technology, etc. made an "ore" and effected the development of a mine (Figure 1).

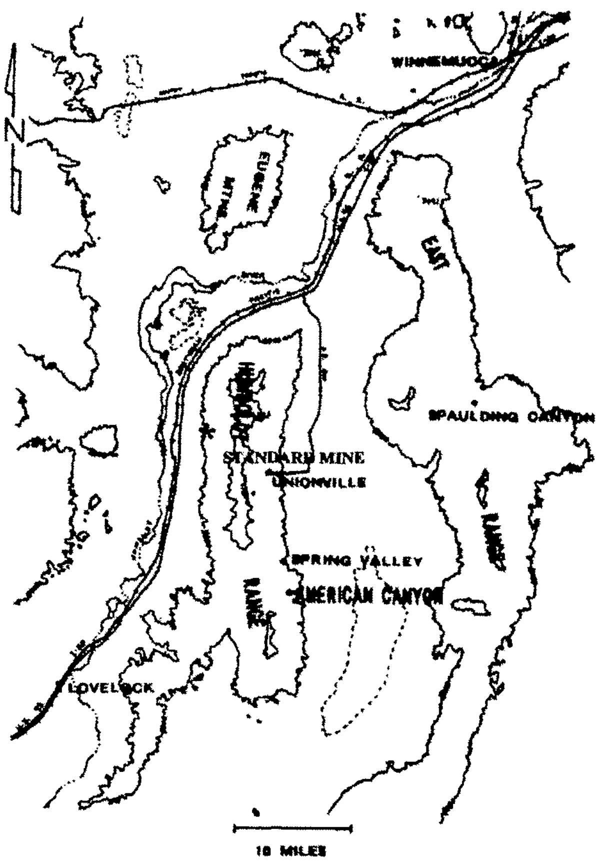

***Figure 1.** Location of theStandard Mine. Base Map U.S.G.S. Lovelock, Nevada, 1:500,000 topographic.*

TECHNOLOGY

The gold deposit at the Standard Mine became an ore when the price paid for gold became high enough that it could be recovered at a profit. Specific techniques that allowed for a profit included open-pit mining and a cyanide leaching mill process. Although these methods are common now, at the time they were relatively new. The Standard Mine and Mill were on the leading edge of mining technology.

Open-pit mining involves simply digging a pit into the ore body. This has been a mining method as long as there has been mining; however, prior to the late nineteenth-century it was not applied to low-grade ore bodies. Large amounts of overburden and ore could not be moved cheaply by hand, destroying the profit margin. Technological improvements in drilling, earth moving, and milling eventually came about that allowed open-pit mining on a massive enough scale so that miners could begin to exploit large, but low-grade, ore deposits.

To take advantage of explosives to break up large amounts of rock, miners needed to be able to drill holes in hard rock in order to insert the charges. This was initially done by hand, using hammers to pound drill steel into the rock. This was a slow process, and drilling one to two feet per hour was considered good progress for experienced, underground miners (Twitty 2001:41). Mechanized drills were eventually developed that greatly accelerated the drilling process and mechanized drilling was applied in open-pit mining. At first, drills were operated and moved by hand, but eventually drills were mounted on horse drawn wagons. After a while, self-propelled drills, mounted on caterpillar treads, were developed (Twitty 2001). This allowed miners to quickly drill numerous, large diameter holes and use explosives to break rock into sizes that could easily be handled (Gardner and Mosier 1941; Twitty 2001).

The introduction of power shovels was also a boon to open-pit mining, allowing for the movement of large amounts of rock relatively cheaply. The first shovels were operated by steam and mounted on rail car chassis, which required the laying of railroad track. By the 1920s, models mounted on caterpillar treads were available. These were much more flexible than the rail mounted models in that they could be moved to new locations without laying track (Twitty 2001). Gasoline, diesel, and electric powered caterpillar tread mounted shovels were available by the late 1930s (Gardner and Mosier 1941:8–16).

Haulage of waste rock and ore out of the pit was also greatly aided by technological advances. Early haulage also utilized rail, with trains of dump cars pulled over rails by locomotives. While rail continued to be utilized by large iron and copper mines well into the 20th-century, the use of trucks to haul waste rock and ore became common during the 1930s, especially at smaller mines (Gardner and Mosier 1941:16–24). The flexibility and lower operating costs of trucks made open pit mining even cheaper.

Gold mines with lower grade ore were also able to take advantage of cyanide milling. Cyanide was long recognized as a way to dissolve gold and silver, and the first method of doing so was patented in 1840. By the mid 1880s, cyanide was used in conjunction with amalgamation in many mills throughout the world. The Standard Mill in Bodie, California, was the first mill designed in the United States to solely use cyanide in its milling process. In 1892, the Ely Mill and Mining Company in White Pine County was the first Nevada mill to use only the cyanide process. By 1910, thirty thousand tons of cyanide was used in gold and silver milling (Lugaski and Young 2000).

The cyaniding mill process involves crushing the ore. This is done to maximize the exposure of the gold particles to the cyanide, and the finer the gold, the finer the ore needs to be crushed. The crushed ore is then introduced into a vat with a weak sodium- or potassium-cyanide solution, where the crushed ore and solution are agitated together in the presence of oxygen for a time. This allows the gold to be dissolved by the cyanide. The gold bearing cyanide solution (pregnant liquor) is then run through zinc shavings. The gold adheres to the zinc, and is recovered by heating the compound until the zinc is driven off (Young 1970:284).

GOLD PRICES

In the first several decades of the twentieth-century, the price paid for gold in the United States was regulated by the Federal government and maintained at $20.67 an ounce. The Great Depression, however, resulted in higher gold prices. In the early years of the Depression, many unemployed people began to rework the old placer districts throughout the western United States. In 1932, it was estimated that between 600 and 700 men were working in the placer fields of Nevada (Smith and Vanderburg 1932). In most cases the people involved recovered "wages," or made enough money to survive, especially if camped at a claim site and supplemented mining income with wage labor, gardening, and hunting (Miller 1998). Many state governments took note of this activity, and began to encourage it by providing information about placer grounds and by giving classes on placer mining techniques (Miller 1998). The Federal government also took notice, and took several measures to increase public knowledge of mining methods. One such method was a series of Information Circulars published by the Bureau of Mines on small-scale exploration and mining methods. These circulars were made available to the general public (cf. Gardner and Johnson 1934, 1936; Jackson and Knaebel 1932; Turner 1933). The Federal government also relaxed restrictions on who was able to buy gold, and the price paid by the Federal government for gold (the Gold Standard) was raised, reaching $35.00 per ounce on January 31, 1934 (Miller 1998:161). The price was raised to stimulate mining activity, and increased hard rock mining in addition to placer gold mining.

THE STANDARD MINE

The mineralized zone that would eventually become the Standard Mine's ore was identified and claimed by Jim Lally about 1918. The price paid for an ounce of gold at that time was not sufficient to be able to mine the deposit profitably. Lally, however, maintained his claims in the hopes that the price of gold would eventually rise, and he excavated several adits in the deposit (Lovelock Review-Miner [LRM] 1934).

In 1934, after the price of gold reached $35.00 per ounce, Jim Lally entered into a partnership with Nevada Supreme Court Justice J. A. Saunders. The deposit at his claims was described as being 300 feet wide, with assays ranging from $5.00 to $50.00 per ton (LRM 1934). Lally and Saunders convinced the Lindgren and Swinerton Construction Company of California that the property had potential, and soon 15 miners were at work exploring the deposits. The miners camped at the site, where a bunkhouse and cookhouse were constructed (LRM 1935). Lally died shortly after the construction company started to work, but Saunders continued to be active in the property (LRM 1935). Additional financial backing for the effort was provided by a group of men from San Francisco known as the Pacific Syndicate (LRM 1936b). The name "Standard" for the property was rumored to have come about because some members of the Pacific Syndicate were involved with the Standard Oil Company (LRM 1935). This was initially denied and it was implied that the name came from the gold price set by the government—the Gold Standard (LRM 1935; Vanderburg 1988:102). The oil rumor persisted, however, until the mine shut down (LRM 1949b).

Exploration on the property continued over the next three years. The number of miners employed at the property varied from four to 24 miners depending on the type of activity and the optimism of the backers. The ore body was thoroughly explored by a series of tunnels, shafts, raises, and winzes that totaled nearly 4,000 feet of excavations. The ore body and diggings were also carefully mapped. The exploration activity was conducted with the idea of proving the extent of the deposits at a minimum assay that would support mining using open-pit methods and an on-site mill. A minimum estimate to achieve this goal was quoted as 1,000,000 tons of ore averaging $2.25 per ton (Vanderburg 1988:102). The size of the ore body was eventually determined to be roughly 1,070,000 tons (Engineering and Mining Journal [E&MJ] 1940a). Musings on the capacity of the proposed mill were in the range of processing between 500 to 1,000 tons of ore per day (LRM 1935, 1936a–h, 1937a–c, 1938a,b, 1939a). The exploration and preparatory activity revolving around the Standard Mine was reported in the local newspaper in a very positive manner, a Nevada boosterism tradition since the beginning of mining in the state (Moehring 1999). The mine managers and investors in the property, however, were very meticulous and careful in their development approach.

In December of 1938, the Pacific Syndicate decided that the property could be profitably mined and they spun off the Standard Cyaniding Company. They brought in H. L. Hazen, a metallurgist and experienced cyanide mill manager[1], to run the project (LRM 1938b). In January 1939, a contract was let to the Western Knapp Company of San Francisco to construct a 500-ton cyanide mill. The Western Knapp Company had previous Nevada experience, including building mills at the Getchell Mine in Humboldt County and at Delamar in Lincoln County (LRM 1939a, 1939b). Initial plans to build a wood frame mill building were scrapped in favor of steel frame construction, which was felt to be more durable (LMR 1939c).

One important aspect of the mine and mill development was securing sufficient water. The Lovelock Review-Miner (1937a) reported construction on a diversion dam in Eldorado Canyon, two miles north of the mine property. The same article reported that the water rights had been filed in 1935. According to the Nevada State Water Engineer, a 1935 application was denied and additional applications in 1935 and 1936 were canceled or withdrawn (Nevada State Water

Engineer's office, personal communication, November 1999). The Master Title Plat for T. 31 N., R. 33 E., however, indicates that a right-of-way for a pipeline was granted on December 1, 1936 and was valid until January 4, 1951 (file number CC 020067). Newspaper accounts indicate that this line was surveyed in June of 1939 (LRM 1939g). Another application, for use of water from Spring Gulch Creek (a drainage between the mine and Eldorado Canyon), was filed in 1939 (Nevada State Water Engineer 1939). Whatever the bureaucratic confusion, another application was filed in April 1940 for water rights on the Eldorado Canyon dam and pipeline, and rights were granted in May of the same year. Water was piped to and stored in an above ground, metal tank, 36 feet in diameter by 12 feet deep (Nevada State Water Engineer 1940a, 1940b).)

After a few false starts, the Western Knapp Company subcontracted the earth moving for the mill to the Isabell Construction Company (LRM 1939b, 1939c). Activity began in May of 1939 with the grading of a new road (LRM 1939d). The Sierra Pacific Power Company started installing a power line to the site at the same time (LRM 1939d), and plans were made for phone service (LRM 1939g). Excavation for the mill continued through May, with the concrete work for the foundation beginning late in the month (LRM 1939e, 1939f). Concrete work and other construction activity continued through the spring and summer and into the fall (LRM 1939g–i). The mill began processing ore on October 7, 1939. It was reported to be the second largest mill operating in Nevada at that time (LRM 1939j) (Figure 2).

Figure 2. *Overview of the Standard Mill foundation as it currently exists.*

The mill was originally designed to handle 500 tons of ore per day; however, by January of 1940 they were treating 560 tons per day with a workforce of 20 men (LRM 1940a). The amount of ore treated daily gradually increased as the mill operators experimented with the size that the ore needed to be ground to in order to optimize metal recovery (Hazen and Bradley 1945). By March 1940, the mill was occasionally treating 600 tons per day (LRM 1940b, 1940c). Production reached a high of 700 tons of ore per day by the fall of 1940 when the optimum amount of grinding was determined (LRM 1940d). This level of work was maintained for a couple of years (Hazen and Bradley 1945; LRM 1941a). Recovery of gold from the ore was good, running as high as 88 percent, but maintained at about 85 percent to keep the daily tonnage at a maximum. The mill was able to efficiently treat both sand and slime (clay sized particles), which were treated and disposed of separately. The average assay of ore was $2.10 per ton (.06 ounces per ton), but material assaying as low as $1.19 per ton (.034 ounces per ton) was utilized if extraction costs could be kept low enough (Hazen and Bradley 1945). Early in 1940, costs averaged around $1.00 per ton, but had dropped to roughly $0.85 per ton by May (E&MJ 1940a,b, 1942b). From the beginning, the Standard Cyaniding Company mill utilized the most modern technology available. In several cases, workers made improvements in milling technology important in overcoming problems associated with local conditions. These improvements, related to warming the cyanide solution in freezing weather and drying damp ore, were reported in the mining literature (E&MJ 1941, 1942a).

The ore occurred in brecciated limestone. It was easily extracted by blasting and removing the shattered rock with power shovels and dump trucks, creating an open pit. The pit was named the Lally Pit (LRM 1949a). Removal of overburden and waste rock and transportation of ore to the mill was contracted. At first, the contract was given to G. K. Smith, who had seven men on the payroll (LRM 1940a–c). In September of 1940, the Isabell Construction Company took over the contract for shoveling and hauling, but it appears that Smith was retained as supervisor (LRM 1940d). Some underground work, excavating high-grade ore assayed at $14.00-15.00 per ton, continued at the property (LRM 1940c). During the first two years of production, the mine excavated 212,151 tons of ore with a gross yield of $327,691 (Couch and Carpenter 1943).

A bunkhouse and cookhouse were constructed at the site during the early development work. Based on time diagnostic artifacts found at that location, it appears as though the Standard Cyanide Company continued to use these facilities during and after construction of the mill. Additional housing, consisting of four two- and three-room houses with electric lights and running water, was constructed below the mill site (LRM 1940a).

During 1941, little news concerning the property was reported as the mine and mill settled down into a daily routine (LRM 1941a). One incident of note was reported, when the company expanded their operations to include a property in Gold Acres, Lander County, Nevada. A 400-ton cyanide mill was constructed at this location, and several people from the Standard Mine were promoted and transferred (LRM 1941b).

Nature began to interfere with mining operations in the open pit at the Standard Mine. In December of 1941 a landslide occurred on the east wall of the pit. A second slide occurred in August of 1942. This slide covered a large portion of ore (E&MJ 1942b; LRM 1942). The mine management believed that material under the slide probably could not be recovered profitably. The exact reasons for the slide were unknown, but speculations included excessive moisture and minor earthquakes (LRM 1942) (Figure 3).

The Second World War (WW II) also began to have an effect on the operations at Standard in 1942. The younger men working at the mine began to leave because of the draft and patriotic fervor. By August, the average age of the mineworkers was over 50. Mine manager Hazen believed that at that point operations were immune to disruption by the draft (LRM 1942). They were not, however, immune to other war related disruptions.

Figure 3. Overview of a portion of the Lally Pit. Note the scars on the lower right hand side of the photograph. These are fault scarps created during the slide.

In August, the haul contractor's trucks were requisitioned for "emergency aid on a government project" (the large landslide occurred while the vehicles were gone)(E&MJ 1942c:84). Loss of the vehicles resulted in a shortage of ore and a brief mill closure. The mill reopened in September (E&MJ 1942c; LRM 1942).

In the fall of 1942, the War Production Board (W.P.B.) issued Order L-208, which closed gold and silver mines producing more than 1,200 tons of ore per year. The idea behind this order was to release experienced miners to work in metals mines deemed necessary for the war effort (Miller 1998:149). This order shut down "gold properties of note," including the Standard Mine (E&MJ 1942d:82).

Subsequent to Order L-208, the W.P.B. wrote Order P-5e. This order was written to transfer needed equipment from shut-down gold and silver properties to strategic mines (Miller 1998: 149). Mill equipment from the Standard Cyanide Mill was transferred to the Nevada-Massachusetts tungsten mine (LRM 1945b), a property to the north of the Standard Mine in the Eugene Mountains. Equipment relocated to the tungsten mine included a rod mill, crushers, pumps, classifiers, a weightometer, and belts (E&MJ 1946a; LRM 1945b).

Although Order L-208 shut down the Standard Mine, it appears as though the remaining Standard miners were able to procure employment at strategic metal mines elsewhere in Nevada. For example, H. L. Hazen was hired as the chief metallurgist for the Manganese Ore Company in Boulder City, Nevada (E&MJ 1944). The Three Kids Mine, in Henderson, Nevada, also contracted with the Standard Mine's haul contractor, the Isabell Construction Company (Rafferty 1992:27).

Order L-208 was rescinded on July 1, 1945 (Tingley et al. 1993:30). H. L. Hazen soon announced plans to reopen the Standard Mine (LRM 1945b; 1945d). Many difficulties were encountered in doing so. One difficulty was from financial hardship caused by the W. P. B. Order L-208 shutdown. Prior to the shutdown, the Standard Cyaniding Company was paying off start-up debt with proceeds from the mine, and was in arrears after being closed. Nevada Senator McCarran introduced a bill, S-27, that helped protect gold and silver mines from debtors (LRM 1945a). This bill was successful, and aided many gold and silver mines (Miller 1998:149), including the Standard.

Another difficulty encountered was replacing mill equipment sold under W.P.B. Order P-5e. The Federal government paid $20,000 for the Standard's equipment, but it cost Standard Cyaniding $80,000 to replace. Some of this equipment was also upgraded at an additional cost of $25,000 (E&MJ 1946d; LRM 1945d, 1947a).

The Standard Cyaniding Company again turned to Western Knapp Co. to refit the mill; however, delivery of the equipment to Nevada was delayed by labor strikes (E&MJ 1946b; LRM 1946a). The last replacements were delivered and ore stripping began in June 1946 (LRM 1946b, 1946c). The mill started in October, and shipped their first bullion the same month (E&MJ 1946d; LRM 1946d). In addition to equipment delivery problems, occasional shortages of labor and materials were also reported (LRM 1947a).

Mine manager H. L. Hazen complained bitterly of government interference in the gold mining industry (LRM 1945c, 1946d, 1947a). His main complaint was against the Federal government for setting gold prices; he believed that gold should be sold on the open market (LRM 1945c). Hazen also complained about undue interference from up to eleven Federal bureaus, which led to unnecessary confusion and cost his company time and money (LRM 1946d, 1947a).

The Standard Cyaniding Company once again contracted out the pit work. In December of 1945, a contract was let with A. J. Kirkman. Kirkman was an experienced open-pit shovel miner, having also operated at the Mercur and Bothwell gold mines in Utah (LRM 1945e). He blasted the ore by first drilling a pattern of holes 18 feet deep and nine feet apart using a wagon drill. The holes were filled to within four feet of the top with blasting powder and detonated simultaneously with a blasting line. Ore and waste rock were hauled using 10-yard Mack trucks. Using a crew of 13 men, about 500 yards of ore and 700 yards of waste rock were hauled each day (Huttl 1947). Compared to pre-war activity, the mill only handled 600–650 tons of ore per day (E&MJ 1947b; Huttl 1947; LRM 1946e), and the mine employed fewer men (Huttl 1947). In spite of the lower production, the Standard property was the largest gold operation in Nevada at that time (E&MJ 1947b), in part due to depressed gold mining activity throughout the state (Tingley et al. 1993:30).

There is a distinct difference in the post-war reporting of Standard Mine happenings. In addition to occasional stories in the Lovelock newspaper, a camp resident, Mrs. Antoinette Cerek, began writing a column for the Lovelock Review-Miner late in 1947. The column might have been intended for weekly publication, but an inspection of the newspaper found several gaps. The column was not named, but it did maintain a format. If something "big" happened at the mine, mill, or camp, that was reflected in the column's headline and reported first. Following the big news event was a series of brief gossipy items on the comings and goings of camp residents and their friends and relatives. If there was no big news event, then only the briefs were narrated (Cerek 1947b, 1948a, 1948c, 1948g, 1948n, 1948q–t, 1948w–y, 1949c). Newsworthy items reported include the weather (Cerek 1948b, 1948d, 1948e, 1948h, 1948l, 1948o, 1948aa, 1949b), birthdays (Cerek 1947d, 1948k), successful deer hunts (Cerek 1947c, 1948z), significant mine and camp happenings (Cerek 1947a, 1948i, 1948m, 1948v, 1948bb, 1949a), and school and church matters (Cerek 1948j, 1948p, 1948u). Mine accidents were also reported (Cerek 1948f, 1948cc; LRM 1948a). Mine accidents from the Standard were not reported in the Lovelock newspaper prior to WW II, but were likely to have occurred.

Since mine camp activity was so well reported by Cerek (1947–1949), we have a pretty good idea of what mine camp life was like after the war. Employees with families lived at the site in housing provided by the mine. Health care and a school were also provided for the children. The mine employees and their families had ample income and free time to travel extensively and maintain family ties and friendships throughout Nevada, California, and Utah. One man even owned and operated a private airplane and bladed a landing strip in the valley below the mine. Employees and their families also participated in local activities such as church attendance, picnicking, gardening, and hunting (women also participated in hunting—in one case a local lady skunked the camp men while hunting the area behind the mine).

The Standard mine was still unable to work the area impacted by the 1942 landslide (E&MJ 1946c) and they began to run out of high-grade ore ($2.75 per ton) late in 1946. Plans were made to exploit lower grade ore that assayed at $1.50 per ton (LRM 1946e). In April of 1947, pit contractor A. J. Kirkman blasted 20,000 tons of the lower grade ore so that it fell into the pit (E&MJ 1947a; LRM 1947b). The mill could not immediately work these deposits, since road building and stripping needed to be completed first (LRM 1947b). To keep the mill running, old tailings from the Rye Patch Mine, a few miles south of the Standard Mine, were treated (E&MJ 1947b; LRM 1947c).

The Rye Patch tailings, which were silver ore, could not be processed at the high rates the mill had established for its own ore and it was treated at the rate of 250 tons per day (LRM 1947c). Interestingly, earlier attempts to cyanide the Rye Patch tailings in 1914 and 1923 were unsuccessful (Vanderburg 1988:101). This is a reflection of the skill of the men employed at the Standard mill. Although the processing rate was low, it must have been profitable since the Standard Cyaniding Company began to request millable ore and tailings from other mines in the region (LRM 1947c, 1947d, 1947e). It is unknown if they received additional outside ore shipments after treating the Rye Patch material.

Lower grade ores (down to $1.30 per ton [E&MJ 1947b]) in the pit prompted the Standard Cyaniding Co. to look for newer and better ways to recover gold. In late summer 1948, the mill replaced their zinc precipitation unit in the mill with an activated charcoal unit (E&MJ 1948; LRM 1948b). This technology was developed in Australia during World War I when zinc was unavailable for recovering gold during cyanide milling. The charcoal used at Standard was surplus WW II material originally intended for gas masks (LRM 1948b). A similar unit was previously tested at the Getchell Mine (in Humboldt County, Nevada) in a 200-ton test plant (E&MJ 1948). Installation of this unit saved the mine $.10 per ton in operating costs (LRM 1948a).

The Standard Cyaniding Company also began exploration work for additional deposits in the area

Figure 4. *Overview of the Gold Standard Pit.*

(LRM 1948b). This paid off in March 1949 when they opened a new pit, named the Gold Standard (Johnson 1977). This pit is located north of the Lally, which by this time was considered exhausted based on the price of gold and operating costs (LRM 1949a). The ore body was different than that found in the Lally. There were large limestone boulders cemented together with ore, which required sorting in the pit. The ore also contained more slime than the material from the Lally. This new ore assayed at $2.50 per ton, but the extra sorting and slime reduced production to 500 tons per day (Figure 4).

CLOSURE OF THE STANDARD MINE

The new pit, however, did not prove rich enough to save the Standard Mine. In May 1949, the Standard Mine and Mill were shut down and turned over to Western Machinery of Salt Lake City, Utah, for dismantling (LRM 1949b, 1949d). The equipment was sold piecemeal. The large water tank went to Mackay, Idaho, and local ranchers purchased houses and other materials (LRM 1949c).

The main reason for the closure was the rise of post war operating costs without a corresponding rise in the price of gold. With the exception of electrical power, there were increases in labor and supplies across the board. Increases ranged from a 20 percent increase in burned lime (used to control the pH of the cyanide solution) to a 118 percent increase in the cost of gasoline; labor costs were 77 percent higher (LRM 1949b). Without a rise in the price of gold, the Standard was no longer able to operate at a profit, and essentially ran out of ore.

Too late for H. L. Hazen and the Standard Mine, the Federal government finally released its controls on the price of gold in 1972. This led to large increases in gold prices and stimulated gold mining throughout Nevada (Tingley et al. 1993:39). Since that time, the Standard Mine area has been the scene for numerous exploration projects, but to date no new mining has occurred (Cordex Exploration 1982, 1993). Perhaps some day soon, a mining company will be able to determine a way to mine the remaining mineralized rock at the Standard Mine at a profit, and once again create ore.

Acknowledgments. The majority of the research for this paper was the result of a cultural resources inventory conducted for Florida Canyon Mining, Inc. by HRA, Inc. of Las Vegas. Thanks to Richard Larsen, Exploration Director of Florida Canyon Mining, and Heidi Roberts, Fenelle Miller, and Claudia Woodman of HRA, Inc.

END NOTES

1. H. L. "Lew" Hazen had previous experience running cyanide mills at Melones, California, and Delamar, Nevada. At Delamar he operated a cyanide mill during the early years of the Great Depression and reworked the tailings from earlier milling efforts (Hazen 1995). He also had previous Nevada experience as a metallurgist for the Humboldt Sulphur Company at Sulphur, Humboldt County, Nevada, in the late 1920s. He perfected and patented a floatation method for recovering sulfur (Hazen 1929, 1930). Eventually, he and his son, Wayne Hazen, started Hazen Research in Colorado. The firm still exists, and is renowned for solving metallurgical problems (Hazen 1995).

REFERENCES CITED

Cerek, Antoinette

1947a Engineer is on Inspection at Standard Mine. *Lovelock Review-Miner* 14 August:1. Lovelock, Nevada.

1947b Standard Mine. *Lovelock Review Miner* 25 September:1. Lovelock, Nevada.

1947c Standard Mine has Successful Deer Hunters. *Lovelock Review-Miner* 23 October:1. Lovelock, Nevada.

Cerek, Antoinette (continued)

1947d Standard Boy is Honored at Birthday Party. *Lovelock Review-Miner* 6 November:4. Lovelock, Nevada.

1948a Standard Mine Holidays Call for Traveling. *Lovelock Review-Miner* 8 January:2. Lovelock, Nevada.

1948b Standard Mine Area Gets Snow, Hopes for More. *Lovelock Review-Miner* 12 February:2. Lovelock, Nevada.

1948c Latest News From County's Big Gold Mine. *Lovelock Review-Miner* 19 February:1. Lovelock, Nevada.

1948d Standard Mine Camp Receives Saving Snow. *Lovelock Review-Miner* 26 February:4. Lovelock, Nevada.

1948e Standard Mine Outlook Better as Snow Falls. *Lovelock Review-Miner* 18 March:1. Lovelock, Nevada.

1948f Workman is Injured in Standard Mill. *Lovelock Review-Miner* 1 April:3. Lovelock, Nevada.

1948g Standard Mine. *Lovelock Review-Miner* 8 April:1. Lovelock, Nevada.

1948h More Snow, Rain Please Standard Mining People. *Lovelock Review-Miner* 15 April:4. Lovelock, Nevada.

1948i Standard Mine Folks Thankful for Road Work. *Lovelock Review-Miner* 22 April:4. Lovelock, Nevada.

1948j Standard Sunday School Picnic Held at River. *Lovelock Review-Miner* 6 May:4. Lovelock, Nevada.

1948k Anniversary is Celebrated at Standard Camp. *Lovelock Review-Miner* 20 May:3. Lovelock, Nevada.

1948l Standard Mine People Provide for Vegetables. *Lovelock Review-Miner* 17 June:4. Lovelock, Nevada.

1948m Standard Mine Gives College Boys Experience. *Lovelock Review-Miner* 24 June:4. Lovelock, Nevada.

1948n Standard Mine. *Lovelock Review-Miner* 1 July:4. Lovelock, Nevada.

1948o Standard Mine Camp Birds are Good Songsters. *Lovelock Review-Miner* 8 July:2. Lovelock, Nevada.

1948p New Playground Equipment Bot for Mine School. *Lovelock Review-Miner* 22 July:6. Lovelock, Nevada.

1948q Standard Mine. *Lovelock Review-Miner* 29 July:3. Lovelock, Nevada.

1948r Standard Mine. *Lovelock Review-Miner*.5 August:1,2. Lovelock, Nevada.

1948s Standard Folks are Proud of Knuteson Record. *Lovelock Review-Miner* 19 August:3. Lovelock, Nevada.

Cerek, Antoinette (continued)

1948t Standard Pair Return From Colorado Trip. *Lovelock Review-Miner* 9 September:1. Lovelock, Nevada.

1948u Standard Mine School Starts with 11 Pupils. *Lovelock Review-Miner* 16 September:2. Lovelock, Nevada.

1948v Manager Hazen Leaves Standard for Convention. *Lovelock Review-Miner* 23 September:3. Lovelock, Nevada.

1948w Standard Mine. *Lovelock Review-Miner* 7 October:3. Lovelock, Nevada.

1948x Air Captain's Family Visits at Standard Camp. *Lovelock Review-Miner* 21 October:3. Lovelock, Nevada.

1948y Standard Mine. *Lovelock Review-Miner.* 28 October:6. Lovelock, Nevada.

1948z Woman Hunter Gets Deer on Edge of Camp. *Lovelock Review-Miner* 18 November:2. Lovelock, Nevada.

1948aa Standard Mine Reports Good Fall of Snow. *Lovelock Review-Miner* 9 December:3. Lovelock, Nevada.

1948bb Hazen Accepts Job in Virginia City. *Lovelock Review-Miner* 16 December:4. Lovelock, Nevada.

1948cc Standard Mine Driver Pinned Beneath Truck. *Lovelock Review-Miner* 23 December:4. Lovelock, Nevada.

1949a Standard Lower Camp now has Water Supply. *Lovelock Review-Miner* 3 March:2. Lovelock, Nevada.

1949b Spring Arrives at Standard Mining Camp. *Lovelock Review-Miner* 24 March:3. Lovelock, Nevada.

1949c Standard Mine. *Lovelock Review-Miner* 14 April:5. Lovelock, Nevada.

Cordex Exploration

1982 Standard Project Report. Unpublished manuscript.

1993 Standard Project Progress Report. Unpublished manuscript.

Couch, Bertrand, and Jay Carpenter

1943 Nevada's Metal and Mineral Production (1859–1940, Inclusive). *University of Nevada Bulletin* 37(4). *Geology and Mining Series* 38. Reno.

Engineering and Mining Journal (E&MJ)

1940a Mining News. *Engineering and Mining Journal* 141(1):66.

1940b Mining News. *Engineering and Mining Journal* 141(5):74.

1941 Heating Cyanide Solutions. *Engineering and Mining Journal* 142(11):64.

Engineering and Mining Journal (E&MJ) (continued)

1942a A Sample Dryer. *Engineering and Mining Journal* 143(1):64.

1942b Mining News. *Engineering and Mining Journal* 143(9):82.

1942c Mining News. *Engineering and Mining Journal* 143(10):83–84.

1942d Mining News. *Engineering and Mining Journal* 143(11):82.

1944 Electrometallurgy. *Engineering and Mining Journal* 145(6):124.

1946a Mining News. *Engineering and Mining Journal* 147(2):146.

1946b Mining News. *Engineering and Mining Journal* 147(5):114.

1946c Mining News. *Engineering and Mining Journal* 147(8):124.

1946d Mining News. *Engineering and Mining Journal* 147(11):104.

1947a Mining News. *Engineering and Mining Journal* 148(6):125.

1947b Mining News. *Engineering and Mining Journal* 148(10):124.

1948 Mining News. *Engineering and Mining Journal* 149(10):125.

Fay, Albert H.

1947 A Glossary of the Mining and Mineral Industry. *U. S. Bureau of Mines Bulletin* 95. Washington, D.C.

Gardner, E. D., and C. H. Johnson

1934 Mining and Milling Practices at Small Gold Mines. *U. S. Bureau of Mines Information Circular* 6800. Washington, D.C.

Gardner, E. D., and Fred W. Johnson

1936 Prospecting for Lode Gold and Locating Claims on the Public Domain. *U. S. Bureau of Mines Information Circular* 6843. Washington, D.C.

Gardner, E. D., and McHenry Mosier

1941 Open-Cut Metal Mining. *U. S. Bureau of Mines Bulletin* 433. Washington, D.C.

Hazen, H. L.

1929 Recovering Sulphur from a Nevada Surface Deposit. *Engineering and Mining Journal* 127(21):830–831.

1930 The pH Value in Flotation, and Maximum Profit. *Engineering and Mining Journal* 129(9):458.

Hazen, H. L., and Henry Bradley

1945 Winning a Profit From $2.10 Gold Ore. *Engineering and Mining Journal* 146(8):84–89.

Hazen, Wayne C.
1995 *Plutonium Technology Applied to Mineral Processing; Solvent Extraction; Building Hazen Research; 1940 to 1993,* an oral history conducted in 1993 by Eleanor Swent, Regional Oral History Office, The Bancroft Library, University of California, Berkeley.

Huttl, John B.
1947 A Nevada Travelogue. *Engineering and Mining Journal* 148(4): 98–99.

Jackson, Charles F., and John B. Knaebel
1932 *Small-Scale Placer-Mining Methods. U. S. Bureau of Mines Information Circular* 6611. Washington, D.C.

Johnson, Maureen G.
1977 Geology and Mineral Deposits of Pershing County, Nevada. *Nevada Bureau of Mines and Geology Bulletin* 38. Reno.

Lovelock Review-Miner (LRM)
1934 Mining Activity Pops in County During Week. *Lovelock Review-Miner* 4 May:1. Lovelock, Nevada.
1935 Plan Huge Scale Mining Operations on Standard Low Grade Ore Property. *Lovelock Review-Miner* 25 October:1. Lovelock, Nevada.
1936a Standard Mine Opens up Half Million Tons. *Lovelock Review-Miner* 17 January:1. Lovelock, Nevada.
1936b Harris Finds Mining in Pershing County Stimulated by Prices. *Lovelock Review-Miner* 28 February:1. Lovelock, Nevada.
1936c Gold Standard Mine has 600,000 Tons of Mill Ore now in Sight. *Lovelock Review-Miner* 13 March:1. Lovelock, Nevada.
1936d Gold Standard Mine Develops Satisfactorily. *Lovelock Review-Miner* 1 May:1, 3. Lovelock, Nevada.
1936e Standard Gold Mine Organized Finances for 1000 Ton Mill. *Lovelock Review-Miner* 20 May:1. Lovelock, Nevada.
1936f Doing but Little Development at Gold Standard. *Lovelock Review-Miner* 26 June 1936:1. Lovelock, Nevada.
1936g Gold Standard Mine Resumes Development Work First of Month. *Lovelock Review-Miner* 11 September:1. Lovelock, Nevada.
1936h Gold Standard. *Lovelock Review-Miner* 6 November:1. Lovelock, Nevada.
1937a Standard Mine Starts Work on Diversion Dam. *Lovelock Review-Miner* 28 May:1. Lovelock, Nevada.

Lovelock Review-Miner (LRM) (continued)
1937b Big Development Seen at Gold Standard. *Lovelock Review-Miner* Special Mining Edition. 6 August:4. Lovelock, Nevada.
1937c Standard Mine Lays off all but Six Miners. *Lovelock Review-Miner* 13 August:1. Lovelock, Nevada.
1938a Standard Mine Developments are Encouraging. *Lovelock Review-Miner* 31 July:1. Lovelock, Nevada.
1938b Report Transfer Standard Mine to New Hands. *Lovelock Review-Miner* 2 December:1. Lovelock, Nevada.
1939a Let Contract for Building of Five Hundred Ton Mill at Standard Cyanide Mine. *Lovelock Review-Miner* 13 January:1. Lovelock, Nevada.
1939b Perfect Plans for 600 Ton Cyanide Plant for Big Standard Property. *Lovelock Review-Miner* 3 February:1. Lovelock, Nevada.
1939c Standard Mill Construction to Start Next Week. *Lovelock Review-Miner* 31 March:1. Lovelock, Nevada.
1939d Excavation of Standard Mill Site is Started. *Lovelock Review-Miner* 5 May:1. Lovelock, Nevada.
1939e Standard Mill Excavation Work Gets Under Way. *Lovelock Review-Miner* 12 May:1. Lovelock, Nevada.
1939f Construct Forms for Standard Mill Foundation. *Lovelock Review-Miner* 26 May:1. Lovelock, Nevada.
1939g Standard Mine Concrete Work Well Under Way. *Lovelock Review-Miner* 9 June:1. Lovelock, Nevada.
1939h Complete Half Standard Mine Concrete Work. *Lovelock Review-Miner* 30 June:1. Lovelock, Nevada.
1939i Last Material for Standard Plant Arrives. *Lovelock Review-Miner* 6 October:1. Lovelock, Nevada.
1939j Big Standard Mill Starts Grinding Tuesday Morn. *Lovelock Review-Miner* 10 November:1. Lovelock, Nevada.
1940a Standard Mine Treats 560 Tons of Ore per Day. *Lovelock Review-Miner* 19 January:1. Lovelock, Nevada.
1940b Standard Mine Reports Tell of Good Recoveries. *Lovelock Review-Miner* 1 March:1. Lovelock, Nevada.
1940c Standard Mine is Developing Some Good Ore. *Lovelock Review-Miner* 15 March :1. Lovelock, v
1940d Standard Mill Averages 700 Tons per Day. *Lovelock Review-Miner* 13 September:1. Lovelock, Nevada.

Lovelock Review-Miner (LRM) (continued)
1941a Standard Mine Settles Down to Routine Grind. *Lovelock Review-Miner* 6 March:1. Lovelock, Nevada.
1941b Workmen at Standard Mine get Promoted. *Lovelock Review-Miner* 4 December:1. Lovelock, Nevada.
1942 Standard Mine to Resume Work in Early Sept. *Lovelock Review-Miner* 20 August:1. Lovelock, Nevada.
1945a McCarran Would Prevent Mine Foreclosure. *Lovelock Review-Miner* 26 April:1. Lovelock, Nevada.
1945b Standard Mine Plans to Re-open Hazen Reports. *Lovelock Review-Miner* 24 May:1. Lovelock, Nevada.
1945c Hazen Asks that Gold be Sold on Open Market. *Lovelock Review-Miner* 31 May:1. Lovelock, Nevada.
1945d Standard Mine Lays Plans to Operate April 1. *Lovelock Review-Miner* 4 October:1. Lovelock, Nevada.
1945e Experienced Ore Mover Contracts Standard Work. *Lovelock Review-Miner* 20 December:1. Lovelock, Nevada.
1946a Strikes Delay Standard Mine Three Months. *Lovelock Review-Miner* 14 March. Lovelock, Nevada.
1946b Standard Mine Gets Machinery for July Start. *Lovelock Review-Miner* 6 June:1. Lovelock, Nevada.
1946c First Shipment Standard Gold Expected Aug. 15. *Lovelock Review-Miner* 4 July:1. Lovelock, Nevada.
1946d Standard Ships Bullion, Hazen is Roaring Mad. *Lovelock Review-Miner* 10 October:1. Lovelock, Nevada.
1946e Standard Mine Digs to 200 Foot Bottom. *Lovelock Review-Miner* 26 December:1. Lovelock, Nevada.
1947a Mining Leader Tells Lions of Difficulties. *Lovelock Review-Miner* 20 February:1. Lovelock, Nevada.
1947b Shoot 20,000 Tons of Ore at Big Mine. *Lovelock Review-Miner* 17 April:1. Lovelock, Nevada.
1947c Standard Mill Starts Working Rye Patch Sand. *Lovelock Review-Miner* 24 April:1. Lovelock, Nevada.
1947d Standard Mine in Market for Millable Ore. *Lovelock Review-Miner* 26 June:1. Lovelock, Nevada.
1947e Shrinking Water Supply Slows Mine Operations. *Lovelock Review-Miner* 7 August:1. Lovelock, Nevada.

Lovelock Review-Miner (LRM) (continued)
1948a Standard Mill Man has Narrow Escape in Bin. *Lovelock Review-Miner* 25 March:3. Lovelock, Nevada.
1948b Standard Mine is Installing Charcoal Unit. *Lovelock Review-Miner* 19 August:1. Lovelock, Nevada.
1949a Standard Mine Finds Profit in New Orebody. *Lovelock Review-Miner* 24 March:1. Lovelock, Nevada.
1949b Standard Plant Closes, Will be Sold, Torn Down. *Lovelock Review-Miner* 5 May:1. Lovelock, Nevada.
1949c Standard Mine Tank is Bought by Idaho City. *Lovelock Review-Miner* 13 October:1. Lovelock, Nevada.
1949d "Equipment for Sale" Advertisement. *Lovelock Review-Miner* 13 October:5. Lovelock, Nevada.

Lugaski, Thomas P., and James A. Young
2000 The History of Cyanide in Precious Metal Mining in Nevada, 1890s–1920s. Paper presented at the Eleventh Annual Mining History Conference, Tonopah, Nevada.

Miller, Charles W.
1998 *The Automobile Gold Rushes and Depression Era Mining*. University of Idaho Press, Moscow.

Moehring, Eugene P.
1999 "Promoting the Varied Interests of the New and Rising Community": The Booster Press on Nevada's Mining Frontier, 1859–1885. *Nevada Historical Society Quarterly* 42:91–118.

Nevada State Water Engineer
1939 Application for Permit to Appropriate the Public Waters of the State of Nevada. Serial Number 10408. July 1939.
1940a Proof of Application of Water to Beneficial Use. Application Number 10404. April 1940.
1940b Certificate of Appropriation of Water. Certificate Record Number 2535. Book 8, Page 2535. May 1940.

Rafferty, Kevin
1992 *The Three Kids Mine Company Town: The Archaeology and History of a Short-Lived Residential Complex*. Report to Bureau of Land Management, Las Vegas, from Archaeological Research of Southern Nevada, North Las Vegas.

Round Mountain Gold
1994 *Round Mountain Gold: An Introduction for Visitors*. Round Mountain Gold Corporation, Smoky Valley Common Operation.

Smith, Alfred Merritt, and William O. Vanderburg
1932 Placer Mining in Nevada. *University of Nevada Bulletin* 31(8). Reno.

Tingley, Joseph V., Robert C. Horton, and Francis C. Lincoln
1993 Outline of Nevada Mining History. *Nevada Bureau of Mines and Geology Special Publication* 15. Reno.

Turner, Scott
1933 Economic Aspects of Gold and Silver. *U. S. Bureau of Mines Information Circular* 6740. Washington, D. C.

Twitty, Eric
2001 *Blown to Bits in the Mine: A History of Mining & Explosives in the United States*. Western Reflections Publishing Company, Ouray, Colorado.

Vanderburg, William O.
1988 Mines of Humboldt and Pershing Counties. Nevada Publications, Las Vegas. Originally published 1936, *U. S. Bureau of Mines Information Circular* 6902 and 1938, *U. S. Bureau of Mines Information Circular* 6995, Washington, D.C.

Young, Otis E., Jr.
1970 *Western Mining*. University of Oklahoma Press, Norman.

Refining the Definition of Pyramid Gray, a Lower Colorado Buff Ware Ceramic

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As a Lower Colorado Buff Ware type, Pyramid Gray has long created confusion among researchers. Because of the brevity of Albert Schroeder's 1958 published description, gray-colored Lower Colorado Buff Ware sherds have been erroneously assigned to the type Pyramid Gray. Using ceramic petrology for temper (or inclusion) identification, a mineralogical description can be assigned to those sherds recovered from Willow Beach. In the absence of vessel form or decoration, temper can be used to classify (or define) types of Lower Colorado Buff Ware pottery. When a distinctive mineral type occurs in a small area, temper identification can by used to demonstrate the source of the pottery.

What Pyramid Gray is and what to do with it has long been problematic for researchers in the Southwest. Questions often arise such as "is Pyramid Gray a real type?," "is it really Topoc Buff?," or "if it is gray, then it must be Pyramid Gray." In part, the myriad of plain wares commonly found on sites in southern Nevada may have contributed to this problem. The vague nature of some published descriptions has not helped either. Exemplifying the problem, Albert Schroeder stated: "The ceramic situation at Willow Beach is the most complex and confusing cultural aspect of the entire study" (Schroeder 1961:41).

Therefore, this study was initiated to address several aspects of the vagaries of Pyramid Gray. One method, ceramic petrology, was utilized to describe characteristics present in those sherds identified by Schroeder as Pyramid Gray and to, perhaps, fit it into a broader context. The collection from where those sherds came was the historically important Willow Beach assemblage.

Pyramid Gray and the morphologically similar Topoc Buff, both Lower Colorado Buff types, have been similarly described and therefore are difficult for most archaeologists to differentiate.

BACKGROUND

The Willow Beach Site is situated in Black Canyon approximately 8 miles below the Hoover Dam on the Arizona side of the Colorado River (Figure 1). Three archeologists, Mark Harrington, Gordon Baldwin, and Albert Schroeder, conducted excavations at the site from the mid 1930s through the early 1950s. Mark Harrington was the first to excavate at the Willow Beach site in 1936. This site was one of several sites identified and excavated by the Civilian Conservation Corps in response to the inundation by Lake Mead in the upper reaches of the Lower Colorado River (Harrington 1937). He excavated an area measuring approximately 40 ft. square.

In the early 1940s, prior to the construction of Davis Dam, Gordon Baldwin surveyed the section of the river from Willow Beach south to Cottonwood Island and identified 155 sites (Baldwin 1948). In 1947, Baldwin excavated at Willow Beach for a second time. He dug a smaller area adjacent to Harrington's first excavation measuring 25 feet square. Unlike Harrington, he attempted to define the stratigraphy of the site. Unfortunately

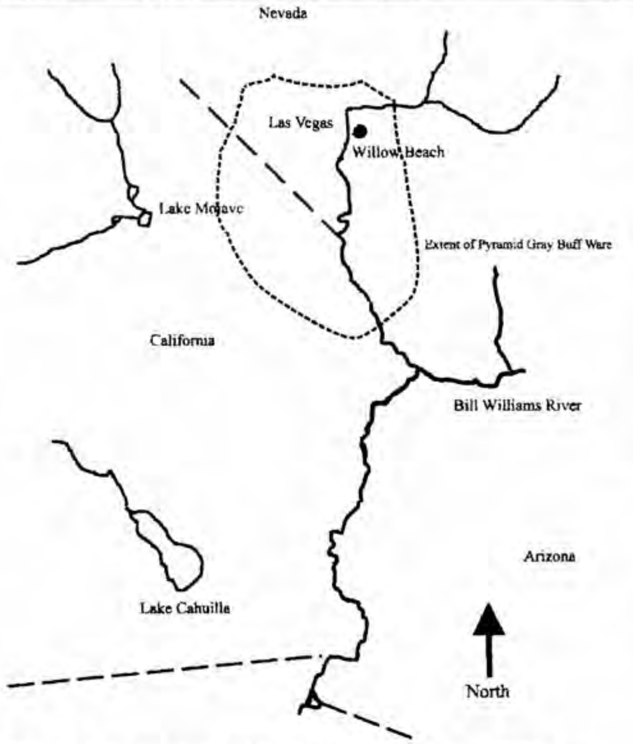

Figure 1. Area map showing the location of Willow Beach.

the results were not formally written up, no drawings were completed, and the artifacts were not cataloged.

Schroeder conducted his work in 1950. His research at Willow Beach can be counted as one of the pioneering efforts in this region of the Southwest. He synthesized the results of the two previous studies and included them in his analysis. In the largest of the three projects, Schroeder excavated two large trenches adjacent to the previous work (Figure 2). He concluded that this site was an Archaic and a Ceramic Period campsite along a travel corridor linking the southern Great Basin area to the Mojave Desert. It had been intermittently inhabited by Basketmaker II peoples from the north, Amargosa groups from the Mojave Desert, and later by peoples from both areas during the ceramic period. Cultural remains recovered from Willow Beach convinced him that the site had been inhabited for more than 1,000 years (Schroeder 1961).

He designated the two trenches as IV and V. They were dug in arbitrary 25 cm levels. Within

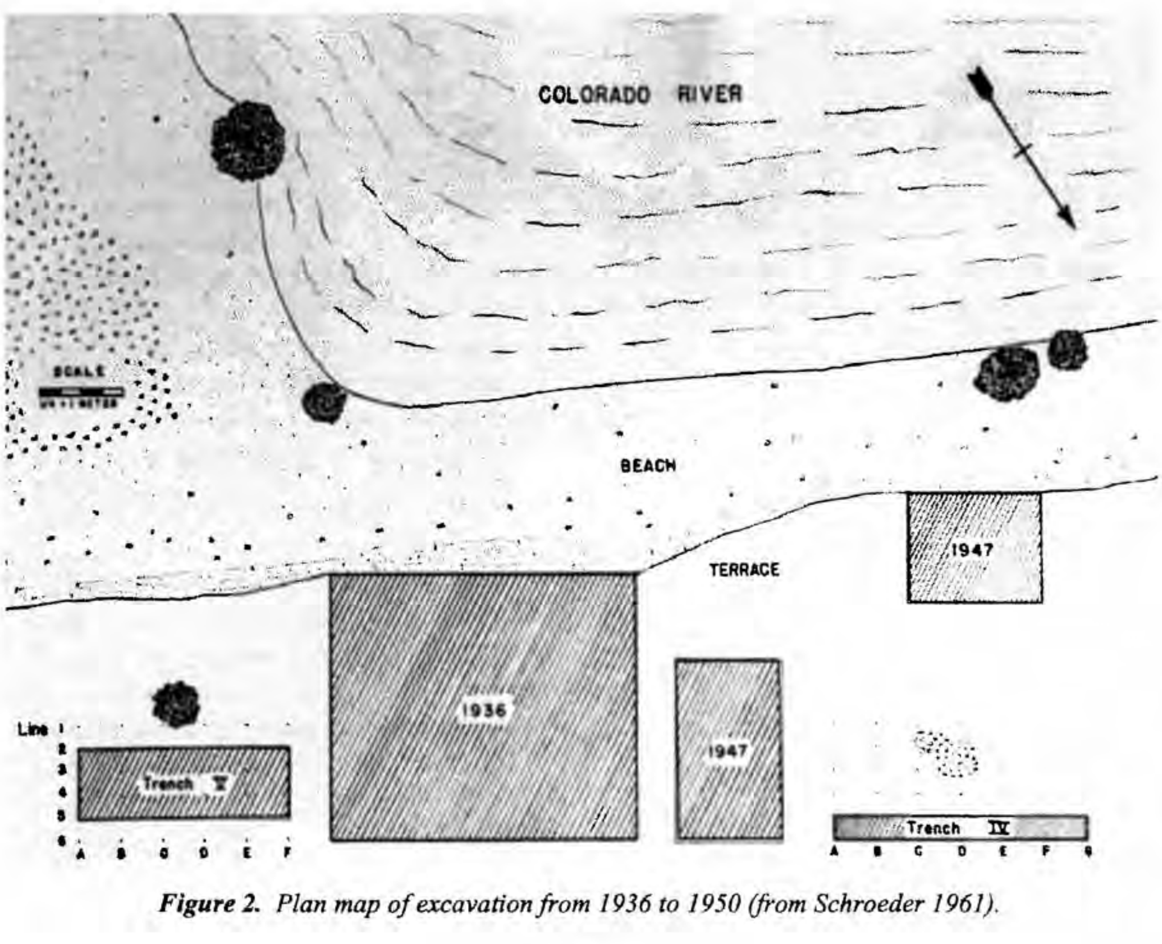

Figure 2. Plan map of excavation from 1936 to 1950 (from Schroeder 1961).

each of these arbitrary levels, natural strata were removed in "Layers." He designated these natural layers A through O. Trench V was located at a low elevation along the riverbank and had been subject to periodic inundation. This resulted in deposition of water-lain silts sealing several of the "cultural deposits and cultural zones." Schroeder believed that the episodes of inundation might also have damaged portions of the cultural component by washing them away. Because of the inundation, this excavated area contained well-developed stratigraphy. He called the bottom layer containing cultural remains "Layer O" and reported that it contained sparse remains of the first occupation at the site. Layers M and N were composed of flood silts and intermixed cultural remains including lithics, bone, and charcoal. His descriptions do not make it clear whether he believed that these artifacts were water-borne or were contained within an in-situ matrix. Layer L was comprised of wind-deposited silts containing charcoal. Because the majority of the layer had been washed away subsequent to its initial deposition, it was present only in a small portion of the trench. Layer K consisted of a sterile stratum of flood silts acting to separate those layers below it from the ones deposited above. Layer J was sterile except for a few artifacts and sparse charcoal in the top few centimeters. Layers I and H were again sterile levels that provided another cap sealing the strata below. Schroeder divided Layers I and H because he believed that an intermediate layer may have existed at one time. This now missing stratum had probably washed away during a flooding episode. Layers F and G were described as two cultural strata that contained heavy deposits of ash and charcoal; artifactual materials were sparse. A pit containing charcoal and artifacts from this occupation horizon intruded into the sterile layers beneath it. Another cap of sterile water-lain silts comprised Layers D and E. Together they comprised a thick layer of sediments that separated the preceramic from the later ceramic period occupations. Layers A, B, and C were affiliated with the ceramic horizon; all others were preceramic or culturally sterile. Pyramid Gray was primarily recovered in Layers A and B.

The second area excavated was designated Trench IV. It was located upslope of the 1947 excavations in an area that had not been subject to periodic flooding. Trench IV's soils were removed to a depth of 1.5 m. Here, he found a homogenous matrix of cultural material from top to bottom and concluded that no obvious stratigraphy existed in this area. Despite the lack of stratigraphy, Schroeder identified two cultural horizons. He reported that the lithic artifacts associated with ceramics in the upper levels could be assigned to site occupations during that late period. In contrast, occupation of the lower levels occurred during the earlier preceramic or "Stone Horizon." The upper and lower horizons of Trench IV contained distinctly different artifact assemblages. Schroeder believed the distinctions were related to the Basketmaker II/Archaic and ceramic period occupations.

The single most important diagnostic artifact type he used to reveal this difference, other than presence or absence of ceramics, was projectile points. A total of 60 points were recovered from all cultural layers in both trenches. He divided them into distinct types based on their attributes. Types were assigned preceramic or ceramic affiliation based on their location within the matrix. Types I, II, and IV were thought to be preceramic, Type V, VI, and VII were ceramic, and Type III was considered an intermediate type (Figure 3). He also noted the presence of worked bone in the lower levels and its absence near the surface of the site; shell was only recovered in the upper portions of the site.

Figure 3. *Point types as defined by Schroeder (1961:142–144).*

Schroeder identified and named five "Stone Horizons" based on the presence or absence of certain traits and diagnostic artifacts recovered from the site strata described above. Layers N and O were combined to make up Stone Horizon 1. This decision was based primarily on the presence of diagnostic Type I, Ia, and Ib projectile points, a slab metate, and the occurrence of mottled chert. The presence of a roasting pit was an important factor in this grouping. Stone Horizon 1 was named the Price Butte Phase. The artifacts in this phase suggested that the occupants practiced a hunting economy with basic traits of both Basketmaker II and Amargosa. ^{14}C samples collected from these layers dated it to 2,200 B.P. Layer L represented Stone Horizon 2. He did not provide it with a name because it had either completely washed or blown away. He did not reveal his rationale behind the existence of this hypothetical layer. Stone Horizon 3, the Nelson Phase, contained Layer J and dated to 1,700 B.P. All traits in Horizon 1 were found here also. This horizon also included new artifact types such as a Type IV knife, the first appearance of oval-shaped grinding implements, and a fire pit. Schroeder saw no traits in this horizon that he could assign to Amargosa. This may be because it included very few artifacts. The probable layer between Layer H and I represented Horizon 4. No artifactual materials were recovered to define either the layer or the horizon. The final Stone Horizon 5, dating to 1,500 B.P., contained Layers F and G. It was called the Eldorado Phase. Like Horizon I, it included point styles with western desert Archaic period affiliations as well as Basketmaker II artifact traits. Diagnostic artifacts specific to Stone Horizon 5 included Types I and III points and a mano for an oval basin metate, and larger blades and drills were absent Layers A, B, and C contained point Types V, VI, and VII. Many of these points are identified as Cottonwood Triangular and Desert Side-notched.

CERAMIC LAYERS

Schroeder recovered 1,258 sherds from the three ceramic layers. These included 1,064 Pyramid Gray sherds and 82 Tizon Brown Ware sherds, both of which are Patayan Tradition ceramics. Although fewer in number (65), Virgin Anasazi Gray Ware were present as were limited numbers of intrusive wares from the Colorado Plateau (81).

Although Schroeder identified eight ceramic wares affiliated with several culture groups, he focused on Pyramid Gray, a Patayan Tradition ceramic. Believing that the clay used in those sherds had been collected locally, he subjected them to various tests. Schroeder performed refiring experiments and tested the prehistoric ceramics and clay samples, which had been collected during the excavations (Schroeder 1952:51–52). Anna Shepard warned him concerning his interpretations of the results in a letter. She said that refiring experiments resulting in similar colors of the prehistoric ceramics and his samples made from the sediments at Willow Beach only meant that there may be a correlation, not that there definitely was one (Shepard 1951). He had added sugar to the clay attempting to replicate the gray color of the prehistoric sherd. The sugar replaced organic materials that he speculated had been added in prehistoric times. He also concluded that a slip was added to the surface to decrease porosity (Schroeder 1961:53).

THE PATAYAN TRADITION

The beginning of the Patayan Tradition coincides with the emergence of a ceramic technology and the beginnings of an agriculturally-based subsistence strategy along the length of the Lower Colorado River. Although some attributed these traits to a Hohokam influence, Schroeder saw this cultural phenomenon as part of the Hakataya tradition that was separate from the Hohokam. According to Schroeder, the Hakataya inhabited much of western Arizona, the western extent of the Sonoran Desert, the Mojave Desert, and northern Baja California. It included all of the Yuman speaking peoples, as well as non-Yuman speakers in western Arizona. Schroeder characterized their villages as "rock-outlined jacales; gravel or boulder alignments; rock filled roasting pits; rock-pile shrines; thick dry-laid, low-walled rock or boulder structures; rock-shelters; and bedrock milling stones...and crudely decorated pottery" (Schroeder 1975, 1979:100). Malcolm Rogers (1945) separated those peoples living along the Colorado River and called them the Yuman culture. The term Patayan used in this document is interchangeable with Yuman.

Schroeder believed that ceramic types could be linked with specific ethnic groups. Together Colton and Schroeder attributed the prehistoric Lower Colorado Buff Ware ceramic complex to the Laquish branch of the Patayan Culture (Colton 1938; Schroeder 1952). Later Schroeder, not liking Colton's term, split the Patayan culture into two branches identified as the Upland and Lowland branches of the Hakataya Culture. The Lowland Branch included the people who inhabited the Lower Colorado River area (Schroeder 1952). Schroeder used the term Laquish for these lowland peoples, and suggested that the Lowland Branch be referred to as the Palo Verde Branch when discussing the area from Blythe south. Schroeder believed that the Northern area or the Amacava Branch "has already been defined by Pyramid Gray" (Schroeder 1952:54). According to Schroeder, the term Patayan should be confined to what Colton called the Upland Patayan of western Arizona, which include the Cerbat, Prescott, and Cohonina Branches.

Malcolm Rogers (1945), on the other hand, proposed that Yuman/Patayan cultural attributes were derived from a Mexican root. After completing exhaustive work comparing historic native groups living along the river, Rogers defined the late prehistoric complex in the Lower Colorado River region as the Yuman Culture (Rogers 1939, 1966).

Rogers, like Schroeder, believed that he could assign ceramic types to specific chronologic periods by comparing the spatial relationship of sherds to trail segments and excavation data. Based on this, he divided the Yuman Culture into three periods, Yuman I, dating at A.D. 800 to 1050; Yuman II, from A.D. 1050 to contact with the Spanish; and Yuman III, from around 1600 to present (Waters 1982:281–297). In addition to his work along the river, he examined sites with ceramic assemblages around Lake Cahuilla. As the lake held water only intermittently, sherds could be associated with specific lacustrine episodes. These episodes could be used to date other buff ware types found in association with Salton Buff, the predominant type in that region.

Rogers thought that ceramics were first introduced in the Yuma area during the Yuman I period. It was not until the Yuman II period that ceramics were being made by the local populations in the Mojave Desert. During the Yuman II and III periods, there was a marked increase in the occurrence of paddle-and-anvil buff ware. It was during these times that the Mojave River provided a natural trade route between the Colorado River and the west coast (Rogers 1945).

Schroeder held an alternate view based on his excavations at Willow Beach. Rather than ceramics being first manufactured near Yuma, he believed they originated in southern Nevada. Schroeder based his convictions on intrusive sherds recovered from Willow Beach found in association with a buff ware he named Pyramid Gray. These sherds were found in levels assigned to the end of the Willow Beach phase dating to A.D. 900-1150. He also held that Rogers' Yuman II period should be pushed back to this time (Schroeder 1952). This, of course, would leave no time for Rogers' Yuman I period. Schroeder was convinced that these Pyramid Gray sherds represented the first ceramics manufactured on the river. Historically, there have been two opposing approaches to building a workable typology for Lower Colorado Buff Ware. Each approach attempted to define which variables are most important in assigning ceramics to meaningful types. Unfortunately, the history of categorizing ceramics in this region is anchored in politics, personalities, and regional allegiance to ideas.

Rogers worked in the Mojave Desert area as early as 1919. He was the first to study these ceramics in detail. As the Curator of Archaeology at the Museum of Man in San Diego, Rogers believed that there had been a long and complex culture history in southern California and adjacent desert areas (Hanna 1982). Over a 26-year period Rogers recovered sherds from more than 500 locations throughout the western deserts both north and south of the Mexican border. Before he died, he had collected and studied more than 60,000 sherds and 2,558 complete vessels (Rogers 1940 in Waters 1982). Unpublished notes on file at the Museum of Man show that Rogers had difficulties deciding which variables were most useful in developing a typology for the region. He felt that surface treatment and vessel and rim form were the two most important traits for chronological assignment. He believed that temper and color differences were not as important because they were dictated by environmental constraints (Rogers 1945; Waters 1982:277). During the early years of his study he believed that temper variations could be assigned to distinct ethnic groups along the river, but this idea was not repeated in later publications (Rogers 1936a). Through the years, he dropped certain early sherd types, changed some names, and combined some groups with others. Ultimately, Rogers completed an unpublished list of Lower Colorado Buff Ware ceramics in Arizona, California, and Nevada. Despite his extensive research in the area, Rogers did not publish any of this information. Harold Colton published type names for Topoc Buff and Pyramid Gray (Colton 1939). Michael Harner identified and published Parker Buff, Fort Mohave Variant (Harner 1955). Albert Schroeder was the first to publish a complete list of type names and descriptions of the Lower Colorado Buff Ware (Schroeder 1958). Although Rogers never published his work, Schroeder knew that he had completed extensive research on the problem. Years earlier, Rogers had given a talk on the preliminary results of his work (Rogers 1936b). Not accepting this area as Rogers' "exclusive domain," Schroeder (1952) completed a survey of the river from Davis Dam to the Mexican border. When he found sherds matching Rogers' descriptions, Schroeder used Rogers' terminology rather than assigning them new names (Schroeder 1952:7). Upon completion of the survey, he sent a manuscript detailing his results to Rogers. Julian Hayden was working at the museum when Rogers received the package by mail and he remembers that Rogers was livid. Rogers believed that Schroeder was "trying to dispose of his Yuman work along the river" (Hayden, personal communication 1995; Waters 1982:280). He felt that, by publishing the types with their descriptions, Schroeder was trying to steal his work.

Before completing the survey, Schroeder had visited the Museum of Man in San Diego to study the Rogers collections. Schroeder had commented that Rogers' notes were "generalized or lack detailed descriptions" (Schroeder 1952:97). Schroeder could not get enough information out of the incomplete notes and collections to form his own opinion about which types were real. Therefore he was not able to recognize several of Rogers' ceramic types.

When Rogers tried to reorganize his data, he found comments including "published by Schroeder 1952" had been written throughout his notes by someone. Schroeder denied writing those notes. In Schroeder's opinion, Rogers' chronology was based almost entirely on "refinements in paste, tempering, color, design, and vessel form" (Schroeder 1952:7). Schroeder disagreed with this and concluded that temper variation was the primary variable in determining types (Schroeder 1952, 1958). He believed that there were two elements that could be used in assigning pottery to similar types; they were temper and time. Temper was the "prime factor" in identifying sources of manufacture. If there was a discrepancy between these two, then they could not be considered the same type. He believed that "form and construction" did not provide a good basis for typing. He considered clay color important, but secondary in significance to temper. Schroeder believed that Rogers had not utilized intrusive ceramics to build chronologies. Waters later states that "Schroeder did not examine Rogers' 1945 paper very carefully (Rogers 1945). He must have misinterpreted its results and did not consult with Rogers" (Waters 1982:280). Schroeder did not like Waters' work either (Waters 1982) and felt that Waters had completely misinterpreted his findings later, even accusing Waters of "outright lies" (Schroeder 1984). Late in life, Schroeder held a great deal of contempt for Waters. When Waters tried to publish his (Waters) version of the Rogers revised types at the Museum of Man, he was turned down. By this time Schroeder had cultivated friendships at the San Diego Museum of Man. Waters instead went to Arizona and published there. Schroeder claimed that Waters had a "southern Arizona bias." He said further "From the looks of Waters' article, he never bothered to check the sherds from my survey and merely used Malcolm Rogers' notes and sherds to define his newly published notes. In the process he accuses me of all sorts of things by misrepresenting what I wrote. Either he cannot read or understand what he reads" (Schroeder 1984). Despite Schroeder's opinions, Hayden felt that Waters had "approximated Rogers' results in his reevaluation and that Rogers would have been happy with it"(Hayden 1994:123).

One problem Schroeder had was Rogers' lack of organizational categories. He had only divided them into ceramic types. Schroeder, on the other hand, had separated the Lower Colorado Buff Ware into six series based on temper. They were assigned names derived from the region where they were predominantly found. The six series included Parker, Gila Bend, Palo Verde, Salton, Lower Gila, La Paz, and Barstow. Within each series were several types. Parker Series included seven types, Gila Bend had four types, Palo Verde had six, four were in Salton, the Lower Gila included only two, La Paz consisted of seven, Ÿnd finally, Barstow was comprised of one. Schroeder lumped all of Rogers' sherds with no temper into the Palo Verde Series. The Rogers temperless types included Picacho, Blythe, and Tumco Buffs. Later Waters did essentially the same thing that Schroeder had done, but included all of the temperless sherds under the designation of Tumco Buff. Schroeder assigned Pyramid Gray to the Parker Series. He included the Mojave Desert area in this series at this time. Later, feeling that Pyramid Gray was more closely related to Prescott Gray Ware than the southern buffs, he changed his mind. He split the series, calling the newly defined one Barstow (Schroeder 1952).

There was further disagreement between the two men pertaining to where ceramics first appeared along the river. Schroeder's work had focused primarily on the north end of the river. Based on his excavations at Willow Beach in 1950, he felt that Lower Colorado Buff Ware ceramics were first manufactured there. This view directly contradicted Rogers' ideas. Rogers believed that ceramics were introduced first in the Yuma area (Rogers 1945). Schroeder based his convictions on intrusive Tusayan Black-on-red sherds from the Anasazi area found in association with Pyramid Gray sherds he recovered from Willow Beach. They were found in levels assigned to the end of the Willow Beach phase dating to A.D. 900-1,150. His dates supporting these contentions were developed using his data on intrusive sherds such as the one mentioned above. Other sherds found at Willow Beach in association with Pyramid Gray included Parker Buff and Hohokam Sacaton Red-on-buff sherds (Schroeder 1952).

METHODOLOGY

To begin this study, Lake Mead National Recreation Area archaeologists recovered the Willow Beach ceramic collections from Western Archaeological and Conservation Center in Tucson. The sherds had been re-cataloged by National Park Service staff but still retained the original type designations assigned by Schroeder in 1951. In all, approximately 1,000 sherds that he had determined to be Pyramid Gray were examined. Much of the standard information, color, temper, etc., was collected. After quantifying the information, it was determined that, in general, there were five overlapping broad groups in those sherds. Next, one sherd was selected that most typified each of the five groups. Those sherds were subjected to thin-sectioning and analysis.

Temper of all sherds was composed of mineral grains and small (2 mm) rock fragments. Percentages of temper and paste were estimated to the nearest 5 percent for each thin-section. Terry and Chilingar's (1955) comparison chart for estimating percent composition was used to estimate modal mineralogy (percent composition) of the temper for each thin-section. Following Power's (1953) chart for visual estimation of roundness, the temper shape was described as very angular, angular, subangular, subrounded, rounded, or very rounded. Several 35-mm color photomicrographs were taken of each slide at 10X, 20X, and 40X in plain polarized light and with crossed polarization.

The mineral temper of each sherd was comprised mostly of single-mineral grains (i.e., each grain composed of one mineral), with a few grains composed of rock fragments. The percentage of single-mineral grains and rock fragments was not noted. Grain size was recorded in mm.

RESULTS

Table 1 summarizes the types of mineral constituents of the Willow Beach sherd temper. Temper from all thin-sections contained quartz, plagioclase, and biotite. Pyramid Gray and Topoc Buff are described as containing abundant quartz temper. Types to the south distinguish themselves by having a greater percentage of feldspar.

All of the sherds discussed here contained quartz, but #6859 had a greater percentage of feldspar (Table 2). Technically this would require that we no longer call this one Pyramid Gray. Perhaps this illustrates the problem with low-power non-petrographic optical identification because Schroeder and these authors considered this sherd Pyramid Gray. Further the temper is angular rather than subround or round (Figure 4). One thin-section (#6859) contained perthitic orthoclase and two thin-sections (#6859 and #6889) contained microcline. Three thin-sections (#6866, #6869, and #6889) contained garnet characteristic of the Precambrian garnet-bearing gneiss that outcrops at

Willow Beach as well as other areas along this portion of the river.

It was previously reported that the temper of Willow Beach pottery contained volcanic glass. No volcanic glass was found in any of the five thin-sections analyzed. However, large shrinkage voids were apparent on each thin section. It may be possible that these shrinkage voids were previously misidentified as glass.

The grain size (<0.1–2 mm) and shape (mostly rounded, subrounded, and subangular) indicate that the temper was obtained from nearby sand sources and was not prepared by crushing rocks. Preliminary thin section analysis was performed on grain mounts of sand from the nearby Willow Beach Wash that empties into the Colorado River just south of the site. Interestingly, the grain mounts contained no quartz or garnet so we don't think this wash is the temper source.

In this study, a description of what the sherds are was partially addressed by the thin section analysis. Until analysis of other sherds, and mineral

Table 1. *Mineral constituents of the temper of Willow Beach potsherds (adapted from Coale 1963 and Tuohy and Strawn 1986).*

Thin-section No.	Mineral							
	Qtz	Plag	Micro	Bio	Grnt	POrtho	trace	ox
6859	x	x	x	x		x		x
6863	x	x		x				
6866	x	x		x	x		x	x
6869	x	x		x	x			x
6889	x	x	x	x	x		x	

Qtz = Quartz; Plag = Plagioclase; Micro = Microcline; Bio = Biotite; Grnt = Garnet; P. Ortho = Perthitic orthoclase; trace=trace mineral (zircon or sphene); ox = oxides

Table 2. *Pyramid Gray thin-section analysis*

Slide	%Paste	%Temper	Temper Composition	%Composition	Size (mm)	Shape
6859	80	20	quartz	39	0.5 - 2	subangular, subrounded
			perthitic orthoclase	22	0.5 - 2	angular, subangular
			microcline	17	0.5 - 1	angular, subangular
			plagioclase	11	0.5 - 1	angular, subangular, subrounded
			biotite	6	0.1 - 0.5	subrounded
			oxides	5	0.2	rounded
6863	70	30	quartz	92	0.5 - 2	subrounded, rounded
			biotite	4	0.1 - 0.3	subangular, subrounded
			plagioclase	4	0.1 - 0.3	subangular, subrounded
6866	65	35	quartz	85	0.5 - 2	subrounded, subangular, rounded
			garnet	5	0.5 - 0.8	subrounded, subangular
			biotite	5	0.1 - 0.3	subangular, subrounded
			plagioclase	<5	0.5 - 1	subangular, subrounded
			trace minerals (zircon or sphene)	<5	<0.1	angular
			oxides	<5	<0.1	rounded
6869	80	20	quartz	61	0.2 - 2	rounded, subrounded
			biotite	11	0.2 - 0.5	subangular
			garnet	22	0.5 - 1	rounded, subrounded
			plagioclase	<6	0.2 - 0.5	subangular
			oxides	<6	<0.1	rounded
6889	70	30	quartz	52	0.5 - 2	rounded, subrounded
			biotite	22	0.1 - 0.3	subangular, subrounded
			microcline	<4	0.2 - 0.3	angular, subangular
			garnet	22	0.2 - 0.5	rounded, subrounded
			plagioclase	<4	0.2 - 1	subangular
			trace mineral (olivine)	<4	<0.1	rounded

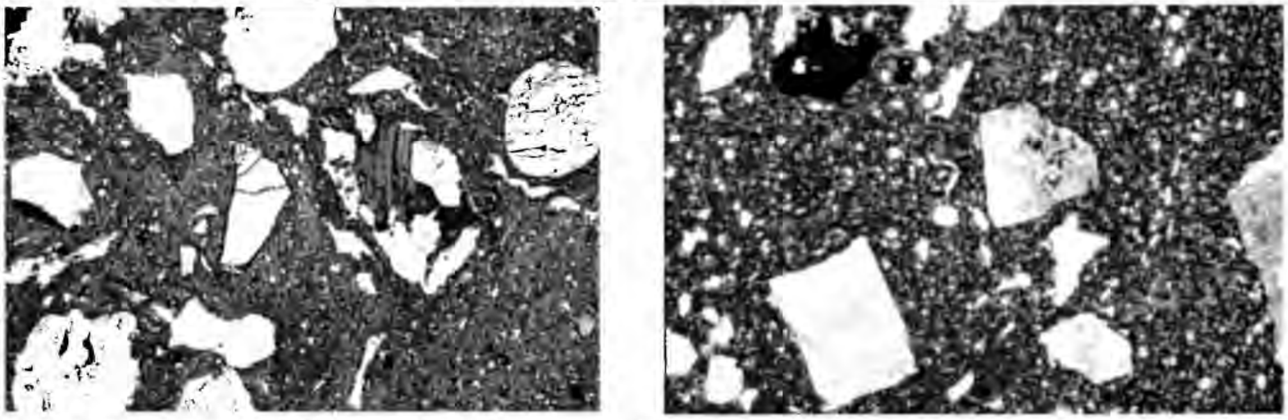

Figure 4. Sherd #6869 showing rounded quartz (left) and sherd #6859 (right) containing predominantly angular feldspar.

and clay locales is completed, sourcing is not practical. Also, separating this type from other plain ware types is problematic. In time, this issue may be addressed by further petrographic analysis. Past research has shown that rather than distinct buff types there is more of a continuum between them. Perhaps they should be defined as tendencies rather than types. Within this continuum of attributes, ceramics in the Patayan Tradition fall into three overlapping wares; no-tempered buff, tempered buff, and brown wares. Pyramid Gray and/or Topoc Buff fall into the general category of northern river, rock-tempered buff ware. This study shows that color is also not a determinant. Fully one third of the Pyramid Gray sherds in this collection were not gray but tan to buff.

All of these issues probably arise from the nature of groups manufacturing these ceramics. Here pottery was a family centered cottage industry. Clay and temper was collected as needed from a variety of sources and probably across broad areas. Vessels may have been made on an as needed basis. This contrasts with some areas in the Southwest where clay and temper is sometimes standardized within a type and production locales have been identified.

In summary, Pyramid Gray can probably be included within that broad spectrum that is called Topoc Buff. It may represent a specific clay and temper source. Recent research suggests that when Topoc Buff was manufactured in the Las Vegas Valley, it included carbonate temper (Seymour 1997 and 2000). This paper represents an initial look at several aspects of this pottery type.

REFERENCES CITED

Baldwin, Gordon C.
1948 *Archaeological Surveys and Excavations in the Davis Dam Reservoir Area*. National Park Service, Boulder City, Nevada.

Coale, G. L.,
1963 A study of Shoshonean pottery, *Tebiwa* 6(2):1–11.

Colton, Harold S.
1938 Names of the Four Culture Roots in the Southwest. *Science* 87 (2268):551–552.
1939 *An Archaeological Survey of Northwestern Arizona Including The Descriptions of Fifteen New Pottery Types*. Museum of Northern Arizona Bulletin No. 16. Northern Arizona Society of Science and Art, Flagstaff.
1945 The Patayan Problem in the Colorado River Valley. *Southwestern Journal of Anthropology*. 1:114–121.

Harner, Michael J.
1955 Mohave Pottery: A Description for the Archaeologist. In *Mohave Pottery*, edited by A. L. Kroeber and Michael J. Harner. University of California, Anthropological Records 16(1):15–30, Berkeley.

Hanna, David
1982 *Malcolm J. Rogers: The Biography of a Paradigm*. Unpublished Masters thesis, San Diego State University, San Diego.

Harrington, Mark R.
1937 A Stratified Camp Site Near Boulder Dam. *The Masterkey*, 11(3):86–89.

Hayden, Julian
1994 The Sierra Pinicate, the Legacy of Malcolm Rogers, and the Archaeology of the Lower Colorado River. In *Recent Research along the Lower Colorado River Proceedings from a Symposium Presented at the 59th Annual Meeting of the Society for American Archaeology, Anaheim, California, April 1994,* edited by Joseph A. Ezzo. Technical Series No. 51. Statistical Research, Tucson.

Powers, M. C.,
1953 A new roundness scale for sedimentary particles. *Journal of Sedimentary Petrology* 23:117–119.

Rogers, Malcolm J.
1936a *Yuman Pottery Making.* San Diego Museum Papers No. 2. San Diego, California.
1936b *Yuman Ceramics.* Paper Presented at the 9th Annual Meeting of the Advance Science Serving Society, Flagstaff, Arizona. Manuscript on file at the Arizona State Museum Library, Tucson.
1939 *Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Areas.* Museum of Man Papers No. 3. San Diego.
1940 *Archaeological Pottery Types of the Yuman Ethnographic Area.* Manuscript in possession of M. Waters, Tucson.
1945 An Outline of Yuman Prehistory. *Southwestern Journal of Anthropology* 1:167–198.
1966 *Ancient Hunters of the Far West.* Edited by Richard F. Pourade. Union-Tribune Publishing Company, San Diego, California.

Schroeder, Albert H.
1952 *A Brief Survey of the Lower Colorado River from Davis Dam to the International Border.* Bureau of Reclamation, Reproduction Unit, Region Three, Boulder City, Nevada.

1958 Lower Colorado Buff Ware. In *Pottery Types of the Southwest,* edited by Harold S. Colton. Museum of Northern Arizona, Ceramic Series 3D, Flagstaff.
1961 *The Archaeological Excavations at Willow Beach, Arizona, 1950.* University of Utah Archaeological Papers No. 50, Department of Anthropology, University of Utah Press, Salt Lake City.

Schroeder, Albert H. (continued)
1975 *The Hohokam, Sinagua, and the Hakataya.* Occasional Paper No. 3. Imperial Valley College Museum Society Publication. El Centro, California.
1979 Prehistory: Hakataya. In *Southwest,* edited by A. Ortiz, pp. 100–107. Handbook of North American Indians, Vol. 9, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.
1984 Letter to Dennis L. Jenkins, Fort Irwin Archaeological Project, January 28, 1984. Manuscript on file at San Diego Museum of Man, San Diego, California.

Seymour, Gregory R.
1997 A Reevaluation of Lower Colorado Buff Ware Ceramics: redefining Patayan in Southern Nevada. Master's thesis, University of Nevada, Las Vegas.
2000 A Characterization of Prehistoric Ceramic Assemblages in The Las Vegas Area, Southern Nevada. Paper presented at the 28th Great Basin Anthopological Conference, Ogden, Utah.

Shepard, Anna O.
1951 Letter to Albert Schroeder, September 4, 1951. On file with the National Park Service, Lake Mead National Recreation Area, Boulder City, Nevada.

Terry, R. D. and Chilingar, G., VI
1955 Chart for estimating percentage composition of rocks and sediments. *Journal of Sedimentary Petrology* 25:229–234.

Tuohy, D. R., and Strawn, M. B.
1986 A comparative analysis of thin sections from plain brown pottery vessels found in the desert west. In *Pottery of the Great Basin and adjacent areas,* edited by S. Griset, pp. 85–161. University of Utah Anthropological Papers, Salt Lake City.

Waters, Michael R.
1982 The Lowland Ceramic Tradition. In *Hohokam and Patayan, Prehistory of Southwestern Arizona,* edited by Randall H. McGuire and Michael B. Schiffer, pp. 275–297. Academic Press, New York.

Retracing the Past: The Austin and Reese River Transportation Company Toll Road

William T. Hartwell, Chuck Barrett, and Susan Edwards

Shortly after its founding in 1862, the mining town of Austin in southern Lander County became an important mercantile center for the mining camps of central Nevada. The town was ideally situated astride the Central Overland Trail, then the only commercial highway across Nevada, and trade with surrounding mining camps flourished. With the advent of the Transcontinental Railroad along the Humboldt River valley 93 miles to the north in the fall of 1868, and the resultant abandonment of the Central Overland Trail, Austin was cut off from the flow of commerce.

To protect the town's commercial interests, the townspeople organized the Austin and Reese River Transportation Company and constructed a toll road connecting the town with a railroad depot to be built at the mouth of the Reese River, thereby assuring Austin's economic future. The toll road demonstrated the importance of a connection to the railroad and likely saved Austin from ghost town status. It was ultimately replaced by the Nevada Central Railroad, which was completed in 1880. A field reconnaissance conducted in June of 2001 by archaeologists from the Desert Research Institute and staff of the Trail of the '49ers Interpretive Center identified several intact traces of the toll road and associated features and artifacts

Prior to construction of the Transcontinental Railroad in the mid-1860s, the town of Austin, located in Lander County, served as the major supply center for early central and northern Nevada mining camps. In the summer of 1859, Captain James F. Simpson of the United States Army Corp of Topographical Engineers established what became known as the Central Overland Trail, running from Camp Floyd, 65 miles south of Salt Lake City, to the Carson Valley (Simpson 1983). Both emigrants and the Pony Express quickly adopted this trail as a principal transportation route. With the outbreak of the Civil War and the loss to the Confederacy of portions of the overland mail route, which ran through the south, mail services were switched to this route, followed by both the overland stage and the overland telegraph. By 1862 the Central Overland Trail served as the principal east-west route across the western United States with established stage stations. An employee of the station at Reese River discovered rich silver ore in the summer of that year and by the end of the year Lander County had been formed and the town of Austin was born (Abbe 1985).

While Austin saw some success as a mining community, the ores were not as rich as originally thought, and other economic factors became important to the community's survival. Because of its location on the Central Overland Trail, well to the east of most other communities in Nevada, it became a major trade center for central Nevada and the hundreds of mining camps that sprang up, most of which were founded by Austin prospectors. Hundreds of wagons a month traveled eastward along the Central Overland Trail bringing supplies from California, which would then be distributed out of Austin. From 1863 to 1868, Austin was the supply center for central Nevada, servicing Ione, Grantsville, White Pine, and dozens of other camps. Huge quantities of freight flowed into the community, and then on to the outlying areas (Abbe 1985; Angel 1866).

THE TRANSCONTINENTAL RAILROAD

In 1863 construction began on the transcontinental railroad. As the rails grew ever closer to Nevada, the citizens of Austin hoped that the tracks would be routed through their town and that they would become an even more important commercial center for the area. While they knew that the railroad favored the less mountainous route along the Humboldt River, they argued that it would be foolish for the Central Pacific Railroad to bypass the large and lucrative local business that Austin would offer the railroad (Angel 1866). The community's hopes were dashed late in 1866 with the publication of the preliminary maps, showing the tracks running along the Humboldt River, 93 miles to the north.

FORMATION OF THE AUSTIN AND REESE RIVER TRANSPORTATION COMPANY

From 1866 to 1868, little if anything was done by the citizens of Austin to prepare for the completion of the tracks across Nevada and the inevitable abandonment of the Central Overland Trail as a major commercial freight route for central Nevada. While the community appeared to hold out hope that late changes would be made to the rail route, as construction of the Central Pacific Railroad approached Nevada, it became clear that the tracks were going to bypass the community well to the north (Reese River Reveille [RRR] 1868a). As the tracks marched steadily east, the terminus of the Central Overland Trail was adjusted accordingly; it moved from Sacramento and Placerville to Cisco on the eastern slope of the Sierra, then on to Wadsworth along the Truckee River as the line over the Sierra was completed.

In the spring of 1868, reports filtered in that the tracks were approaching the town of Winnemucca. Austin's newspaper, the Reese River Reveille, began running editorials and letters to the Editor about what Austin should do to protect her economic base (RRR 1868b,c). Some thought that the existing Overland Trail was sufficient, but most felt that a road should be built north to connect with the railroad to carry supplies from the tracks to Austin and then on to the surrounding mining camps. While the town wavered and sought consensus, one enterprising citizen, L. J. Hanchett, filed for a toll road franchise on a portion of the most likely route to the tracks at the mouth of the Reese River (Hanchett 1868a). Mr. Hanchett chose to file on only 6 miles of the potential route, but at the most critical juncture: the Canyon or narrows of the

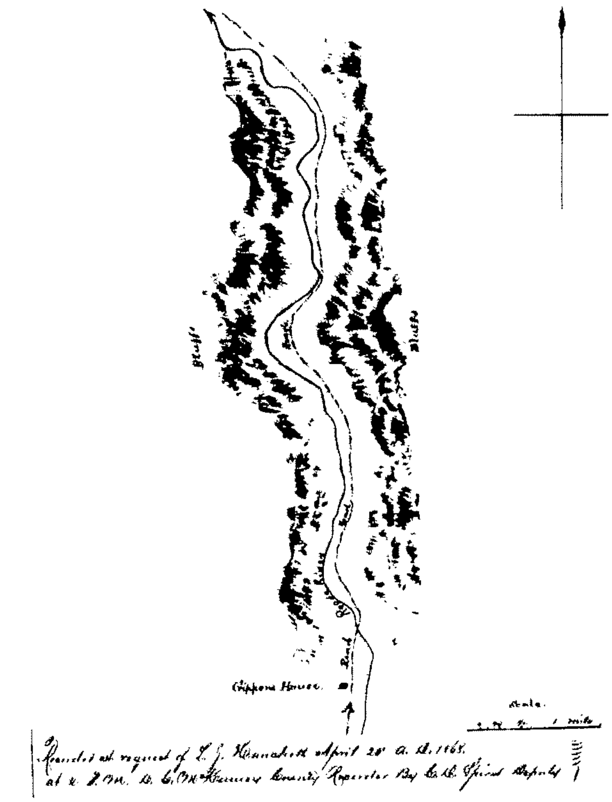

Figure 1. *A copy of the map filed by L. J. Hanchett to secure franchise to the portion of the toll road that would pass through the canyon narrows of the Reese River.*

Reese River, where no alternative route for the road could be constructed (Figure 1).

Eventually, a committee was appointed to study the possible routes for a road (RRR 1868d); finally, on July 1, 1868 the first public meeting was held by the citizens of Austin to consider what should be done. Proposals included routes along the Reese River, up Grass Valley to Beowawe, or northwest to Winnemucca (RRR 1868d). On July 28, documents were prepared for the establishment of the Austin and Reese River Toll Road, and on July 30, the route along the Reese River was adopted (RRR 1868e) (Figure 2). Construction on the new route began August 13, and on August 14 Mr. Hanchett sold his toll road franchise through the Reese River Canyon to the new company for $1,000.00 (Hanchett 1868b).

There is a report of an earlier toll road constructed in 1863 by Bradley connecting Austin with the mouth of the Reese River (Goodwin 1971). However, there is no other evidence to support the

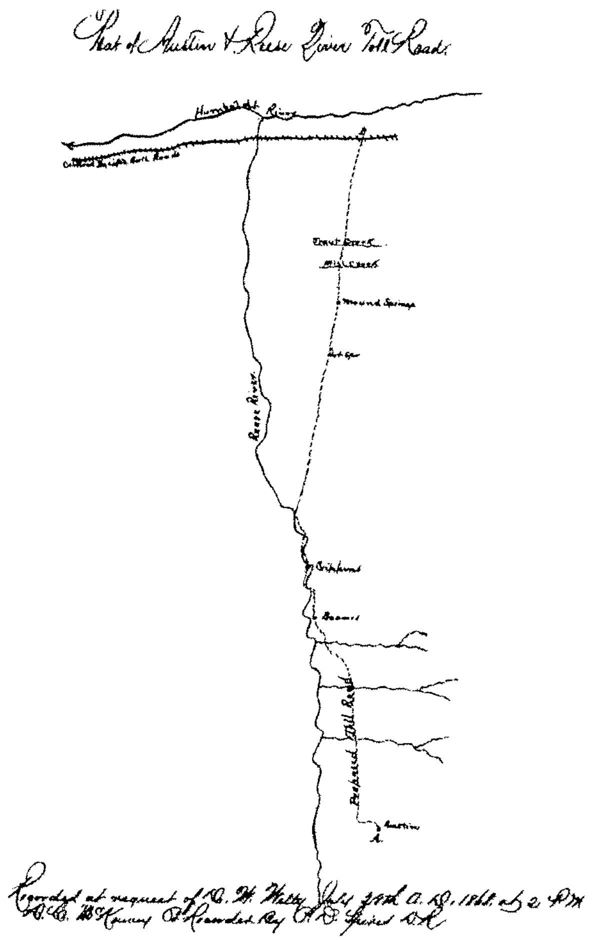

Figure 2. *A map of the proposed toll road connecting Austin to the Central Pacific Railroad at a point that would become the town of Argenta.*

existence of such a road, and some believe that this is simply the Austin and Reese River Toll Road reported with incorrect dates. A road at this location would have served no purpose prior to the construction of the railroad in 1868, and no road is shown on maps drawn in early 1868. Additionally, such a road likely would have been mentioned in newspaper reports on possible routes for the 1868 toll road.

ESTABLISHMENT OF THE TOWN SITE OF ARGENTA

It was understood, perhaps from the preliminary map filed in 1866, that the Central Pacific Railroad would build a depot somewhere in the vicinity of the mouth of the Reese River to service Lander County. The committee chosen to select the route for the toll road to the mouth of the Reese River considered three alternatives for that portion of the road north of Mill Creek Canyon (RRR 1868e).

The first proposed route turned northwest, crossed the Reese River Valley and connected with the existing road that ran from the Battle Mountain Siding south along the eastern slope of the Battle Mountain range to the numerous mines there. This option was rejected because it ran across the floor of the valley and raised flooding concerns. Also, the boundary between Lander County and Humboldt County was unclear, and many thought that the Battle Mountain Siding was in Humboldt County.

The second route, also rejected, ran down the center of the valley on a direct route to the tracks and would have intersected them about half way between present day Battle Mountain and Argenta Point. This again was low-lying land that was subject to occasional flooding, and at that time consisted of a large alkali flat considered unsuitable for a depot.

The third route ran north and then east and then north again along the western slope of the Shoshone Range. While somewhat longer than the other two proposed routes, it was elevated enough above the valley floor to avoid seasonal flooding, and had the advantage of passing near to water sources extant in the numerous side canyons. This was the route decided upon.

Charles Crocker, an important figure in the economic development of California and responsible for spearheading construction of the Central Pacific Railroad, helped finance the construction of the toll road, and also promised to build a town at the point that the toll road met the tracks. Once the route of the toll road was settled, the town site for the depot was chosen by the railroad and was identified as being "2 miles east of the Skull Ranch," at the point where the Austin toll road intersected the tracks (RRR 1868e). The chosen location occurred at what is now known as Argenta Point, on the northwestern edge of the Shoshone Range. One report erroneously mentions the existence of a silver mining camp at Argenta Point prior to the arrival of the railroad (Paher 1984); that information is incorrect, however, and it is possible the writer confused it with the Battle Mountain Mining Camp in Long Canyon.

On October 26, it was reported that railroad surveyors were on the scene, surveying out the town. Soon a general store and a hotel were under construction at the new station (RRR 1868f). Judge E. B. Crocker named the town site "Argenta." He had originally wanted to bestow this name upon the town of Reno, but had been outvoted by his more influential brother, Charles, the Superintendent of the Central Pacific (Myrick 1992:13,19).

TOLL ROAD OPERATION

On October 2, 1868 it was reported that representatives of Wells, Fargo & Company were selecting station sites along the road. Lumber was removed from the recently abandoned stations along defunct portions of the Central Overland trail and used to build the new facilities (RRR 1868g).

The 1869 Lander County Assessment Roll lists eight stations owned by Wells, Fargo & Company between Austin and Argenta (Lander County Assessor's Office 1869). These were Italian Canyon, Silver Springs, Wallace's, Vic's, Hot Springs, Boston (Mound Springs), Trout Creek, and Rock Creek. No reports were located mentioning stations owned by any of the other stage companies using the route in 1869 or any subsequent year.

The first passenger train arrived at Argenta on November 5, 1868 (Myrick 1992:19), and by November 10, there were two companies providing stage service between Austin and Argenta: Wells, Fargo & Co. and Miller and Wadleigh (RRR 1868h). The stages were packed with passengers bound for the mining boom then underway in White Pine County. In the first few days of the new service, more people arrived at Argenta than the stages could carry, and such a bottleneck developed that rail service into Argenta was halted until the condition could be resolved (RRR 1868i).

The trip by stage from Austin to Argenta took about 16 hours and was usually uneventful, although notable exceptions did occur. On November 25 a drunken stage driver rolled the southbound Wells Fargo stage not once but twice near Trout Creek, and on at least three occasions the stage was robbed, fortunately without loss of life (RRR 1868j).

TOLLS

Under the provisions of the 1865 Nevada toll road law, the individual franchise holders would set their own tolls for the use of the road. The tolls were subject to an appeal process whereby users could complain to the local County Commissioners, who had the power to modify the fees and thus avoid unreasonable charges. Prior to the 1865 law, the franchise was granted and the tolls set by the County Commissioners.

During archival research, no record was found that listed the Austin and Reese River Toll Road rates, though there is one recorded passing comment that the rates were too high (RRR 1868k). Rates for similar toll roads set by the Lander County Commissioners in 1863 do survive, however, and are indicative of the charges that may have been collected Lander County Commission (1863).

8 draft animals and a wagon	$2.50
6 draft animals and a wagon	$2.00
4 draft animals and a wagon	$1.50
1 or 2 draft animals and a wagon	$1.00
1 draft animal and a buggy	$0.50
1 saddle animal	$0.25
loose livestock	$0.125
hogs and sheep	$0.05

RELOCATION TO BATTLE MOUNTAIN

Soon after the railroad extended the tracks to Elko, the White Pine traffic stopped disembarking at Argenta to take the stage to Austin. Passenger traffic fell sharply and business at Argenta quickly declined. At the same time, a mining boom developed at Galena Canyon, 8 miles south of the Battle Mountain Switch, and that facility became very busy. When the railroad tried to auction off lots at Argenta, there were few buyers (RRR 1868k). Bowing to the inevitable, the railroad surveyed out a new town site at Battle Mountain Switch and in the winter of 1869–1870 the few buildings that had been built at Argenta were moved to Battle Mountain (The Crescent 1870; The Humboldt Register 1870).

As a result of the decline at Argenta, that portion of the Austin and Reese River Toll road north of Mill Creek was abandoned and a new road was built by parties unknown between Mill Creek and the mouth of Galena Canyon, where it intercepted the existing road that ran north to Battle Mountain. A stage station was built at the Reese River crossing. As it happens, this route was identical to one of the options discussed by the toll road selection committee in 1868. This road became known as the Rothe Road and was declared a public road by the Lander County Commissioners on October 18, 1872 (Lander County Commission 1872).

After 10 years of operation, the Austin and Reese River Transportation Company's toll road franchise was extended another five years by the Lander County Commissioners pursuant to the provisions of Nevada law (Lander County Commission 1879).

THE NEVADA CENTRAL RAILROAD AND THE DEMISE OF THE AUSTIN AND REESE RIVER TOLL ROAD

While the Austin and Reese River Toll Road allowed Austin to continue to function as an important trade center in central Nevada, the need for a cheaper and more reliable form of transportation soon became apparent. Prior to the decision to build the toll road, a group of men had tried to form the Humboldt and Colorado Railroad Company to connect Austin to both the transcontinental railroad to the north, and to ports of call on the Colorado River, but had failed to gain the necessary federal franchise (RRR 1868l).

The idea of building a railroad connecting Austin to the Central Pacific not only refused to die, but actually grew over the years. In 1875 Senator Thomas Ferrell got a bill through the Nevada Legislature and past the Governor's veto that provided $200,000 in Lander County bonds to pay for the construction of such a line. After a number of false starts, construction began in the summer of 1879 and the line was completed on the evening of February 9, 1880, the very last day to qualify for the bonds (Myrick 1992:66–77). A few months later, on May 8, 1880, the stockholders of the Austin and Reese River Transportation Company met and dissolved the corporation (RRR 1880). While the toll road officially ceased to exist, many portions of the road and right-of-way continued to be used. An 1881 map of the state of Nevada continues to feature the stage road and shows its relationship to the Nevada Central Railway and other features of the time (Figure 3).

THE ARCHAEOLOGY OF THE TOLL ROAD

In June of 2001, the Desert Research Institute (DRI) of the University and Community College System of Nevada, in collaboration with the Trail of the '49ers Interpretive Center, conducted a one-week field reconnaissance to try and determine whether or not portions of the toll road or the associated stage stations remained intact and could be identified. The project participants included Chuck and Ginger Barrett of the Trail of the '49ers Interpretive Center and Ted Hartwell and Sue Edwards, archaeologists at the DRI.

Much to their surprise and pleasure, they were able to determine that as much as 40 percent of the original route of the toll road remains intact in the form of faint track traces. These traces, such as those shown in Figure 4, are often associated with artifacts consisting of bottle glass, tin cans, and assorted pieces of rusted metal that were discarded over time by those using the route.

The dating of these artifacts indicates travelers used the route well into the 1930s. Other portions of the toll road have been obliterated by agricultural or transportation activities, or have become incorporated into currently used roadways.

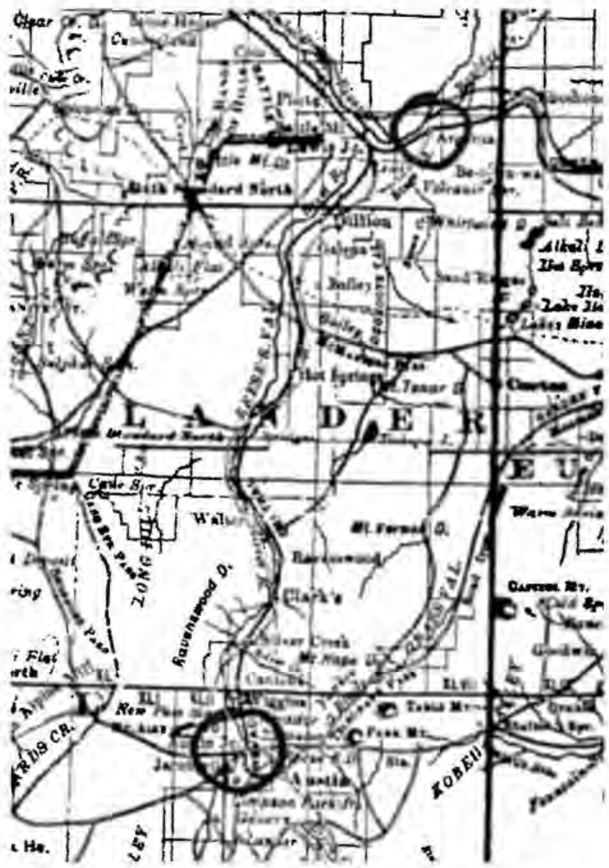

Figure 3. A portion of an 1881 map from the state of Nevada, showing the toll road between Austin and Argenta.

METHOD

During the week of June 6, 2001 a field reconnaissance of the toll road route and some of the stations was conducted. The route was initially identified from contemporary newspaper reports from the Reese River Reveille and later refined from Government Land Office (GLO) survey maps. Preliminary research on the toll road consisted of examination of archival records housed at the Trail of the '49ers Interpretive Center, the Nevada State Historical Society library, the University of Nevada, Reno library, and the Nevada State archives. Additional archival research of GLO survey maps housed at the Bureau of Land Management (BLM) offices in Battle Mountain was conducted both during and following completion of the field reconnaissance. For each identified stage station site, the surveyors' field notes (from the GLO records) were examined for precise locations and any descriptions of the stations that might have been made. During field reconnaissance, GPS coordinates were regularly obtained and later compared to current USGS maps as well as copies of archival GLO survey maps whenever practicable in an attempt to determine whether or not traces observed in the field were, in fact, related to the toll road.

FIELD RECONNAISSANCE

Traces of the toll road were initially identified about two miles north of Austin (Figure 4), and the road was traced with little difficulty almost due north across Italian Creek and on to Silver Creek (Figure 5). The existing well-graded dirt road generally parallels the old road, traces of which are readily apparent for long stretches approximately 30 m east of the present road. Only a cursory attempt was made to locate the stage stations reported to have been at these two locations.

There is an occupied ranch complex at Italian Canyon that may occupy the general location of the original stage station. At Silver Creek, the foundations of the Silver Creek Schoolhouse as well as remains of its walls and the roof are still readily apparent (Figure 6). The remains of additional foundations in the vicinity may represent activity associated with one of the toll road stations, but this conclusion is highly speculative at this time.

Figure 4. *North of Austin, Nevada. A faint trace of the original stage road connecting Austin to Argenta, and later to Battle Mountain, can be seen running parallel and just to the left of the currently used road.*

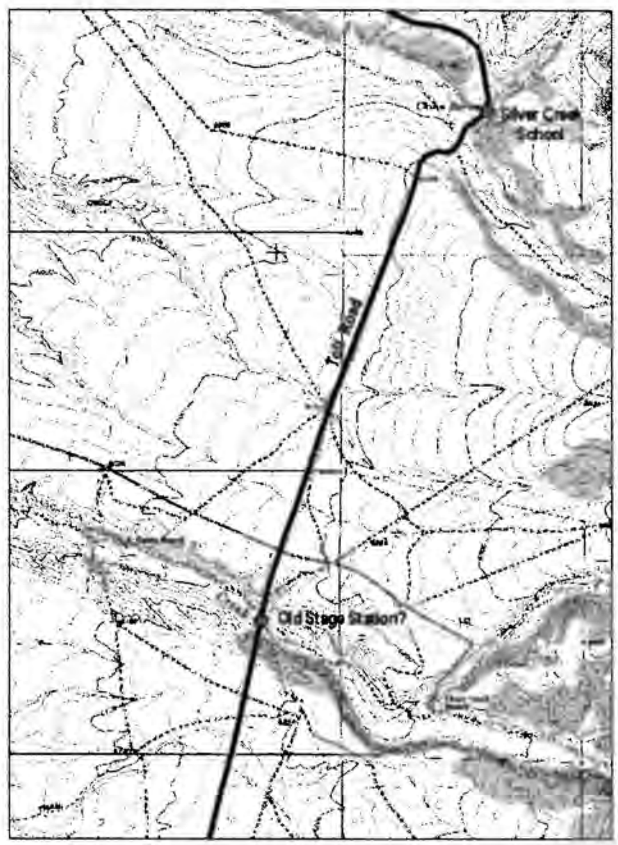

Figure 5. *USGS map section with GLO map features overlay, showing the location of the Silver Creek School and the approximate location of the toll road and the associated station at Silver Creek.*

Figure 6. Silver Creek is described as one of the stage station locations along the Austin and Reese River Toll Road. Shown above are the foundations and remains of the walls and roof of the silver Creek Schoolhouse.

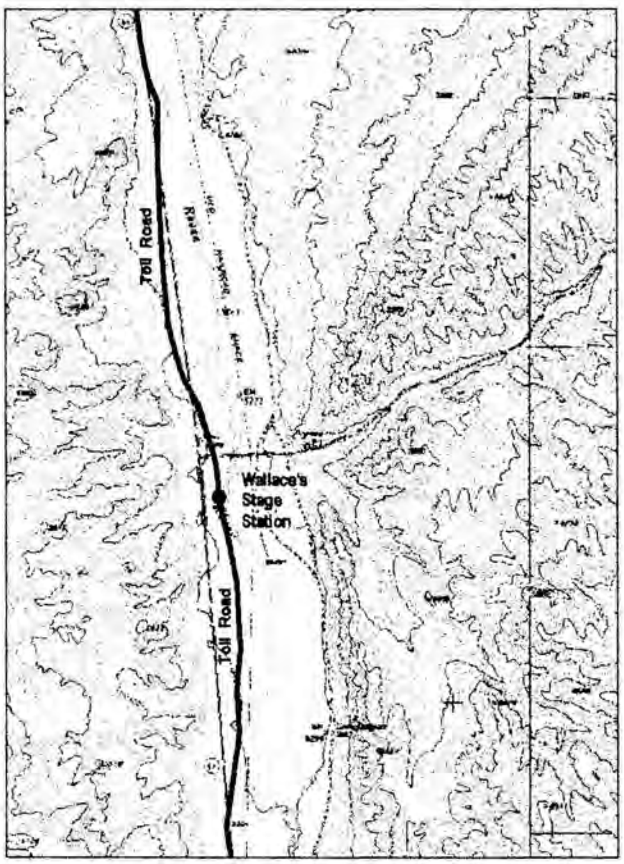

Figure 7. USGS. map section with GLO overlay of toll road and station, assumed to be "Wallace's" station.

From Silver Creek, the contemporary written descriptions of the route state that the road turned west, past Bradley Springs and then turned north along the east edge of the Reese River just south of the Vaughn Ranch. There is an unimproved dirt road that generally follows this route today, but no trace of the original road could be found in this area. It is entirely possible that it has been completely obscured by the current route and associated ranching activities.

About half a mile south of Vaughn's, the road crossed the Reese River and then ran north along the western side of the river. Here, about a mile north of the Iowa Canyon schoolhouse, the GLO survey maps indicated the presence of a stage station on the west side of the river (Figure 7). The site of the stage station had been examined previously by Roberta McGonagle of the Battle Mountain District BLM, who recorded a single-course stone foundation that likely represents the remains of this station. Further investigation of the site during this field reconnaissance resulted in the relocation of the station "foundation" and also revealed the presence of previously undiscovered artifacts dating to the era associated with the original operation of the toll road. Traces of the toll road in this area are ephemeral at best, having been obscured by vegetation, erosion, and probably by the meandering of the channel of the Reese River. This station is likely the one designated as "Wallace's," probably named for its proximity to the Wallace Ranch, located approximately a mile and a half to the north according to GLO maps.

From this point the toll road continues north along the west side of the river and becomes obscured by the roadbed of Highway 305. A stone building designated "Walters Ranch," originally constructed prior to the toll road, survives to this day on a small hill just west of Highway 305 (Figure 8). Past Walters Ranch, the road apparently crossed the river three times before leaving the canyon of the Reese River just south of the turnoff to Antelope Valley. Due to time constraints, no attempt was made to locate the trace of the road through the canyon.

At the northern end of the Reese River Canyon was the stage station and tollbooth known as Vic's, named after Vic Koenison, a stage driver for Wells, Fargo & Co. While the actual station site appears to be under the roadbed of Highway 305, considerable

Figure 8. The stone house shown above, known as the "Walters Ranch," was originally built prior to the construction of the toll road. Although it did not function as a formal stage station, its proximity to the toll road may have made it an occasional stop along the way.

Figure 9. Corrals and the remnants of what may be a hitching post at the Hot Springs site

artifacts and a portion of the old road were readily apparent.

From Vic's, the road rounded the point just beyond the station and then ran in a straight line directly to Hot Springs. The ruined buildings and old corrals close to the Hot Springs site (Figures 9–11) were initially thought to be related to the "Hot Springs" station mentioned in the Lander County Assessment Roll for 1869. However, apparently these features are not directly associated with the stage station, but are part of what was then known as the Smith Ranch. According to GLO survey field notes, the actual station was further south, in the vicinity of an existing ranch

Figure 10. Ruins of a stone out-building at the Hot Springs site

Figure 11. A mud roof and wood slat building at the Hot Springs site.

complex that may well have been the site of the original station.

From here the toll road tended north. While Highway 305 continues west of north and runs around the western tip of some unnamed hills that form the northern end of the Valley of the Moon, the toll road ran between the hills, about half a mile to the east of the highway. Continuing north, the toll road remains east of the present day highway, only impinging on (but not crossing) the highway at the point of a hill where the turnoff to Carico Lake and Red Rock Canyon leaves the highway. Here the toll road turns sharply east and generally follows the contour to Mound Springs. The trace from Hot Springs to Mound Springs is clear and a major portion of it is still in use today. About half way along the route is a series of gravel pits that obliterate about a quarter of a mile of the trace.

Figure 12. An easily visible trace of the toll road south of Mound Springs.

***Figure 13.** The Central Pacific Railway at what was once the town site of Argenta.*

At Mound Springs and on to the north the old trace is quite visible (Figure 12). The springs have been developed and there are watering troughs for livestock close to the old road. About 100 yards south of the stock tanks is what appears to be an old foundation, and approximately another 50 yards south is a dugout cut back into the hill just below some of the springs. The Lander County Assessment rolls use the name "Boston" to identify the station between Hot Springs and Trout Creek; the origin of the name is unknown. Both the BLM maps and the GLO surveyor's notes confirm the presence of a station at Mound Springs.

From Mound Springs the trace continues east of Highway 305, crosses Mill Creek and then angles up slope and enters Trout Creek about a mile south of Trout Creek Ranch. The road down into the actual creek channel has survived, and the trace can be seen in places further to the east. This station is not identified in either the BLM maps or in the surveyor's notes; however, it is clear from the maps that the toll road did swing east along the creek channel into the area now occupied by a ranch house and out-buildings.

The maps also indicate that the road did not cross Trout Creek in the area of the station; rather it backtracked west along the south side of the creek for about a mile and a half and west of Old Highway 8A) before turning north and crossing the channel. The old trace can be followed from the north side of Trout Creek about half the distance to what is now known as the Marvel Ranch, just below the mouth of Lewis Canyon.

The Marvel Ranch seems to be the most likely site of the station identified as Rock Creek in the 1869 Assessment roll. Again, however, neither the maps nor the GLO surveyor's notes indicate any station at this location.

From here the road turned to the east and followed the contour of the Shoshone range, first east and then north as the mountains turn toward the Humboldt River. In this area the presumed trace can be observed in areas, although many portions of the route have been used as access to borrow pits and farmland in the area. Extensive agricultural activities in the northern reaches of the toll road make it difficult to determine with any certainty (barring the presence of contemporary artifacts) whether or not traces belong to the original toll road.

At Argenta Point, the toll road would have crossed what is now Interstate 80 and rounded the point just south of the railroad tracks, in the vicinity of the present day access road, and terminated at the site of Argenta (Figure 13).

ARTIFACTS

During the course of the field reconnaissance, numerous artifacts and features were encountered. Many of these cultural materials are contemporary with the original operation of the toll road, though most appear to be associated with periods of later use. Due to time constraints, photo-documentation was the only technique used to record these objects, with no site forms, sketches, or mapping taking place. In most cases, artifacts consisted of various types of tin cans, bottle glass fragments (Figure 14), and unidentified pieces of rusted metal.

Although there was by no means an exhaustive survey conducted along the entire length of identified remnants of the toll road, artifacts observed during the reconnaissance usually occurred as isolated finds along stretches of the road. Artifact concentrations not directly associated with stage stations or the terminus of the toll road at Argenta most often appeared to represent utilization of the route subsequent to its operation as a toll road. Diagnostic cans and bottle glass seem to indicate resurgence in use of much of the route for a short time sometime in the 1930s, although this conclusion is preliminary in nature.

Figure 14. *Isolated fragments of "purple" bottle glass along a section of the toll road. The purple color is actually a result of long-term exposure of the glass to sunlight, which interacts with manganese in the originally clear bottle.*

Figure 15. *"Black" bottle glass fragment from the Argenta town site. Glass color and method of manufacture often provide good chronological markers. This fragment is actually a dark olive green or olive amber glass, made nearly opaque by the introduction of various compounds (iron, copper) during the glass manufacturing process (Kendrick 1979; Mumsey 1970). Used primarily for alcoholic beverages such as wine, stout, and ale, this glass usually pre-dates 1870.*

Diagnostic artifacts that were encountered in the vicinity of the town site of Argenta as well as the two identified stage stations (Wallace's and Vic's) were much more likely to be associated with the time period encompassing the route's use as a toll road. Although no structures remain at Argenta, several slightly mounded deposits occur that may represent the eroding of old foundations as well as buried trash middens. Surficial and partially buried artifacts are fairly abundant, and though most are unidentifiable or non-diagnostic, many speak to the brief heyday that Argenta enjoyed prior to relocation of commercial activities to nearby Battle Mountain (Figures 15–18).

A brief reconnaissance of the area believed to represent the location of the stage station designated as "Wallace's" resulted in the rediscovery of a single-course stone foundation (Figure 19) previously recorded by Roberta McGonagle of the Battle Mountain District BLM office. In addition, previously unrecorded artifacts including tin cans and bottle glass fragments similar to those noted at the Argenta town site were encountered. Most notably, several sections of a wrought iron wood-burning stove were discovered (Figure 20). One of the fragments has a date of "1857" that is clearly visible in the photograph.

Figure 16. *Old rail car coupler from the Argenta town site.*

Figure 17. *Tin can from the Argenta town site. Tin can construction also can provide temporal information. The hand-soldered "hole-in-cap" can depicted above probably pre-dates the early 1900s (Busch 1981).*

Figure 18. *During the late 1880s, embossed bottles bearing the customer's or product's name became quite common (Fike 1987). The flat-paneled extract bottle found at Argenta provides an example of this manufacturing technique.*

CONCLUSIONS

The construction and operation of the Austin and Reese River Toll Road had historically important socio-economic impacts on the region. As one of the first north-south routes built connecting communities to the railroad, it reduced the cost of transporting supplies into the Austin mining district, and may have saved Austin from relegation to ghost town status. It also likely led to the development of northern portions of the Reese River as well as helping to supply the southern mining

Figure 19. *Partially buried single-course stone foundation that may be the remnant of the stage station designated as "Wallace's" located on the banks of the Reese River.*

Figure 20. *Fragments of several sections of a iron-wrought wood-burning stove found in the area believed to be the location of "Wallace's" stage station. Note the date of 1857 stamped on the fragment near the center of the photograph.*

camps of Ione and Grantsville, and possibly others. Despite the significance of the toll road in the history of Austin and Lander County, it has been almost entirely neglected in the several histories of Nevada that have been published over the past 120 years.

This preliminary study demonstrates that while much of the Austin and Reese River Company Toll Road has been destroyed by construction and agricultural activities or has become incorporated into county roads or highways, significant portions of it remain intact and relatively unaltered since its use as a stagecoach line between Austin and Argenta, and later Battle Mountain. Although the route's operation as a toll road lasted only 12 years, artifacts discarded from vehicles along the road or during brief stops at the stage stations are still in evidence, and represent nearly 70 years of at least sporadic use between the late 1860s and early 1930s. Additional studies are proposed to examine the areas around the identified stage stations as well as the town site of Argenta more closely before casual collection, agricultural activities, and natural erosional processes erase the remaining traces of this small but important part of Nevada's history.

Acknowledgments. The investigators are grateful to DRI's Lander Endowment for providing the funding for this pilot study. We would also like to thank Roberta McGonagle of the Battle Mountain District Office of the Bureau of Land Management for providing invaluable information and access to resources critical to the completion of this study.

REFERENCES CITED

Abbe, D. R.
1985 *Austin and the Reese River Mining District: Nevada's Forgotten Frontier.* University of Nevada Press. Reno, Nevada.

Angel, M.
1866 *Harrington's Directory of the City of Austin, For the Year 1866; With a Historical and Statistical Review of Austin, and the Reese River Mining Region.* J. D. Fairchild & Co. Austin, Nevada.

Busch, J.
1981 An Introduction to the Tin Can. *Historical Archaeology* 15(1):95-104.

The Crescent, Reno, Nevada
1870 "Removed." March 19.

Fike, R. E.
1987 *The Bottle Book: A Comprehensive Guide to Historic, Embossed Medicine Bottles.*Gibbs M. Smith, Inc., Peregrine Smith Books, Salt Lake City, Utah.

Goodwin, V.
1971 Lewis Rice Bradley: Nevada Cattleman and Governor. *Nevada Historical Society Quarterly,* winter edition, pp. 17–18.

Hanchett, L. J.
1868a Application for toll road. Lander County Recorder's Office, Miscellaneous Records, Book 2, page 2. Undated but filed between April 10 and April 20, 1868.

Hanchett, L. J. (continued)
1868b Indenture transferring right title and interest in toll road to the Austin and Reese River Toll Co. August 14, 1868. Lander County Commission, Battle Mountain, Nevada

The Humboldt Register, Battle Mountain, Nevada
1870 Removed. March 19.

Kendrick, G.
1979 *The Antique Bottle Collector.* Harcourt Brace Jovanovich, New York, New York.

Lander County Assessor's Office
1869 Assessment Roll, Wells, Fargo & Co.

Lander County Commission, Battle Mountain, Nevada
1863 Book A, page 1, April 4.
1872 Book A, page 15, October 18.
1879 Book A, page 239, January 20.

Munsey, C.
1970 *The Illustrated Guide to Collecting Bottles.* Hawthorne Books, Inc., New York New York.

Myrick, D. F.
1992 *Railroads of Nevada and Eastern California: The Northern Railroads.* (Reprint edition) University of Nevada Press, Reno.

Paher, S.
1984 *Ghost Towns and Mining Camps of Nevada.* Nevada Publications, Las Vegas, p. 161.

Reese River Reveille (RRR), Austin, Nevada
1868a Report on the Approach of the Tracks. April 15.
1868b A Railroad for Austin. March 26.
1868c A Word to the Wise. June 24.
1868d Austin Route to the Railroad. June 23.
1868e Committee Report on the Possible Routes along the Reese River. July 30.
1868f Railroad Town North. October 26.
1868g The Cars are Coming. October 2.
1868h By Miller & Wadleigh's Stage. November 10.
1868i From Virginia. November 14.
1868j A Stage Upset by Drunken Driver—the Passengers Abused and Assaulted. November 26.
1868k A Word from Argenta. November 25.
1868l Humboldt and Colorado Railroad Company. May 28.
1880 A. & R.R.T. Co. April 7.

Simpson, J. F.
1983 Report of Explorations Across the Great Basin in 1859. University of Nevada Press, Reno.

*Petroglyphs of an Extinct Pronghorn (*Stockoceros *sp. ?) and a Winter Solstice Sunrise Marker at the Rock City Site, Lincoln County, Nevada*

Alvin R. McLane, Reno, Nevada
Farrel Lytle, The EXAFS Company, Pioche, Nevada
Shannon Lytle, Manetta Lytle, and Nelson Lytle, Pioche, Nevada

An unique group of petroglyphs in the Hiko region portray four-pronged animals with a close resemblance to the Stockoceros *sp., an extinct Pleistocene pronghorn. Fossils show that this animal was about the size of living pronghorn, but with four equal size horns, two branching upward above each eye. They were common in the Southwest and the Mojave Desert. Dates of the animal, often in archaeological contexts, are between 11,000 to 13,000 B.P., with one sample dating approximately 7,432 B.P. Recent, non fossil, two-horned skulls have been located in Wyoming.*

Near the animal petroglyphs, but probably not associated with them, is an accurate winter solstice sunrise indicator. The solar petroglyph consists of a ticked and bisected circle 32 cm in diameter. When viewed from this panel, the winter solstice sunrise emerges from behind the top of a 30 m high, white pinnacle, located 1.20 km to the ESE.

Aeons ago, a great rock tumbled from a cliff. It lay there for unknown millennia until prehistoric people chanced upon the shelter under the immense stone. Did people find this spot 11,000–13,000 years ago when four-pronged animals roamed the Southwest?

The Rock City Site (LN10/20/00-3) is in Lincoln County, Nevada, near the settlement of Hiko. It is located at an elevation of 1,603 m (5,260 ft.), near the east end of a east-trending, rock-walled valley where shelters and wind-protected areas abound. The site is located in a zone of the Hiko Tuff, a pinkish-gray and tan welded tuff. It forms cliffs and in certain areas weathers to form brown-stained, spheroidal outcrops. Large exposures usually have well-developed, intersecting systems of vertical joints. The Hiko Tuff is a huge ash-flow sheet that has spread over at least 7,000 km^2 (2,703 sq. mi.) in southeastern Nevada. The unit is ca 50–275 m (164-900 ft.) thick. The tuff is of Miocene age, dating to 18.2 Ma (Rowley et al., 1995:59, 61; Tschanz and Pampeyan 1970:71–72). It is the main rock type in Lincoln County that the American Indians utilized in making petroglyphs.

The site is 72 m long and 64 m wide, covering 4,608 square meters. The north end of the site is located along a cliff and on a slope with large boulders, while the south end is level and sandy with scattered large boulders. The site consists of several components: (1) two rock shelters (one with the supposedly *Stockoceros* petroglyphs), (2) four petroglyph panels, (3) chert lithics associated with both rock shelters, (4) Brown Ware pottery sherds, and (5) a tinaja (a rock basin) water source capable of holding several gallons of water. Rock Shelter #1 is the main shelter with the petroglyphs and Rock Shelter #2 is located to the southeast, closer to the tinaja. Petroglyph Panel #1 is in Rock Shelter #1, Petroglyph Panel #2 is located to the southeast, Petroglyph Panel #3 is located further to the southwest, and the solar disc, Petroglyph Panel #4, is the northern most component of the site (Figure 1).

Plant resources growing in the area include Mormon tea (*Ephedra viridis*), big sagebrush (*Artemisia tridentata*), Indian rice grass (*Oryzopis hemenoides*), four-winged saltbush (*Atriplex canescens*), cliffrose (*Cowania mexicana*) and juniper (*Juniperus osteosperma*). Chert for tool-making

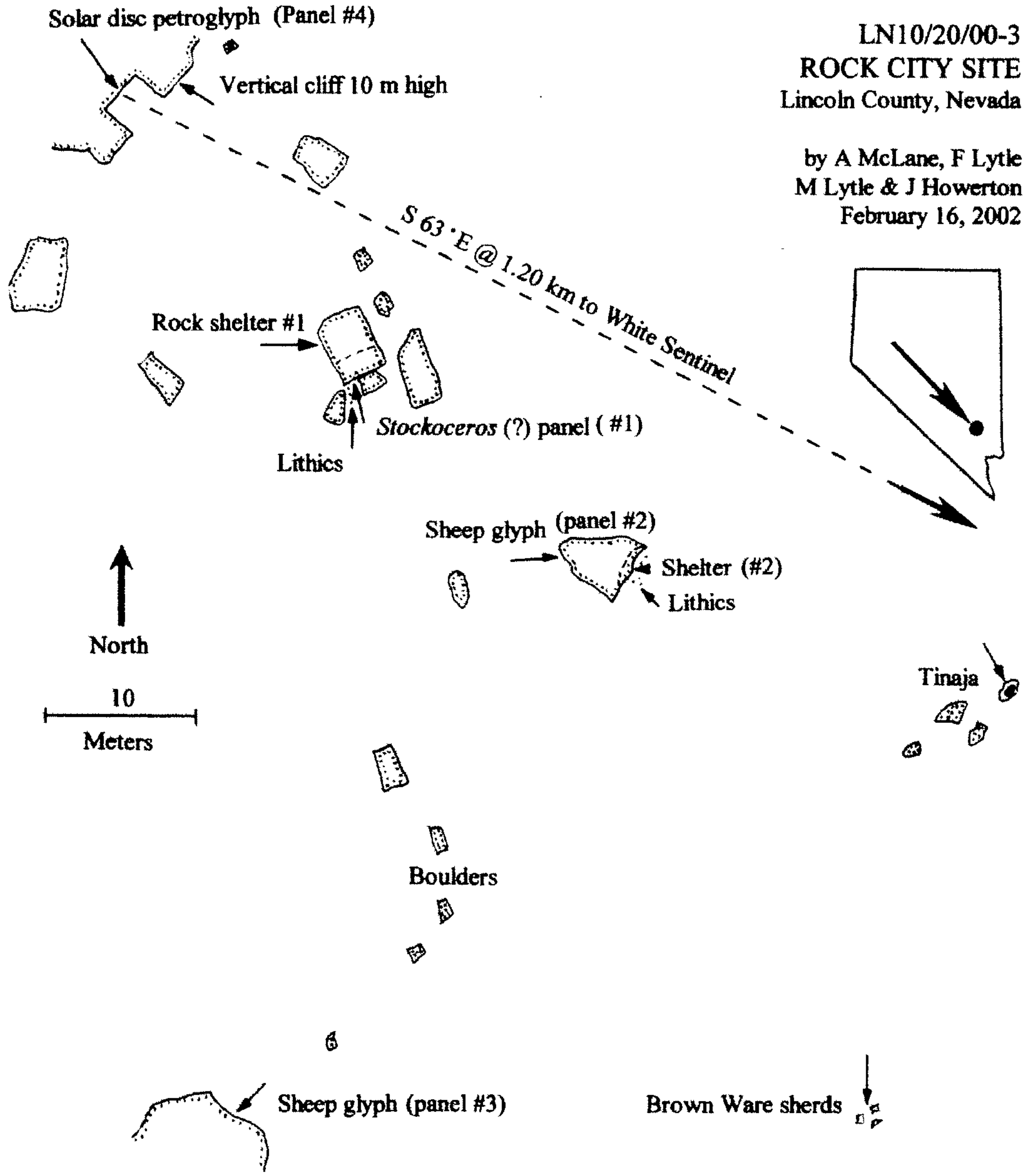

***Figure 1**. Map of the Rock City Site.*

is also nearby. Various-colored cryptocrystalline silicates form at the interface between the Tertiary volcanic rocks and the older, underlying carbonate rocks (here Devonian in age). One of these contacts is located less than 1.61 km (1 mi.) from the petroglyph site. The process of forming the chert is not well known. Perhaps, because groundwater may carry a lot of silica, it is deposited from breakdown of the volcanic ash/tuff at the volcanic and carbonate interface (Peter D. Rowley, personal communication 2002). Occasionally, translucent obsidian flakes are found in the area. One of us (F. Lytle) has sourced the obsidian from a site about 16.1 km (10 mi.) away. The tuff rocks have a propensity to form cavities and hollows on top of the boulders and outcrops. Ranging in size from a cupful to many barrels capacity, these so called tinajas collect precipitation and may be a reliable water source for months. One of these water basins, holding up to half a barrel, is located to the east of the shelter overhang.

Near the quad horn petroglyph location (Panel #1) are three other pecked petroglyph panels. To the southeast 20 m from the main petroglyphs is a dim panel (Panel #2) in a west facing cavity of a large boulder. Barely discernible is a bighorn sheep, a ticked circle, and short lines. Forty-two meters further southwest is Panel #3, a small sheep

Figure 2. *Petroglyph panel #1.*

element, nearly lost in the immensity of its surroundings. Panel #4 is a somewhat faded, but well executed, 32 cm wide, outward ticked circle with a line across the center. A faint zoomorphic figure is located under the circle and two vertical lines are nearby. This panel is on the cliff wall from where the gigantic rock tumbled to form the shelter with the Stockoceros elements. The panel is located 25 m northwest of the Shelter #1. When the winter solstice is viewed from the solar disc, the sun rises at about 7:05 AM from behind the White Sentinel, a 30 m tall tower on the sky line, located S63˚E at 1.2 km (0.75 mi.) away.

The possibly *Stockoceros* panel (Panel #1) is located under the south end of the immense fallen boulder. The shelter is 6.3 m wide and 5.5 m deep, measured along the 21° sloping ceiling. However, the petroglyphs utilize less than half of the ceiling, only on the west 2.2 m of the ceiling. Elements consist of four, four-pronged animals, an unusual foot-like print, with five toes pointing downward, and a repeatedly scratched vertical line with three scratched pointers pointing east from the line. (Figure 2) There are a few other miscellaneous marks. Historic scratches are also present on the ceiling of the shelter but they do not impinge on the integrity of the panel.

Chert lithics, whose source is a short distance away, are scattered over the floor in Shelter #1. Chert lithics are also in Shelter #2 on the east side of another large boulder. Additionally, burned rocks and bone are in the shelter. In the immediate area are also sparse obsidian and quartzite flakes. Brown Ware sherds, striated and burned black on the interior surface, were found in the southeast part of the site.

We believe that our animal image is one of the extinct herbivore mammals of the family Antilocapridae (prong-horn-like), known only from North America.

The *Capromerix*, weighing 10 kg (22 lbs.) is a small four-pronged plains grazer. *Tetramerix*, a large, 59 kg (130 lbs.) four-pronged pronghorn, roamed from California to Mexico. We believe our petroglyph animal image is the *Stockoceros*, intermediate between the two above in size (Figure 3). It was the size of the living pronghorn (*Antilocapra americana*), weighing about 53 kg (117 lbs.). The uniqueness of the animal, like our petroglyph image, are the two horns of equal size, projecting upward from the skull. Possibly two species of the Pleistocene *Stockoceros* have been identified—*S. onusrosagris* (Stocks pronghorn) and *S. Conklingi* (Conglings pronghorn) (Internet data, Some Late Pleistocene, Now-extinct Fauna of the Southwest). However, these animals have not been particularly well-studied and, as Grayson (1993:67) has pointed out, these may be the same animal. Information and drawings of this animal are also found in Kurtén and Anderson (1980:74, 323).

Here, we may speculate on the age of the petroglyphs. The solar disc, being exposed to the elements, is considerably weathered. But the images in the Shelter #1 loci are so clear and different, that when first found it was wondered if they were authentic. It was decided that they were.

Figure 3. *Pleistocene* Stockoceros.

Being hidden and well-protected, they are fresh-appearing, as if made only a short time ago. Only the western panel, close to the edge of the shelter, has considerable weathering. In the references found on the internet, many of the Stockoceros remains have been excavated from archaeological contexts, generally dating from 11,000 to 13,000 B.P. In artifact-bearing levels at Burnet Cave, New Mexico, they date at 9,500 B.C.E. From the same cave, another quad horn, also has been dated 7,432 B.P. The literature that we have found lists *Stockoceros* extinct. However, in a surprising conversation with Jim Yoakum (personal communication 2002), he notes that some 20 years ago, a four-pronged, non-fossil, skull specimen of only a few years old was found in Wyoming—possibly a throw back from the earlier quad horn!

Though not particularly well-dated, Brown Ware ceramics, like those found near the Rock City Site, date back to ca 500 years ago (Lockett and Pippin 1990:77). An Elko projectile point, found 1,190 m (3,904 ft.) west of the Rock City Site, dates from 3300 to 1300 B.C. (Thomas and Bierwirth 1983:182). Thus, with the wide range of dates found in the literature pertaining to the *Stockoceros* sp. and with the dates of artifacts found in the region, the time of the making of the four-horn animal petroglyph animals are unclear.

Petroglyph images of animals no longer living in Nevada, though rare, are not unknown. For instance, a bison petroglyph image at a site (CrNV-11-7850) in Elko County, Nevada was reported by Woody (1993). Also, from Elko County, bison remains are dated at 1,052 B.P. (Fred Nials, personal communication 1993). It is our belief that the quad horn animals in the shelter at the Rock City site are an actual depiction of the Stockoceros sp. Only the date when the petroglyph images were made remains a question.

REFERENCES CITED

Grayson, Donald K.
1993 The Desert's Past-A Natural Prehistory of the Great Basin. Smithsonian Institution Press, Washington, D.C.

Kurtén, Björn, and Elaine Anderson
1980 Pleistocene Mammals of North America. Columbia University Press, New York.

Lockett, Cari L., and Lonnie C. Pippin
1990 Re-examining Brownware Ceramic in the Central and Southern Great Basin. In Hunter-Gatherer Pottery From the Far West, edited by Joanne M. Mack, pp. 67–82. Nevada State Museum Anthropological Papers, Number 23

Rowley, Peter D., L. David Nealey, Daniel M. Unruh, Lawrence W. Snee, Harold H. Mehnert, R. Ernest Anderson, and C. Sherman Grommè
1995 Stratigraphy of Miocene Ash-Flow Tuffs in and near the Caliente Caldera Complex, Southeastern Nevada and Southwestern Utah. In Geo logic Studies in the Basin and Range-Colorado Plateau Transition in Southeastern Nevada, South western Utah, and Northwestern Arizona, 1992, edited by Robert B. Scott and W. C. Swadley, pp. 74—88. U.S. Geological Survey Bulletin 2056.

Thomas, David Hurst, and Susan L. Bierwirth
1983 Material Culture of Gatecliff Shelter: Projectile Points. In The Archaeology of Monitor Valley, 2. Gatecliff Shelter, Vol. 59, Part 1, edited by David Hurst Thomas, pp. 177–211. The American Museum of Natural History Anthropological Papers, New York.

Tschanz, C. M., and E. H. Pampeyan
1970 Geology and Mineral Deposits of Lincoln County, Nevada. Nevada Bureau of Mines Bulletin 73.

Woody, Alanah
1993 Five Rock Art Sites in Elko County, Nevada. Paper presented at the 23rd Great Basin Anthropological Conference, Elko, Nevada.

Hot Creek Valley, Nevada

William Gray Johnson

Hot Creek Valley is located in north-central Nye County (Figure 1). It is a remote desert valley approximately 60 miles northeast of Tonopah. U.S. Highway 6 cuts across it diagonally (southwest to northeast). At Warm Springs, U.S. Highway 6 intersects with State Road 375 with the latter providing the approximate boundary between Hot Creek and Reveille Valleys. The valley is a long graben with up to 3,600 feet of Quaternary and Tertiary fill underlain by a thick section of Tertiary volcanic rocks. The Hot Creek Range dominates the west side of the Valley where Morey Peak rises to 10,246 ft. The Kawich and Reveille Ranges pinch the southern end of the Valley while Pancake Range flanks the eastern side. Halligan Mesa and a series of small buttes close out the northern end of Hot Creek Valley. Shadscale (*Atriplex confertifolia*), bud sage (*Artemesia spinescens*), and big sagebrush (*Artemesia tridentata*) communities predominate the valley. The climate is semi-arid with mean yearly precipitation at approximately 5.3 inches. Occurring as both snow and rain, it is distributed almost evenly throughout the year (Tueller et al. 1974:8). No data on temperature variation is known but Beatly (1976:23) indicates that the region is characterized by large daily ranges in temperature.

The archaeology of the area has been reviewed by Bard et al. (1981), Elston (1982, 1986), Pendleton et al. (1982), and Thomas (1985) and reveals a variety of different types of prehistoric and historic occupations. Elston (1986) further divides this area into three subregions: Lahontan Basin, Central Subregion and the Eastern Slope of the Sierra Nevada. Hot Creek Valley is located in the Central Subregion where significant archaeological investigations have been conducted in the Reese River Valley (Thomas 1971), Monitor Valley (including Gatecliff Shelter) (Thomas 1983a) and at high altitude sites such as the Alta Toquima Village (Thomas 1982) to name but a few.

Recorded history in the Great Basin does not begin until the 1800s. However, trade beads that date to the Mission Period in California (late 1700s) are found at Native American archaeological sites. For example, King (in DuBarton 1992:63) identified Olivella biplicata rough disc beads in the southern Great Basin that date as early as 1780. According to Steward (1938:111), ethnographic information gathered from Native American occupants of the Hot Creek Valley indicates camps were located at Tybo Creek and Hot Creek. Linguistically, these occupations were located within the Shoshone grouping (Steward 1938:Figure 6). Steward (1938:11) notes that two families lived at Hot Creek and three or four families lived at Tybo Creek. Traveling for the Tybo Creek families was limited to approximately 25 miles as, for example, they obtained pine nuts near Rocky Peak and sometimes in the Reveille Range but never as far away as the Quinn Canyon Mountains to the east. The families at Hot Creek were headed by Hot Creek John, Kawüsi, and Brigham while the families at Tybo Creek followed a chief named Kunugipajugo. However, a report by Powell and Ingalls on the Western Shoshone contradict Steward indicating Wet-sai-go-om' beom' was the chief at Hot Creek (in McKinney 1983:45). For festivals, the Hot Creek families went to Duckwater (in Railroad Valley) or Biabahuna (in Little Smoky Valley) whereas the Tybo Creek families usually joined the Kawich Mountain people for festivals or had them come to Tybo to participate. Later, as historic period peoples expanded their influence, the native hunting and gathering economy was permanently disrupted and families worked on ranches and in mines (Crum 1994:63).

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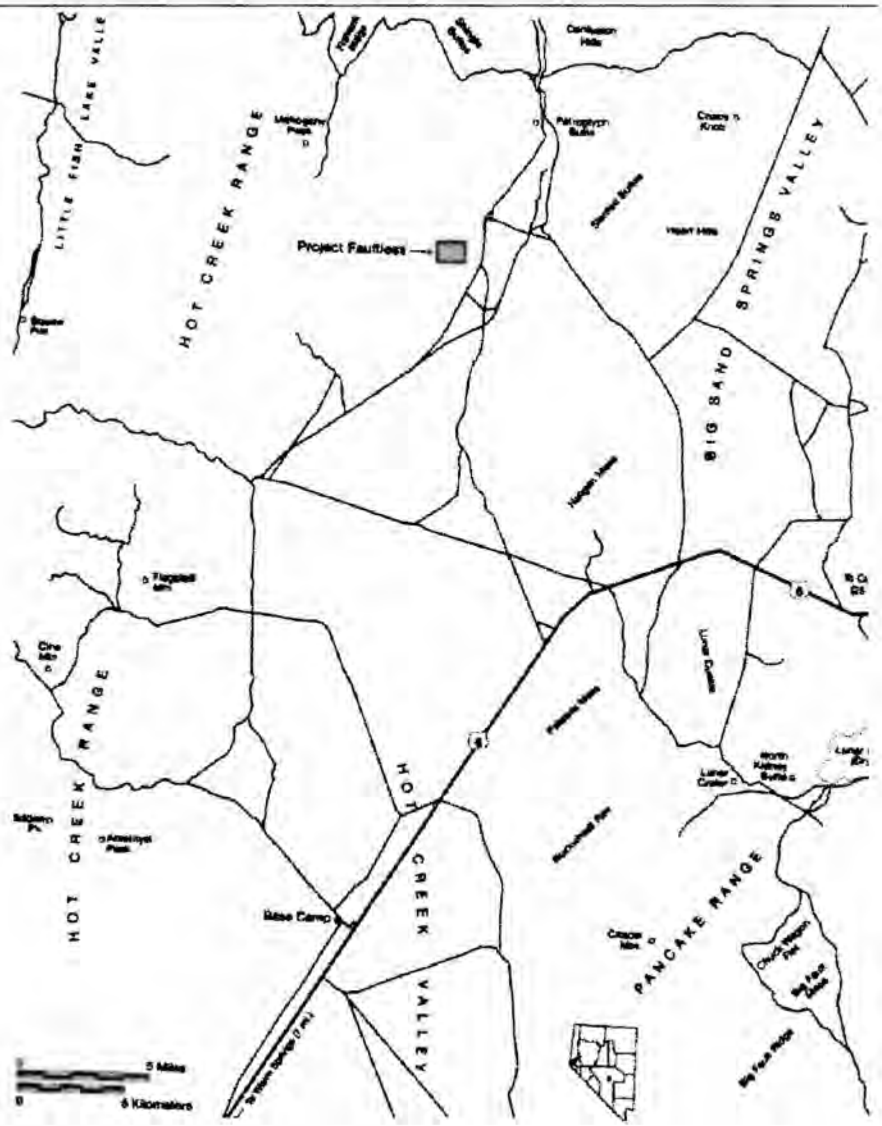


Figure 1. *Hot Creek Valley.*

EARLY EXLORATIONS

The historical period in this part of Nevada begins with the 1827 expedition of Jedediah Strong Smith, a trapper with the Rocky Mountain Fur Company. His place in history is somewhat overshadowed by the Lewis and Clark expedition, but his accomplishments were significant. According to Elliot (1987:34), Smith was the first white man to cross present day Nevada. His approximate route followed present day Highway 6. From the Sierra, Smith and two companions proceeded eastward following along the south shore of Walker Lake and eventually through the Hot Creek Valley (Elliot 1987:34–36). According to Morgan (1965:210), this route is conjectured based on what was possible but, in general terms, Morgan (1965:418) believes the route would have taken Smith and his companions "east from Walker Lake between the Gabbs Valley and Pilot Ranges, around the southern end of the Shoshone Mountains and the Toiyabe Range and across the Toquima Range near Manhatten. Thence east across the Monitor Range and down Hot Creek to come into the route of US 6 below Black Rock Summit... then have gone northeast,... almost as far as Ely... [to] north of Wheeler Peak, then turned nearly north along the base of the Snake Range to reach the Utah line in the vicinity of Gandy."

Earlier Spanish exploration efforts (attempting to find a travel route from the New Mexico missions to the ranching chain being developed in

California) led many to believe that a great river, named the San Buenaventura, crossed the Great Basin and cut its way through the Sierra Nevada to the Pacific Ocean. So strong was this belief that it was not until John Frémont had explored nearly every stream on the west slope of the Sierra that it was dispelled (Anonymous 1991:30). However, Smith became the first person to be convinced that the supposed river did not exist based on his 1827 555 Smith on this point but, nonetheless relied on Smith's explorations because a copy of the 1845 map had notations in the handwriting of George Gibbs, a Frémont cartographer, showing references to Smith's journeys in the Great Basin (Elliot 1987:36).

After Smith, the Joseph Walker expedition of 1833 crossed part of Nevada (down the Humboldt) on a trek to California. The adventures of this expedition were written into a literary work by Washington Irving in 1837 called Adventures of Captain Bonneville. Irving's novel was based on a manuscript he purchased from Captain Eulalie Bonneville and according to Bonneville's account, he had sent Walker and approximately 36 men to explore and trap in the vicinity of the Great Salt Lake and was annoyed that they had made "a long frivolous expedition across to California and had a very gay time on the plazas there" (Anonymous 1991:31). Conflicting accounts of Walker's purported frivolity have since emerged as it appears the California trek was planned and elaborately equipped. Historians have found that Bonneville had written a letter to the General-in-Chief of the Army referring to the expedition and explaining that arrangements had been made to collect information. At that time, the British were sharing Oregon and the Mexicans had claims to everything south of Oregon and west of the Rockies. Thus, army activities in the area "collecting information" were probably somewhat circumspect.

Following Walker, John Frémont began explorations in Nevada. His 1845 expedition entered near Pilot Peak and split into two parties; one led by Frémont, the other led by Walker. Walker's group went down the Humboldt while Frémont's group made a central crossing to Walker Lake (as named by Frémont) where they waited for Walker's party. The united group made their way to Owens Valley and through Walker's Pass on their way to California (Anonymous 1991:32-33).

EMIGRANTS

Frémont's reports stimulated interest in the West and were particularly valued for the accurate maps and descriptions of the terrain (Anonymous 1991:33). The ensuing years found more emigrants heading West. Among one of the largest contingents were the Mormons. After having lost their leader, Joseph Smith, Brigham Young took command and led the faithful to the Great Salt Lake. By 1849, Young announced the formation of the State of Deseret, which included Nevada (Anonymous 1991:36). Meanwhile, the California gold rush had started and the route along the Humboldt became an important access for fortune-seekers. Trading posts soon appeared along the Humboldt Road and in June of 1849 a trader named H. S. Beatie, who was sent out by Young, established a post then known as Mormon Station but now called Genoa. The next year, the U.S. Government ignored Young's Deseret and created the Territory of Utah (which included Nevada, then called Western Utah).

In 1851, mail service between Salt Lake City and Sacramento was initiated with a stop in Carson Valley. Originally following the Humboldt, the mail route was moved south in 1855 to avoid the heavy snow in the Rubies. Passenger service soon followed the mail and by 1854 both mail and passengers could be hauled between Salt Lake City and California. By 1857, the stage service was available three times a week.

ESTABLISHING STATEHOOD

The first effort for official recognition of the Territory of Nevada came in 1857 but the plea was ignored. The second attempt occurred in 1859 and resulted in the election of Isaac Roop as governor. It was during this year that silver was discovered in Washoe and started the mining forays that characterize much of Nevada's history. The stampede that had crossed the Sierras to California reversed itself and "the stampede back over the mountains was on" (Anonymous 1991:40).

Though the residents of the Territory of Nevada may have considered themselves Nevadans in 1859, it was not until 1861 that then President Buchanan signed a territorial organic act that recognized Nevada Territory as containing "all that part of Utah Territory west of the 116th meridian" (Anonymous 1991:41). Later that same year, President Lincoln commissioned James W. Nye as governor. Nye arrived in Nevada on July 11th to proclaim establishment of the Territorial Government. Nine counties were organized at the first session of the legislature: Ormandy, Storey, Esmeralda, Humboldt, Churchill, Douglas, Lyon, Lake, and Washoe.

Nye county was carved out of Esmeralda County in 1864, the same year Nevada was granted statehood. According to Davis (1913:960), the earliest maps of Nye County showed "Fremont's Trail in 1845" through Smoky Valley. Along it were names of San Antonio Peak, Hot Springs, Twin Rivers, and Smoky Creek. Ione was established as the original county seat on April 2, 1864 but was not able to hold it for long. The county seat moved to Belmont on February 6, 1867. During that time, Nye County's boundaries changed with the last change to the western boundary occurring on March 5, 1869. On the eastern side, part of Nye County east of the 115th meridian west from Greenwich was added to Lincoln and White Pine Counties.

MINING

The move of the county seat to Belmont was significant for it recognized the growing importance of mining in the county. The Hot Creek Range became a focal point in mining when ore was discovered in Tybo canyon in 1866. Apparently an Indian led a prospector to the ore and, according to Ashbaugh (1963:232), it was a lode that was running $2000/ton. Angel (1881:527) indicates Tybo's first resident was John Centers (having made his home there in August, 1866), thus Centers was likely the prospector shown the ore. Interestingly, the name Tybo is a corruption of the Shoshone word "tybbabo" which means "white men's place" (Mitchell and Mitchell 1981:50).

Twelve miles north of Tybo was Hot Creek where ore was discovered by William Waters, William Robinson and others. Angel (1881:517) indicates the area became the Hot Creek District in 1866 and was named for the hot water that runs for several miles through the valley, "sinking in a tule marsh in a valley east of the range." North of Hot Creek was Morey, another small community. According to Angel (1881:515), these three towns, Belmont, Tybo, and Morey, were in the bordering mountains around Hot Creek Valley and no families actually lived in the valley in 1881.

While the Hot Creek District was organized early, the Tybo District (being composed on the southeast portion of the Empire District) saw more activity. The district itself was organized in 1870 and the town of Tybo was established in 1874. By 1876, Tybo had 1,000 residents, five stores, two blacksmith shops, and numerous saloons (Angel 1881:527). A weekly newspaper, the Tybo Sun, began publication in May of 1877 and a review of the advertisements indicates that by that time Tybo had a hotel, two general stores, a stock broker, two attorneys, two medical doctors, a bakery, a livery/stable, two boarding houses, 1 stationery store, two meat markets, three restaurants, a blacksmith, two boot and shoemakers, the Eureka Foundry, a furniture store, a saddle and harness shop, three drug stores, a stage line, and 10 liquor stores/bars. The newspaper was published every Saturday with a one-year subscription price of $8.00. The stories discuss politicians in the West, local information such as births and deaths, and national political issues as well as human interest stories. Interestingly, Brigham Young was mentioned in several of the stories and was never portrayed very well, often as a crack-politician.

Tybo experienced two booms and busts. During the first boom ethnic clashes developed. According to Mitchell and Mitchell (1981:50), the Irish, Cornish and Europeans hated one another and they all hated Asians. Hulse (1972:276) indicates Asians (primarily Chinese) were one of three racial minorities that played a significant role in Nevada's history (the other two being Native Americans and African Americans) and often operated small businesses or worked as servants. Thousands joined the labor crews when construction of the Central Pacific Railroad was underway in the 1860s. However, when construction ended in 1869, many tried to find employment in mining towns. Apparently, a few Asians went to work as woodchoppers near Tybo and an armed posse ordered them out of the district threatening to kill any who remained. Native Americans, on the other hand, made up a significant portion of the workforce in the mining industry. For example, Crum (1994:63) reports that 60 percent of Round Mountain's employees were Native Americans in 1921.

Tybo's boom and bust history is typical of many mining towns in the West. The first boom came to an end in 1891 (Mitchell and Mitchell 1981:50). During that boom two smelting furnaces were built; one shortly after the first ore was discovered and the other in 1875. According to Angel (1881:527), most of the ore was smelted until 1879 when the process of crushing and roasting was adopted. The change in technology resulted in the closing of the smelting furnaces and forced more than 400 men out of employment resulting in the decline of Tybo. By 1881, only 100 people could be counted as residents.

One of the legacies of smelting furnaces was the charcoal production industry. Charcoal burns at higher temperatures than wood and served as a more efficient fuel for the smelters. The workers that produced the charcoal were known as "Carbonari" or "charcoal burners" (Zeier 1987:87); descendants of which still live in Eureka. While numerous methods of producing charcoal have been documented (e.g., Zeier 1987), probably the most impressive archaeological remains are the beehive-shaped charcoal ovens (Figure 2). Many can still be found in the Tybo District. O'Neill (1980) reports that a Eureka contractor named Henry Allen was responsible for building 15 of the kilns in the Tybo area. Based on information O'Neill obtained from the Eureka Sentinel of September 2, 1877, Allen was hired by Tybo Consolidated Company to build the kilns for their smelters. He used a force of 20 men for three months and approximately 600,000 bricks. The kilns had the capacity to produce 1,400 bushels of charcoal with each charge (a charge taking approximately five days).

Figure 2. Beehive-shaped charcoal oven.

Tybo's second boom came in 1929 when the Treadwell-Yukon Company ran a 350-ton flotation concentrator and took out $6,781,405 before they shut down operations in 1937 (Ashbaugh 1963:233). Ashbaugh (1963) reports a mini-boom prior to Treadwell's operations when the LA Consolidated Mining Company put in a flotation mill in 1917 and ran it for three years. Mitchell and Mitchell (1981:50) report an estimate of over $10 million was taken from Tybo Canyon between 1874 and 1937.

Tybo was an important center of activity in the Hot Creek Range and was connected to other communities via stage lines linked with the Eureka and Palisade Railroad. It was established in 1873 and, with stage lines, provided a means to economic prosperity. Angel (1881:107) reports a daily stage (except Sunday) ran from Eureka to Belmont with stops at Morey (80 miles), then to Hot Creek (16 miles), then to Tybo (12.5 miles), and then 35 miles to Belmont. Numerous way-stations along the lines supported the stages. According to Angel (1881:525), More's Stage Station was located about 15 miles north of Hot Creek and 4.5 miles from Morey. Mordy and McCaughey (1968:149) indicate it was originally a Shoshone winter camp

Figure 3. House at More's Stage Station.

called dzicava meaning dried-juniper water. Mitchell and Mitchell (1981:55) report that some claim it was built by two brothers whose names are now lost but others claim the house (Figure 3) was built by George Sorhouet around 1928. Paher (1970:353) supports the former when he indicates the station was established after two brothers planted an orchard, dug a reservoir, built log stables with sod roofs and erected a fine stone building in the mid 1870s. Either way, the house at Moore's Station (modern spelling) was lived in by the Sorhouets until they moved to Tybo in 1938. It was abandoned for some time during which it was periodically used by campers. In the mid-1990s, relatives of Hot Creek families purchased the property and have renovated it.

The town of Hot Creek is located at the head of the creek for which the valley is named. A post office opened there in 1867 and within a year there were 300 residents, two stamp mills and a large business district (Cook 1978:17). In 1871, topographic parties visited Hot Creek and indicate that no notes were available except average milling assays of ores from the Ole Dominion Mill. Those notes indicate a low monthly intake of $200/ton and a high of $325/ton (Wheeler 1872:39).

Ashbaugh (1963:232) reports Hot Creek's production cooled off and by 1881 only 25 residents could be counted. Among them was Joe Williams, author of the Williams Resolution which he introduced in the Nevada Senate in 1881. It called for regulating freights and rates on the railroads of the state (which were apparently out of control at the time). Angel (1881:525) indicates Williams' business was divided between mining and farming and that he also owned a hotel. However, Williams' great grandson, Gil Cochran (personal communication 1995), indicates Williams was attracted to the area by the mining industry but he made his living from selling his farming and ranching products to the mining operations as well as running the hotel. According to Cochran, Hot Creek is now separated into two components: Lower Hot Creek Ranch and Upper Hot Creek Ranch and Williams homesteaded the lower ranch in the 1870s. The Upper Hot Creek Ranch (called Upper Town at the time) had a mine called Uncle Sam Mine which resulted in the establishment of a 3-stamp mill. The mine and mill attracted up to 2,000 people for a short time until the mill burned in 1868 and the payload from the Uncle Sam mine was depleted. The miners moved away abandoning their claims allowing Williams and his wife, Sophie Ernst, to buy up all the patents and consolidate the Upper Ranch into the Lower Ranch holdings. The ranch was later divided between two of their children with daughter, Elizabeth, holding the Upper Ranch and son, J. T., holding the Lower Ranch. These were consolidated once again when Elizabeth provided J. T.'s heirs with a life-interest in the Upper Ranch. However, upon Elizabeth's death in 1972, the life-interest became null and void resulting in the Upper Ranch reverting to Elizabeth's heirs. Among her heirs was Sonia Barnt Cochran; whose son is Gil Cochran. Today, Sonia lives in Genoa and Gil manages the Upper Ranch in concert with two relatives. The Lower Ranch has been sold numerous times and is no longer in the hands of Williams' heirs. It is this portion of the ranch that is normally referred to as the town of Hot Creek. In reference to this, Mitchell and Mitchell (1981:54) indicate that the "town" is currently part of a privately owned ranch with the main house consisting of a one-story Victorian made of part stone, part wood frame and siding. According to Gil, this structure dates from the turn of the twentieth century and should not be confused with the hotel that his great grandfather ran. That hotel burned to the ground in the late 1800s.

RANCHING AND AGRICULTURE

Ranching and agriculture eventually replaced mining in the area and continues to the present. The specifics of these activities in the Hot Creek Valley are not known, but Thomas (1983b:136) indicates homesteading in nearby Monitor Valley focused on the lowland springs and streams for grazing purposes. Agricultural crops included native hay, grain, potatoes, Jerusalem artichokes, and onions. These were shipped to Belmont for sale. Crum (1994:63) notes some Native American participation in these economic developments including one Shoshone that sold his produce in Belmont.

Presumably the same is true for Hot Creek Valley as there are a number of ranches located there today. And, as stated previously, we know that one of Hot Creek's residents, Joe Williams made his living from ranching and farming (along with his hotel). In addition, cattle roam free over much of the range today and were likely introduced in the area with the earliest white settlers.

Figure 4. *Plaque commemorating the Faultless event.*

NUCLEAR TESTING

In the 1960s, the Supplemental Test Site (STS) program was initiated to support U.S. defense policy regarding high-yield nuclear tests. Anticipated ground motion from such tests caused concern about possible adverse effects on structures in nearby communities, including Las Vegas, if they were conducted at the Nevada Test Site. As such, the STS was begun and on November 18, 1966 a Site Selection Committee (SSC) was formed to review technical and operational factors to identify and recommend sites in which high-yield nuclear devices could be tested. Three principal areas were reviewed: Amchitka Island, Central Nevada, and the North Slope of the Brooks Range in Alaska (Holmes and Narver 1974).

Eight locations in central Nevada were evaluated on the basis of geology, ground shock, fallout, groundwater safety, groundwater resources, construction support, operations, and other considerations. They were 1) Willow Creek Valley, 2) Central Monitor Valley, 3) Little Fish Lake Valley, 4) Northern Hot Creek Valley, 5) Pancake Range/ South Little Smoky Valley, 6) North Central Monitor Valley, 7) Antelope Valley, and 8) Central Big Smokey Valley. Of these, the SSC chose Little Fish Lake Valley, Central Monitor Valley, and Northern Hot Creek Valley for deep exploration.

Based on early exploratory findings and the urgency of the STS program, the Faultless event was conducted in Northern Hot Creek Valley on January 19, 1968 (Holmes and Narver, Inc. 1974). It was designed to study the behavior of seismic waves and to evaluate the usefulness of the area for other higher yield experiments. The explosive power of the device was less than one megaton and was detonated at 3,200 feet below the surface. The aftermath resulted in an unusual collapse crater. Rather than the usual saucer-shaped depression, a large irregular block bounded by local faults subsided. Within the crater, at ground zero, a plaque commemorates the Faultless event (Figure 4). Although a second event (codenamed Adagio) was planned, Faultless was the only device detonated in Northern Hot Creek Valley.

TODAY

Ranching and agricultural activities continue in Hot Creek Valley on private and public land. Much of the private land belongs to Metropolitan Life Insurance Company whereas most of the public land is the responsibility of the Bureau of Land Management. The Department of Energy maintains withdrawn lands in the Valley near the Faultless Project; current undertakings include remediation of mudpits associated with the nuclear weapon test and groundwater monitoring. These environmental restoration activities led to an overview of the Valley's cultural resources. An archaeological collection, amassed during the 1960s, has brought Native American interest in the collection and will likely result in return of some of the artifacts.

REFERENCES CITED

Angel, Myron (editor)
1881 *History of Nevada*. Thompson and West, Oakland, California.

Anonymous
1991 *The WPA Guide to 1930s Nevada* (new edition of original with new foreword by Russell Elliot). University of Nevada Press, Las Vegas.

Ashbaugh, Don
1963 *Nevada's Turbulent Yesterday: A Study in Ghost Towns*. Westernlore Press, Reno.

Bard, J. C., C. I. Busby, and J. M. Findlay
1981 *A Cultural Resources Overview of the Carson & Humboldt Sinks, Nevada*. Cultural Resource Series No. 2. Bureau of Land Management, Reno.

Beatly, Janice C.
1976 *Vascular Plants of the Nevada Test Site and Central-Southern Nevada: Ecologic and Geographic Distributions*. Laboratory of Nuclear Medicine and Radiation Biology, University of California, Los Angeles.

Cook, Fred S.
1978 *Legends of Nye County*. Times Publishing, Hawthorne, Nevada.

Crum, Stephen J.
1994 *The Road on Which We Came: A History of the Western Shoshone*. University of Utah Press, Salt Lake City.

Davis, Sam P. (editor)
1913 *The History of Nevada*. Elm Publishing Company, Reno, Nevada.

DuBarton, Anne (with contributions by William Gray Johnson)
1992 A Gabled Wooden Lodge in an Archaeological Context: Archaeological Investigations at Sample Unit U19adPL, Nevada Test Site, Nevada. Desert Research Institute, Quaternary Sciences Center, Technical Report, Reno, Nevada.

Elliot, Russel R.
1987 *History of Nevada* (2nd edition). University of Nebraska Press, Lincoln.

Elston, Robert G.
1982 Good times, Hard Times: Prehistoric Culture Change in the Western Great Basin. In *Man and Environment in the Great Basin*, edited by D. B. Madsen and J. F. O'Connell, pp. 186-206. Society for American Archaeology Paper No. 2, Washington, D.C.
1986 Prehistory of the Western Area. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 135-148. Handbook of North American Indians, vol. 11, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Holmes and Narver, Inc.
1974 *Summary Report Central Nevada Test Area Demobilization and Restoration Activities*. Produced for the U.S. Atomic Energy Commission, Nevada Operations Office, Las Vegas.

Hulse, James W.
1972 *The Nevada Adventure: A History*. University of Nevada Press, Reno.

McKinney, Whitney
1983 *A History of the Shoshone-Paiutes of the Duck Valley Indian Reservation*. The Institute of the American West and Howe Brothers.

Mitchell, Stan, and Jacqueline Mitchell
1981 *Visitors' Guide to Historic Places in Nye County, Nevada*. Self-published. Manuscript on file at University of Nevada, Las Vegas Special Collections Library, Las Vegas.

Mordy, Brooke D., and Donald L. McCaughey
1968 *Nevada Historical Sites*. Western Studies Center, Desert Research Institute, Reno.

Morgan, Dale L.
1965 *Jedediah Smith and the Opening of the West* (2nd reprint of 1953 edition). University of Nebraska Press, Lincoln.

O'Neill, James A.
1980 The Giant Beehives. *Nevada Magazine* 40(4):48-49.

Paher, Stanley W.
1970 *Nevada Ghost Towns and Mining Camps*. Howell-North, Berkeley.

Pendleton, L .S. A., Alvin R. McLane, and D. H. Thomas
1982 *Cultural Resources Overview, Carson City District, West Central Nevada*. Cultural Resource Series No. 5. Bureau of Land Management, Reno.

Steward, Julian H.
1938 *Basin-Plateau Aboriginal Sociopolitical Groups*. Smithsonian Institution Bureau of American Ethnology Bulletin 120, Washington, D.C.

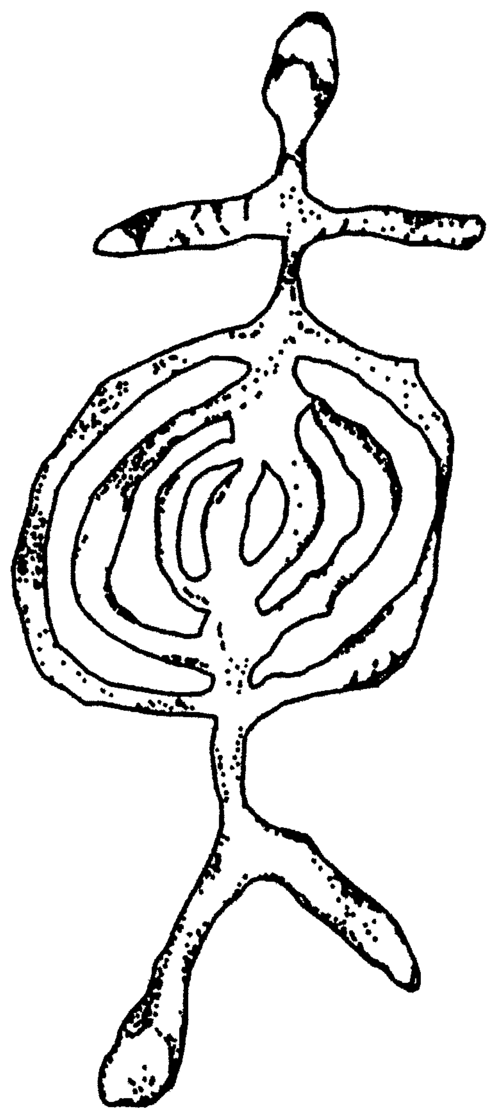
Thomas, D. H.
1971 Prehistoric Subsistence-Settlement Patterns of the Reese River Valley, Central Nevada. Ph.D. dissertation, University of California, Davis, University Microfilms, Ann Arbor.
1982 *The 1981 Alta Toquima Village Project: A Preliminary Report*. University of Nevada, Desert Research Institute Social Sciences Technical Report No. 27. Reno.
1983a *The Archaeology of Monitor Valley, 2: Gatecliff Shelter*. Anthropological Papers of the American Museum of Natural History 59(1). New York.
1983b *The Archaeology of Monitor Valley, 1: Epistemology*. Anthropological Papers of the American Museum of Natural History 59(1). New York.

Thomas, D. H. (continued)
1985 *The Archaeology of Hidden Cave, Nevada.* Anthropological Papers of the American Museum of Natural History 61: Part 1. New York.

Tueller, Paul T., Allen D. Bruner, Richard Everett and J. Barry Davis
1974 *The Ecology of Hot Creek Valley, Nevada and Nonradiation Effects of an Underground Nuclear Detonation.* A publication of the Agricultural Experiment Station, University of Nevada, Reno.

Wheeler, George M.
1872 *Preliminary Report concerning Explorations and Surveys Principally in Nevada and Arizona.* Reprinted in 1970 by Books for Libraries Press, Freeport, New York.

Zeier, Charles D.
1987 Historic Charcoal Production Near Eureka, Nevada: An Archaeological Perspective. *Historical Archaeology* 21(1):81–101.



Ethnohistoric Adaptations in the Carson Desert

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Marsh and lacustrine food resources are known to have been important to Native Americans of the Great Basin from the archaeological record, oral histories, ethnographic literature, and written accounts of early European explorers. However, few researchers have examined how natural fluctuations coupled with man-made changes in lacustrine and marsh environments affected Native American landscape use in the post-contact period. Native American adaptation to an increasingly restricted water-related resource base no doubt echoed in their social structure and resource selection. Using data from archaeological, ethnographic, and historic contexts in the Carson Desert, these issues are explored using a focused study on the eastern shoreline of South Carson Lake.

Margaret Wheat (1967) and Catherine Fowler (1990, 1992) have compiled the primary ethnographic material for the Carson Desert area in their studies centered on Stillwater Marsh. Wheat and Fowler's principal informants—Alice Steve, Wuzzie George, and Jimmy George—willingly shared techniques for marsh resource collection and processing accumulated while they were growing up during the late nineteenth and early twentieth centuries. These remembrances provide rare glimpses of how housing, shelter, and food were procured from the wetlands in the ethnohistoric period. Using these elder's stories and experiences, we can learn much about what we see in the archaeological record and relocate some of the places in which they visited or lived.

HISTORIC PERIOD IN THE CARSON DESERT

The first documented visits to the Carson Desert by Euro-Americans were Peter Skene Ogden's group of trappers from the Hudson Bay Company in 1830 (Cline 1974; Fowler 1992:16; Hattori and McLane 1980:9; Kelly 1985:32) and Joseph Reddeford Walker's party in 1833. Ogden operated under the Hudson Bay Company's policy to trap-out the desert west in order to make it unprofitable to cross for the American fur companies on their way to the rich northwest (Cline 1974; Kelly 1985; Rusco 1976). These trappers also hunted for their own sustenance and probably severely affected the number of fauna available to the Native Americans along their path.

Settlers followed the trails of explorers and trappers westward to California beginning with the Bartleson-Bidwell party in 1841 (Fowler 1992:16; Hattori and McLane 1980:9; Kelly 1985:32). In 1848, the number of settlers traveling west increased dramatically with the discovery of gold in California, but fortunately for the Northern Paiute living in the Carson Sink and Carson Lake region, the emigrant trails stayed west of the Carson Sink avoiding the rich marsh resources that they relied upon for food and shelter for portions of the year.

The Northern Paiute's response to the first Euro-American intrusions into their foraging territory was friendly—showing the weary travelers where to get water and giving them fish and pinenuts such as they did Bidwell in 1941. But the nervous trappers, explorers, and emigrants were quick to strike fatal blows when they felt threatened by Native Americans. Word soon spread that these "white-eyes" were unpredictable and dangerous. Hiding and/or retreat into the uplands away from transportation corridors such as the Humboldt River, was an adaptive response to these dangerous conditions. This strategy deprived Indians of the fish from the rivers, large game that was also being hunted by Euro-Americans, and grass seeds that were now being eaten and trampled by livestock. However, with the discovery of gold and silver near Virginia City in 1859, not only did another surge of emigrants come from the east, but they began to settle in the Lahontan Valley as farms and ranches were staked to supply hay and grain for stock, and food for miners laboring to extract the Comstock Lode.

Also in 1859, Captain James Simpson of the Corps of Topographic Engineers mapped a new, more direct route from Salt Lake City that passed just south of Carson Lake (Fowler 1992:18 and Hattori 1980). Northern Paiutes exhibited growing concern as whites continued to come from the east. These concerns and frustrations, coupled with resource shortages and repeated abuse of Native Americans, cumulated in the Pyramid Lake War to the north of the project area in 1860 (Simpson 1876).

The rush of settlers into the Carson Desert region proved to be the fatal blow to the mobile hunting-and-gathering pattern of the Cattail Eaters. Before this time, they were able to essentially avoid Euro-Americans by retreating to the uplands to gather pinenuts, roots, and seeds and hunt game while living in winter habitations near the marshlands. Now white settlers were taking too many of their resources and the uplands were depleted due to overuse and drought conditions. The first homesteaders claimed areas near Carson Lake along the southern branch of the Carson River in 1860 and 1861. A toll bridge was built across the Stillwater Slough in 1860, further facilitating travel through the area (Kelly 2001:20); and small settlements sprang up shortly thereafter at Stillwater, St. Clair, and Redman's Station.

Ranching and farming grew in importance throughout the late nineteenth century. By necessity, Cattail Eaters adapted to their newly limited resource base by becoming laborers for Euro-American settlers.

In 1903, the Newlands Reclamation Project began. This project diverted water from the Truckee and Carson Rivers to reservoirs to be distributed through irrigation canals to the arid lands of Lahontan Valley. This water facilitated further agricultural developments in the Carson Desert and led to the establishment of the town of Fallon. The Newlands Reclamation Project was completed in 1915 (Townley 1977).

These historic events did not happen in a vacuum and natural cycles of drought and flooding continued in the Carson Desert. Tree-ring data and historic records indicate that there were low precipitation years between 1868 to 1890 and 1907 to the mid-1930s (Kelly 2001:23).

Robert Kelly (2001) has suggested that population stress and drought may be incentives to become semi-sedentary. These two conditions were met between 1859 and 1890 in the Carson Desert. The Euro-American expansion taxed the already delicate resource base of most Great Basin's Native American inhabitants. During this time of increasing resource stress and decreasing returns in the uplands brought about by dry conditions and overpopulation, the Cattail Eaters would likely have been drawn to the relatively reliable marsh resources. Euro-Americans, now settled in the lowlands, probably regarded Native Americans as threats when they camped near their settlements; however, their presence presented a solution to a labor shortage on the farms and ranches.

The Cattail Eaters went to work for the Euro-Americans probably not because of the lure of wage labor as some suggest, but because the stress of overpopulation coupled with drought conditions made it one of the few options available. Euro-Americans had control over the relatively reliable wetlands and becoming their employees was one way to gain access to the marsh. Euro-Americans also supplied new drought tolerant foods such as canned goods and livestock. Conversely, the agricultural industry welcomed the seasonal labor of the Indians because they could be let go to "live off the land" in times that they were not needed. By the 1880s, many of the Paiute worked as ranch hands, hunting waterfowl, tending to animals, and performing housework (Fowler 1992; Kelly 1985, 2001; Townley 1977:13; Wheat 1967).

ENVIRONMENT

The archaeological sites that I have examined are all near South Carson Lake located south of Hidden Cave and Grimes Point, and east of the Fallon Naval Station (Figure 1). First accounts of the area highlight the tremendous changes in the natural environment that have occurred in the past 145 years. In 1859, Simpson described the then large South Carson Lake as abundant in fish, waterfowl, and Native American encampments (Simpson 1876:85). To those of us who have seen the now dry desert playa called South Carson Lake, these

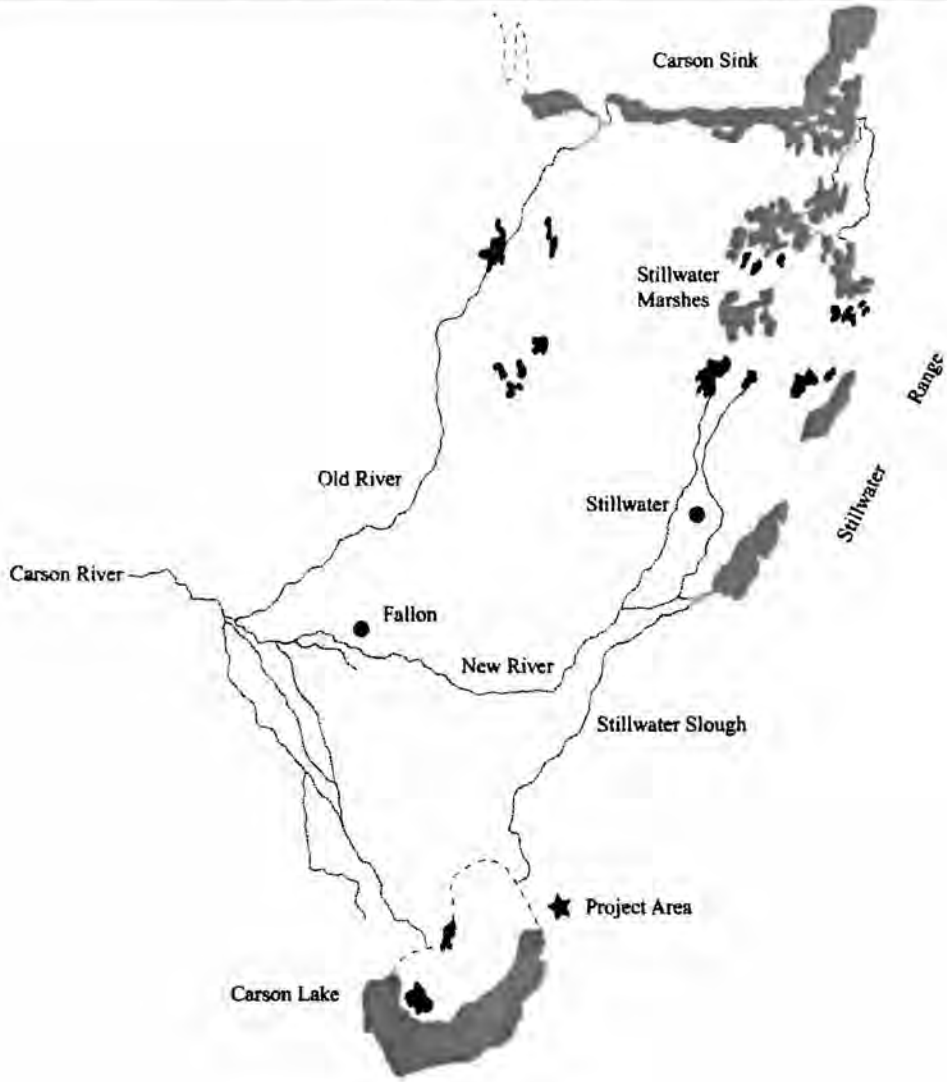

Figure 1. *Hydrographic map of Carson Desert area.*

observations seem unreal. This change is due, at least in part, to channel evolution of the Carson River in response to the combined effect of sediment accumulation and flood events.

In 1885, Russell (1885) described that before 1862 the Carson River had flowed into South Carson Lake and from there through a slough north into the Stillwater Marsh. Simpson, in 1859, described this slough as nearly 50 feet wide and 3 to 4 feet deep with a strong northern current (Simpson 1876). In 1862, a flood event breached the established channel and began flowing northward through a relic riverbed that emptied into the Carson Sink that is named "Old River." Although the southern branch was not entirely abandoned, it soon became only a secondary pathway as the northern branch gained dominance. After 1862, only a small portion of the river flowed over the large delta that led to South Carson Lake, resulting in stagnation of the lake and its slough that were fed only by occasional spring flooding events. A flood in the spring of 1867 or 1869 created a new channel named the "New River" that branched off the northern segment and spread eastward before dumping into the Stillwater Slough and Marsh (Morrison 1964:104–106).

Although the Newlands Reclamation Project has somewhat stabilized the Carson River channel in its current path, the process of hydrologic shifting is ongoing. The natural fluctuations of the Carson River, which is fed by the Sierras and affected by heat and evaporation, reflects regional climatic changes. The hydrologic system continues to adapt as this sink adjusts to accumulating sediment fill, fault movement that is changing the base level by deepening the Stillwater Marsh, and to cyclical flooding. These cyclical events and hydrologic adaptations of the Carson River change what types of resources are available in the Carson Desert and where, highlighting the need to understand an area's geomorphic history even in historic-period studies.

We know that the current hydrologic regime has been greatly modified by both natural and humanly-induced processes from when it was first described by Simpson and others. By necessity, the Cattail Eaters responded to changing social and environmental conditions by becoming semi-sedentary wage laborers. But now we ask how these changes are reflected in the archaeological record of the ethnohistoric period?

William Wright, a journalist from Virginia City, visited the Carson Desert in the summer of 1861, a year before the flood that would divert the water northward, away from South Carson Lake. He describes how men, women, and children were camped along the eastern shore of South Carson Lake living in semi-circular sunshades made of willow, reeds, and tule mats that were located around half-a-mile from the water's edge to avoid mosquitoes (DeQuille 1963:30–31). According to Wright, even at this early date Native Americans spoke some English and initiated trade for known items such as biscuits, flour, and other material goods (see DeQuille 1963:38–39).

ARCHAEOLOGY

Far Western Anthropological Research Group, Inc. conducted a Class III linear archaeological survey in the area east of Carson Lake during the summer of 2004. These investigations revealed two ethnohistoric sites (CrNV-03-5941 and CrNV-03-5942) on a relic shoreline feature (Young and Wriston 2004). This low terrace overlooks the East Ditch and the irrigated fields below. Upslope, greasewood vegetates the slightly undulating aeolian sheets and coppice dunes interspersed amongst hardpan sediment.

One of the sites is a deflated single component locale consisting of a worked glass bottleneck, a button, metal cable and remnants, lithic debitage, fire-cracked rock clusters, and freshwater clamshell concentrations. This site is located approximately 3/4-mile from the Grimes Slough, and less than 1/2-mile from East Ditch, an irrigation canal in existence since at least 1938.

The other site, found just west of the first, is large and multi-component. It contains at least 21 features, most of which have both fire-affected rock and freshwater clamshells. The shell concentrations generally have a shallow organic layer with anywhere from 20 to several hundred freshwater clamshells averaging around 5 cm in maximum diameter. Artifacts are clustered around these features and consist of probable Late Archaic period projectile point fragments; lithic debitage; flaked tools, ground stone; historic-period glass in aqua, amethyst, green, olive, and white colors; can and metal fragments; and mason jar lids.

Based on the temporally diagnostic types of historic-period artifacts present, both sites' historic components date to between ca. A.D. 1860 and ca. A.D. 1910. These sites were occupied shortly after Simpson and Wright reported Native American encampments along this margin of the lake and possibly coincide with the changing hydrologic conditions of South Carson Lake after its abandonment by the Carson River in 1862.

The larger site has potential for buried cultural remains in the aeolian deposits atop the terrace where most of the historic artifacts are located. Through excavation, we may be able to isolate different components and therefore determine which features are related to the ethnohistoric period, the Late Archaic period, and identify differences in the material culture between these components. In addition, from my small sample, the historic-period features seem transient in nature with smaller concentrations of mollusk shells and less accumulation of lithic debitage. The decrease in the amount of lithic tools and debitage associated with the historic-period features is expected if curated Euro-American metal utensils have replaced their function. The modest features may also result from relatively fewer inhabitants pursuing these traditional resources.

The shell and fire-cracked rock concentrations likely relate to seasonal resource use by relatively small groups of foragers when South Carson Lake was still full of water and the nearby slough still emptied northward, possessing a gentle current that could feed the bottom dwelling mollusks and the fish that they needed to reproduce (Drews 1988; Hambrook and Eberle 2000). When the lake was too dry to release water through the slough, the mollusks would have moved or died off. Therefore, the presence of mollusk shell concentrations in a site can help us recreate nearby water conditions. Mollusks are not efficient to carry for long distances due to their high volume to weight ratios, so we should find them relatively close to appropriate water sources.

Margaret Wheat and Catherine Fowler's informant, Wuzzie George, knew little about mollusks beyond that they had been eaten in her grandmother's day (Fowler 1992:72). The fact that Wuzzie George had acquired so much practical knowledge about wetland resource use after her birth (ca. 1880), but did not know about the collection and processing of mollusks, suggests that their use had largely been abandoned by this time. This abandonment may reflect the Carson River's diversion northward that desiccated South Carson Lake and the slough; it may also reflect social change.

Mollusks are relatively high in protein and nutrients and are plentiful when conditions are right. This protein source would have been easily acquired by women and children who were already near the marsh to exploit other resources (see Fowler 1990, 1992; Kelly 2001; Wheat 1967) and may also have been a valuable dietary addition when other game was sparse. Mollusks required no special skill, tools, or knowledge to procure; they were not readily transported like many of the high prestige sources of protein (e.g., meat, pinenuts); did not provide hides for clothing like rabbits and deer; and their availability fluctuated with the water level. Perhaps for these reasons, the collection of freshwater clams never developed the social significance of that relegated to hunting large game, rabbit drives, or pine nut gathering; all of which result in easily transported, nutrient-packed, food sources; and which, in the case of rabbits and larger game, provided valuable hides for winter warmth.

However, freshwater clams may have gained importance in times when other sources of protein became scarce such as when the Hudson Bay Company's trappers scorched the area of game animals or during settler's expanding hunting forays. Nevertheless, because this resource would have disappeared with the lakes during the drought period in the late nineteenth century, it would have only provided a short-term solution to a protein shortage. Conversely, mollusks may have simply dropped from use as both women and men gained access to more reliable protein-rich resources such as cattle, pigs, and chickens. Further explorations of the ethnohistoric archaeology in this region can help determine how mollusk use changed through time and how its record reflects the changing hydrologic regime in the region.

SUMMARY

During the drought period of the late nineteenth century, the Cattail Eaters' lifeways changed from nomadic hunters-and-gatherers to semi-sedentary wage laborers due to Euro-American expansion into the valley and resource restriction of their traditional foraging territory. Food resources changed from marsh-based animals, birds, and plants; and upland roots, seeds, and game; to canned food, beef, pork, and sheep supplemented with occasional traditional foods.

The traditional resources that persist in the Native American diet are generally high prestige goods that are easily transported and relatively high in protein such as pinenuts and wild game. Social gatherings also serve to reinforce these items' importance.

How the Cattail Eaters adapted to Euro-American intrusion into their core territory at a time of drought is recorded in the archaeological data as landscape use and resource choices changed through time. What is exciting about ethnoarchaeological studies is that we have more information available than any time previously about how individuals adapted to stressors and what these stressors were. Through modern Native American interviews, oral histories, ethnographies, and research of the historical record, we can fill gaps in our knowledge concerning traditional prehistoric models (optimal foraging, diet breadth, behavioral ecology, etc.), not necessarily to extrapolate into the past, but to test in the historic period. Historic archaeological theories regarding gender, ethnicity, class systems, and core-periphery relationships could further enhance prehistoric modeling of human behavioral response to restricted resources and environmental change.

However, we need additional data. A limited number of ethnohistoric period sites have been excavated in the Great Basin. This limitation to the refinement of ethnohistoric models has been perpetuated by the difficulty in identifying ethnohistoric sites. However, this difficulty will only be illuminated by investigating known ethnohistoric sites recorded in oral histories and the historic record. In addition, these site types have been largely ignored by the majority of research designs. Specific questions that may be asked of the ethnohistoric record include:

- What Euro-American goods are found at ethnohistoric sites through time?
- Does the adoption of these goods reflect access or choice?
- Was a product selected and used in its intended manner? For example, is the seeming abundance of lard buckets a reflection of using lard in the cooking process, or does it reflect curation of the container for secondary re-use?
- What readily available Euro-American goods are not found in ethnohistoric sites?
- What prehistoric technologies and resource bases persisted after contact and for how long (e.g., millingstones and pinenut processing)?
- Did these technologies remain in use because there were no Euro-American tools to replace them (e.g., millingstones)?
- What social role(s) do persisting prehistoric technologies and resources play in the culture?
- How does material culture reflect changing social conditions?
- What were the environmental conditions and available resources of sites that exhibit continuous use from the prehistoric to historic period as opposed to the environmental and resource characteristics of sites inhabited for the first time during the historic period?

The ethnohistoric record can address these research questions if we collect the data. In my brief study of two ethnohistoric period sites near the eastern shore of South Carson Lake, I came up with more questions than answers. These questions require substantial data sets that can be gleaned from the archaeological record in areas such as the Carson Desert. Ethnoarchaeological sites are often written off as mixed-component historic/prehistoric sites of little value. In the absence of definitive ethnohistoric artifacts, such as worked glass, their identification is somewhat arbitrary. We need to study documented ethnohistoric sites in the Carson Desert region in order to establish some guidelines for defining ethnohistoric sites in unknown locations. We need to know what types of artifacts characterize different task sites throughout the landscape including wetlands, playa-margins, and uplands, and why.

We have a continuum of culture and cultural change in the ethnoarchaeological record. Cultural adaptation is an issue that we all research, whether our interests are historic-period Chinese encampments or Paleoarchaic adaptations to changing climate.

Research designs for archaeological study are often weak to nonexistent when it comes to the ethnohistoric period. Prehistoric archaeologists assume that it should be included in the realm of historic archaeology while historic archaeologists consider it the prehistoric archaeologists' responsibility. I hope that this article raises awareness and promotes discussion between the varying specialists and land managers so that we can all achieve a better understanding of the unique processes of cultural adaptation in the ethnohistoric-period.

REFERENCES CITED

Cline, G.
1974 *Peter Skene Ogden and the Hudson's Bay Company*. University of Oklahoma Press, Norman.

DeQuille, D. (William Wright)
1963 *Washoe Rambles*. Westernlore Press, Los Angeles, California.

Drews, Michael P.
1988 Freshwater Molluscs. In *Preliminary Investigations in Stillwater Marsh: Human Prehistory and Geoarchaeology*, Volume 1, edited by Christopher Raven and Robert G. Elston, pp. 328–338. Cultural Resource Series Number 1, U.S. Department of the Interior, Washington, D.C.

Fowler, C. S.
1990 *Tule Technology: Northern Paiute Uses of Marsh Resources in Western Nevada*. Smithsonian Institution Press, Washington, D.C.
1992 *In the Shadow of Fox Peak: An Ethnography of the Cattail-Eater Northern Paiute People of Stillwater Marsh*. U.S. Department of the Interior, Cultural Resource Series Number 5. Washington, D.C.

Hambrook, Julie A. and Michael Eberle
2000 What Makes a Healthy Environment for Native Freshwater Mussels. U.S. Geological Survey and U.S. Department of the Interior, Washington.

Hattori, E. M.
1980 Simpson Pass (26CH595) NRHP Project Site Record. Nevada State Historic Preservation Office. Carson City, Nevada.

Hattori, E. M. and A. R. McLane
1980 Archaeological and Historical Studies at Simpson Pass Churchill County, Nevada. Social Sciences Center of the Desert Research Institute. Reno, Nevada.

Kelly, R. L.
1985 Hunter-Gatherer Mobility and Sedentism: A Great Basin Study. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.
2001 *Prehistory of the Carson Desert and Stillwater Mountains: Environment, Mobility, and Subsistence in a Great Basin Wetland.* University of Utah Anthropological Papers, Number 123. The University of Utah Press, Salt Lake City.

Morrison, R. B.
1964 *Lake Lahontan: Geology of Southern Carson Desert, Nevada.* Geological Survey Professional Paper 401. U. S. Government Printing Office, Washington, D.C.

Rusco, M. K.
1976 Fur Trappers in the Snake Country: an Ethnohistoric Approach to Recent Environmental Changes in the Great Basin. In *Holocene Environmental Change in the Great Basin*, edited by R. Elston and P. Headrick. Nevada Archaeological Survey Research Paper 6:152–173.

Russell, I. C.
1885 *Geological History of Lake Lahontan, a Quaternary Lake of Northwestern Nevada.* U.S. Geological Survey Monograph 11.

Simpson, J. H.
1876 *Report of Explorations Across the Great Basin of the Territory of Utah for a Direct Wagon-Route from Camp Floyd to Genoa, in Carson Valley, in 1859.* Government Printing Office, Washington, D.C.

Townley, J.
1977 *Turn This Water into Gold: the Story of the Newlands Projects.* Nevada Historical Society, Reno.

Wheat, Margaret M.
1967 *Survival Arts of the Primitive Paiutes.* University of Nevada Press, Reno.

Young, D. Craig and Teresa A. Wriston
2004 A Class III Survey for the NGS Geothermal Project, draft. Far Western Anthropological Research Group, Inc., Davis, California.

The Paleoarchaic Occupations of Moonshine Spring South and Moonshadow Spring, Persing County, Nevada: Implications for Early-Period Mobility in the Great Basin

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Technological organization and mobility patterns of early-period hunter-gatherers are current topics of interest among Great Basin researchers. We are still trying to determine whether the early inhabitants of the region were highly-mobile big-game specialists or "wetland-tethered" broad-spectrum foragers. Recently, geochemical sourcing has provided a sense of lithic conveyance zones and/or subsistence ranges of Paleoarchaic populations in the central and western Great Basin (Graf 2002; Jones et al. 2003). These patterns suggest that populations were far-ranging, frequently traveling hundreds of kilometers to meet lithic and/or subsistence needs. Two recently tested archaeological sites, Moonshine Spring South (CrNV-22-5540) and Moonshadow Spring (CrNV-22-7636), located southeast of the Black Rock Desert in northwest Nevada, provide additional data on the mobility patterns of the region's Paleoarchaic populations. This article presents the results of investigations at these two sites and places it in the context of Paleoarchaic mobility studies in the Great Basin.

PALEOARCHAIC ARCHAEOLOGY IN THE GREAT BASIN

Models of Adaptation

For decades, archaeologists' explanations of early-period adaptations have centered on two competing models. The first, which postulates that early populations were highly mobile big-game hunters, is consistent with adaptations in other regions of North America during the Terminal Pleistocene/Early Holocene (TP/EH) (Kelly 1988; Kelly and Todd 1988). This model is supported by similarities in the technological organization of early-period assemblages in the Great Basin and those found in other areas where large-mammal exploitation has been confirmed (Beck and Jones 1997; Elston and Zeanah 2002). Specifically, the presence of large bifacial points and knives suggests a reliance on large game (Beck et al. 2002). Subsistence remains in the Great Basin, however, do not confirm this hypothesis. Faunal assemblages from early-period sites suggest that Paleoarchaic populations relied on a wide range of subsistence resources including large and small mammals, birds, and fish (Beck and Jones 1997; Bedwell 1973; Elston and Zeanah 2002). While it remains possible that early groups relied primarily on highly ranked big-game, additional sites with well-preserved subsistence remains must be found in order to determine if this model is valid.

The traditional alternative to the highly-mobile big-game model is that early-period populations exploited a wide variety of resources and were based near highly productive wetlands in the Great Basin during the TP/EH. This "Western Pluvial Lakes Tradition" (WPLT) model (Bedwell 1973) is supported by the subsistence record; remains of various mammals, birds, fish, and flora have been recovered from Paleoarchaic sites in the Great Basin (Beck and Jones 1997; Bedwell 1973; Eiselt 1997; Elston and Zeanah 2002; Goebel et al. 2003; Oetting 1994; Pinson 2004; Willig 1991; Wriston 2003). While these data confirm that Paleoarchaic foragers were at times tied to productive wetlands, they do not necessarily indicate that they were long-term sedentary occupants of these patches as Bedwell (1973) proposed. Other data suggest a more mobile lifeway. Lithic assemblages from most Paleoarchaic sites, for example, are more consistent with those of highly-mobile populations (Elston and Zeanah 2002; Graf 2001; Kelly 1988; Kelly and Todd 1988) and systematic surveys in upland settings clearly demonstrate that Paleoarchaic hunter-gatherers inhabited a wide variety of environments, many of which are not directly associated with wetland features (Beck and Jones 1997; Grayson 1993; Jones and Beck 1999). Furthermore, recent geomorphological studies indicate that at certain periods during the TP/EH, local conditions were occasionally dry enough to suggest that humans camped along fossil, not active, shorelines (Oetting 1994; Pinson 2004).

Recently, a third model of adaptation has emerged. Termed "Paleoarchaic" (Beck and Jones 1997) or "PreArchaic" (Elston and Zeanah 2002), this model posits that there may not have been a distinct shift between Paleoindian and Archaic adaptive strategies during the TP/EH transition (Beck et al. 2002; Simms 1988). Instead, proponents of the model view early-period hunter-gatherers as generalists who exploited a variety of floral and faunal resources. According to the Paleoarchaic model, groups traveled across the landscape between highly productive wetland "patches" where they exploited waterfowl, fish, and other wetland resources. Once resource abundance diminished at one of these patches, they departed in search of another. While between patches, Paleoarchaic hunter-gatherers exploited a different set of resources than those present in lakeside/marshside settings. As desiccation of the region occurred during the TP/EH, these groups were forced to travel greater distances in search of wetland resources and eventually adopt alternative subsistence activities (Beck et al. 2002).

Geochemical Source Analysis

Because the subsistence record from the TP/EH is relatively limited, Great Basin researchers are left with the lithic record as the primary source of information for developing models of mobility and adaptation. Fortunately, the Great Basin is dominated by highly-visible lithic scatters of obsidian and other fine-grained volcanic rock (FGVR). Because there is a well-established and rapidly-expanding source record of such toolstone in western North America, its presence on archaeological sites is useful for studying prehistoric lifestyles (Hughes 1984). When used in conjunction with technological analysis of lithic assemblages, geochemical source data can also provide information about hunter-gatherer mobility.

Geologic source provenance analyses are beginning to provide a sense of lithic procurement and/or subsistence ranges of Paleoarchaic populations in the Great Basin. In the western and central Great Basin, work by Graf (2002) and Jones et al. (2003) suggests that early-period hunter-gatherers were highly mobile. Based on these studies, a predominantly north-south pattern in the distribution of obsidian has emerged, suggesting that populations were far-ranging and moved primarily through the extensive north-south valleys of the region. These lithic conveyance zones extend up to 400 km from north to south (Jones et al. 2003).

A different pattern of lithic procurement and/or subsistence ranges is emerging in northwest Nevada. Amick's (1997) analysis of 50 Paleoarchaic obsidian artifacts from the Black Rock Desert indicates that toolstone originated at sources to the northwest, north, and east of the study area. These sources are located ca. 60–150 km from the Black Rock Desert. Smith (2004) reports similar results from XRF analysis of 100 artifacts from Paleoarchaic sites in the Summit Lake Basin, where tools were made of obsidian from sources located to the northwest, north, and northeast of the sites. These sources are located ca. 4–229 km from the Summit Lake Basin. These data suggest a radial pattern of procurement, rather than the predominantly north-south-trending distributions observed by Graf (2002) and Jones et al. (2003). Similar radial patterns of procurement and conveyance have been observed by Connolly (1999) and Oetting (1993) in the northern Great Basin. Geologic source provenance data from Moonshine Spring South and Moonshadow Spring presented below appear to confirm this radial pattern for northwest Nevada and suggest that there may be regional differences in Paleoarchaic mobility.

MOONSHINE SPRING SOUTH AND MOONSHADOW SPRING

Moonshine Spring South and Moonshadow Spring are prehistoric archaeological sites situated on and around upland springs in Pershing County, Nevada (Figures 1 and 2). The sites are located in the Rabbithole Creek drainage along the western

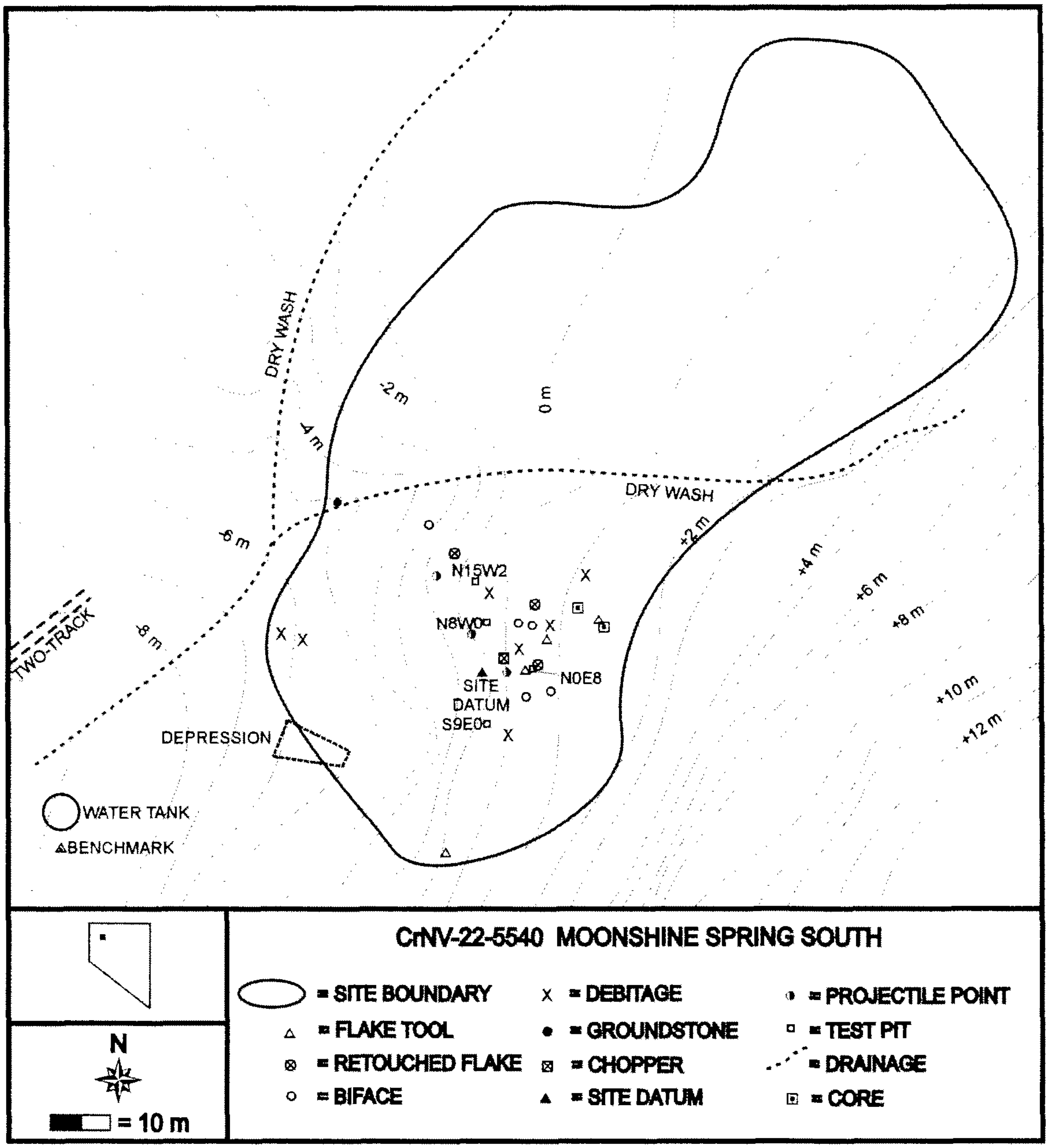


Figure 1. *Moonshine Spring South site map.*

slope of the Antelope Range, [redacted]. They were initially recorded by David Valentine, Winnemucca Field Office of the Bureau of Land Management. Each site has temporally discrete, typologically "clean" assemblages containing Parman and Windust Great Basin Stemmed projectile points (Layton 1979; Pendleton 1979) and associated lithic tools, suggesting an occupation of between 11,500 and 7,500 radiocarbon (^{14}C) years ago (B.P.) (Beck and Jones 1990, 1997). This paper focuses specifically on the lithic assemblages from these sites. For a more detailed overview of Moonshine Spring South and Moonshadow Spring, consult Smith et al. (2004).

The sites were tested by the Sundance Archaeological Research Fund, University of Nevada, Reno in August 2003 with two primary research objectives in mind. The first goal was to carefully map and record the distribution of surface artifacts. The second goal was to test for the presence of intact buried cultural deposits. The first goal, mapping surface artifacts, was accomplished using a total-station laser theodolite. Following a five-m-interval

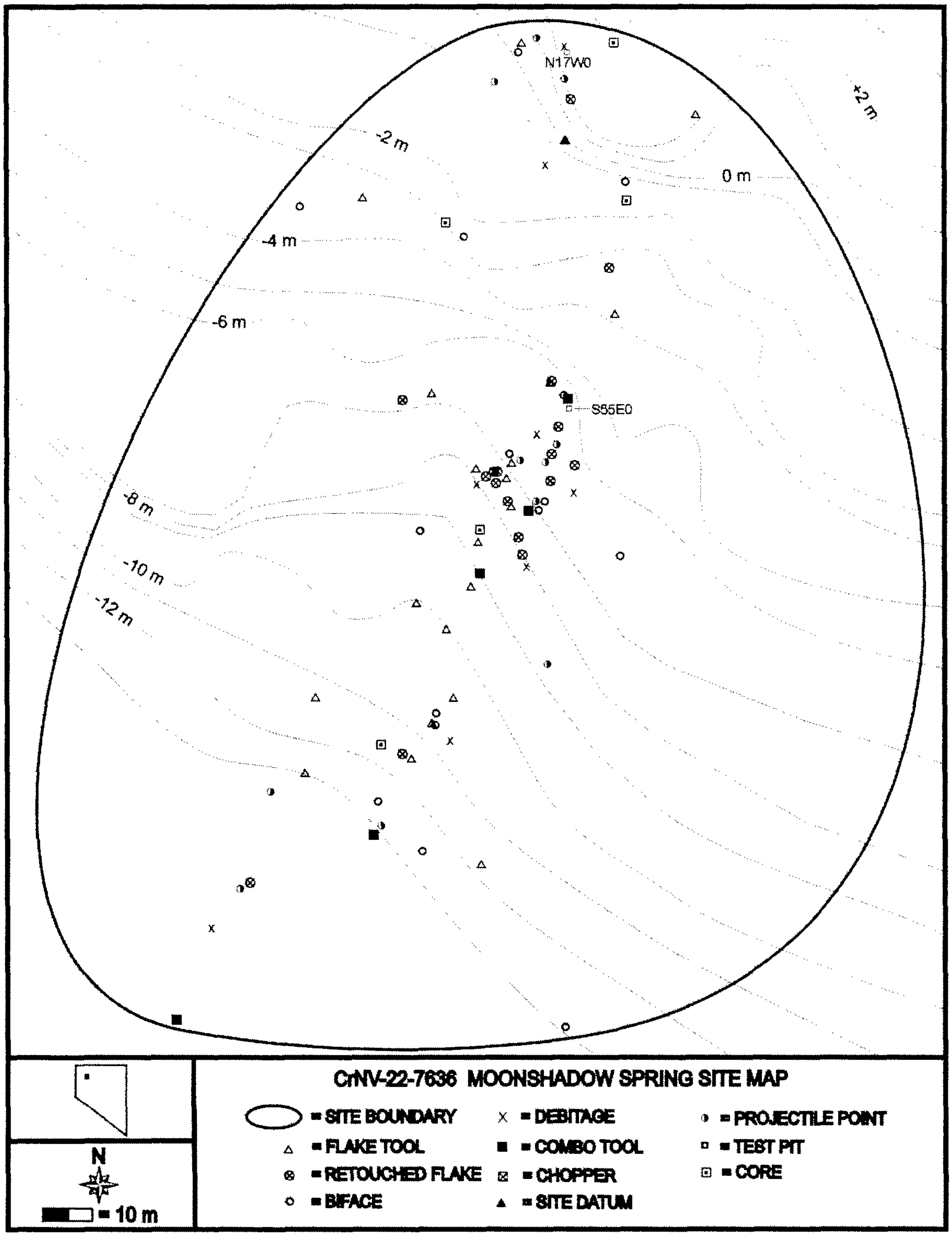


Figure 2. Moonshadow Spring site map.

pedestrian survey to locate all surface material, each artifact was plotted using a three-coordinate system based on an arbitrary site datum. The second goal, testing for buried cultural deposits, was accomplished by excavating several 1-m^2 test pits at each site. While subsurface testing did not reveal the presence of any buried features or intact deposits, the surface and buried assemblages recovered from both sites have provided valuable data regarding site function and mobility.

THE LITHIC ASSEMBLAGES

Artifact and Debitage Typologies

Lithic artifacts and debitage from Moonshine Spring South and Moonshadow Spring were analyzed using a standard typology developed by the Sundance Archaeological Research Fund for early-period assemblages in the Great Basin. This typology consists of temporally diagnostic artifact types including Parman, Cougar Mountain, Haskett, and Windust stemmed projectile points, defined elsewhere (Butler 1970; Layton 1979; Leonardy and Rice 1970), and a variety of side scrapers (unifacial tools with steep, invasive retouch along the lateral margin or margins of a flake), end scrapers (unifacial tools with step invasive retouch along the distal end of a flake), retouched flakes (flakes with marginal retouch or use-wear along one or more margins), choppers (large cobble tools extensively worked along one or more margins), gravers (unifacial or bifacial tools with one or more canted or symmetrical bits), notches (unifacial or bifacial tools with an intentionally-worked concavity), backed knives (tools possessing a blunted or backed margin opposite of the utilized margin), cores (objective pieces used to provide flakes), combination tools (tools possessing characteristics of one or more of the above types), as well as early, mid, and late stage bifaces.

Categories of lithic debitage in this typology include retouch chips (< 1 cm in size; possessing simple platforms (i.e., pressure flakes)), retouch chip fragments (< 1 cm in size; no platforms), biface thinning flakes (possessing complex and often lipped platforms), flakes (> 1 cm in size; possessing simple platforms and no cortex), flake fragments (> 1 cm in size; no platforms and no cortex), primary cortical spalls (flakes with > 50 percent cortex), secondary cortical spalls (flakes with < 50 percent cortex), and undefined cortical spalls (incomplete cortical flakes), angular shatter (debitage lacking defining characteristics of other categories), and blade-like flakes (flakes possessing parallel dorsal scars and ridges; at least twice as long as wide).

Moonshine Spring South

A total of 28 lithic tools were recovered from Moonshine Spring South through surface collection and subsurface testing (Table 1). These include eight bifaces, one Windust stemmed projectile point, one large stemmed projectile point, and two Parman or Cougar Mountain stemmed projectile points (Figure 3). Because the latter three specimens are incomplete, they cannot be definitively assigned to a specific typological category. Other tools include three cores, one backed knife, four side scrapers, six retouched flakes, and one large chopper. One large milling stone was also observed but not collected. The majority of lithic tools are manufactured on obsidian (42.9 percent; n = 12), with lesser

Table 1. *Lithic tools by raw material from Moonshine Spring South.*

	Raw Material				
Tool Category	Obsidian	CCS	FGVR	Other	Total
Projectile Points	1	1	2	-	4
Bifaces	3	3	2	-	8
Side Scrapers	2	2	-	-	4
Backed Knife	-	1	-	-	1
Choppers	-	-	1	-	1
Retouched Flakes	5	1	-	-	6
Cores	1	2	-	-	3
Groundstone	-	-	1	-	1
Total	12	10	6	-	28

amounts of cryptocrystalline silicate (CCS) (35.7 percent; n = 10) and FGVR (21.4 percent; n = 6).

Debitage from Moonshine Spring South was primarily recovered from four test pits, with a limited amount collected from a surface context (Table 2). The Moonshine Spring South sample is dominated by retouch chip/retouch chip fragments (n = 199), biface thinning flakes (n = 139), and flake fragments (n = 112). Lesser amounts of angular shatter (n = 22), cortical spalls (n = 19), flakes (n = 5), and blade-like flakes (n = 1) were also recovered. The vast majority of raw material represented is obsidian (64.2 percent; n = 319), with smaller percentages made on CCS (27.16 percent; n = 135), FGVR (8.24 percent; n = 41), and quartzite (0.40 percent; n = 2). This pattern is relatively consistent across all debitage types except that FGVR has a lower proportion of biface thinning flakes than obsidian and CCS.

Figure 3. *Projectile points from Moonshine Spring South: (1) Windust stemmed projectile point; (2)–(4) unidentified stemmed projectile point fragments.*

Moonshadow Spring

A total of 88 lithic tools were recovered from Moonshadow Spring through surface collection and subsurface testing (Table 3). These include 16 biface fragments, one Parman stemmed projectile

Table 2. *Debitage sample by raw material from Moonshine Spring South.*

	Raw Material				
Artifact Category	Obsidian	CCS	FGVR	Other	Total
Cortical Spalls	2	1	2	-	5
Primary Cortical Spalls	4	1	-	-	5
Secondary Cortical Spalls	7	2	-	-	9
Flake Fragments	59	40	13	-	112
Flakes	2	3	-	-	5
Blade-like Flakes	-	1	-	-	1
Retouch Chip Fragments	129	41	21	-	191
Retouch Chips	4	4	-	-	8
Biface Thinning Flakes	100	36	-	-	136
Bipolar Flakes	-	-	-	-	0
Angular Shatter	12	6	2	2	22
Total	319	135	41	2	497

Table 3. *Lithic tools by raw material from Moonshadow Spring*

	Raw Material				
Tool Category	Obsidian	CCS	FGVR	Other	Total
Projectile Points	11	-	-	-	11
Bifaces	9	4	3	-	16
Side Scrapers	11	3	1	-	15
End Scrapers	4	-	-	-	4
Backed Knife	-	1	-	-	1
Choppers	-	-	1	-	1
Retouched Flakes	21	4	2	-	27
Cores	2	3	-	-	5
Notches	1	-	-	-	1
Gravers	3	-	-	-	3
Combination Tools	3	2	-	-	5
Total	65	17	6	-	88

Figure 4. Stemmed projectile points from Moonshadow Spring: (1)–(3) medial stemmed point fragments; (4) Parman stemmed point; (5) distal stemmed point fragment; (6)–(10) proximal stemmed point fragments.

point, one non-diagnostic projectile point fragment, and nine stemmed projectile point fragments (Figure 4). Because the latter nine specimens are incomplete, they cannot be definitively assigned to a specific stemmed-point typological category. Other tools recovered include five cores, 15 side scrapers, four end scrapers, one backed knife, 27 retouched flakes, three gravers, one notch, and five combination tools. The majority of lithic tools are manufactured on obsidian (73.9 percent; n = 65), with lesser amounts of cryptocrystalline silicate (CCS) (19.3 percent; n = 17) and FGVR (6.8 percent; n = 6).

Debitage from Moonshadow Spring was recovered from two test pits as well as limited surface collection (Table 4). The Moonshadow Spring sample is dominated by flake fragments (n = 117), biface thinning flakes (n = 57), and retouch chip/retouch chip fragments (n = 42). Lesser amounts of flakes (n = 24), cortical spalls (n = 22), and angular shatter (n = 6) were also recovered, as well as one CCS bipolar flake and one obsidian overshot flake. The vast majority of debitage is made on obsidian (80.00 percent; n = 216), with smaller percentages made on CCS (11.48 percent; n = 31), FGVR (8.15 percent; n = 22), and quartzite (0.37 percent; n = 1). This pattern is relatively consistent across all debitage types.

GEOLOGIC SOURCE PROVENANCE DATA

A total of 59 artifacts from both sites were submitted to the Northwest Research Obsidian Laboratory in Corvallis, Oregon, for non-destructive XRF analysis. Specifically, 17 artifacts from Moonshine Spring South and 42 artifacts from Moonshadow Spring were included in the sample. Five known sources and three unknown sources were identified. The known sources lie between approximately 18 km and 143 km from the sites.

Moonshine Spring South

Almost 65 percent of the obsidian sample from Moonshine Spring South (64.70%; n = 11) originated from the Mt. Majuba source (Table 5). Two other obsidian sources, Massacre Lake/Guano Valley (17.65 percent; n = 3) and Double H/Whitehorse (17.65 percent; n = 3), are represented to a lesser degree in the sample. Of the 11 artifacts made on Mt. Majuba obsidian, one is a Windust

Table 4. *Debitage sample by raw material from Moonshadow Spring.*

	Raw Material				
Artifact Category	Obsidian	CCS	FGVR	Other	Total
Cortical Spalls	1	-	-	-	1
Primary Cortical Spalls	3	3	-	-	6
Secondary Cortical Spalls	12	3	-	-	15
Flake Fragments	92	16	9	-	117
Flakes	21	3	-	-	24
Blade-like Flakes	-	-	-	-	0
Retouch Chip Fragments	35	-	2	1	38
Retouch Chips	3	1	-	-	4
Biface Thinning Flakes	43	4	10	-	57
Bipolar Flakes	-	1	-	-	1
Angular Shatter	5	-	1	-	6
Overshot Flake	1	-	-	-	1
Total	216	31	22	1	270

stemmed projectile point, one is a late stage biface, one is a scraper, one is a core, three are retouched flakes, and four are pieces of debitage. The debitage made of Mt. Majuba obsidian consists of two primary cortical spalls, one secondary cortical spall, and one flake fragment. Of the three artifacts made of Massacre Lake/Guano Valley obsidian, one is a late stage biface, one is a retouched flake, and one is a primary cortical spall. Of the three artifacts made on Double H/Whitehorse obsidian, one is a mid stage biface and two are flake fragments.

Moonshadow Spring

The Moonshadow Spring sample includes 32 artifacts of Mt. Majuba obsidian (76.19 percent of sample), four of Double H/Whitehorse obsidian (9.52 percent of sample) and one each of Massacre Lake/Guano Valley, Bog Hot Springs, and Hawks Valley obsidian (2.38 percent of sample, respectively) (Table 6). Additionally, three artifacts from Moonshadow Spring are made on three unknown obsidians (2.38 percent of sample, respectively). Of the 32 artifacts made on Mt. Majuba obsidian, one is a Parman stemmed projectile point, five are stemmed projectile point fragments, two are late biface fragments, five are mid stage biface fragments, six are scrapers, one is a graver, two are retouched flakes, and 10 are pieces of debitage. The debitage made on Mt. Majuba obsidian consists of four flake fragments, one flake, two primary cortical spalls, one secondary cortical spall, one piece of angular shatter, and one biface thinning flake. The artifact made on Massacre Lake/Guano Valley obsidian is a stemmed projectile point fragment. Of the four artifacts manufactured on Double H/Whitehorse obsidian, one is a stemmed projectile point fragment, one is a biface fragment, and two are flake fragments. Additionally, one stemmed projectile point fragment was made on Hawks Valley obsidian and one stemmed projectile point fragment was made on Bog Hot Springs obsidian. One flake fragment is made on each of the Unknown 4 and 5 sources, and one secondary cortical spall is made on obsidian from the Unknown 6 source.

Table 5. *Geologic source data for Moonshine Spring South.*

	Artifact Class						
Raw Material Source	Proj. Point	Biface	Scraper	Core	Ret. Flake	Debitage	Total
Mt. Majuba	1	1	1	1	3	4	11
Massacre Lake/Guano Valley	-	1	-	-	1	1	3
Double H/Whitehorse	-	1	-	-	-	2	3
Hawk's Valley	-	-	-	-	-	-	0
Bog Hot Springs Unknown 1	-	-	-	-	-	-	0
Unknown 4	-	-	-	-	-	-	0
Unknown 5	-	-	-	-	-	-	0
Unknown 6	-	-	-	-	-	-	0
Total	1	3	1	1	4	7	17

Table 6. *Geologic source date for Moonshadow Spring.*

	Artifact Class						
Raw Material Source	Proj. Point	Biface	Scraper	Graver	Ret. Flake	Debitage	Total
Mt. Majuba	6	7	6	1	2	10	32
Massacre Lake/Guano Valley	1	-	-	-	-	-	1
Double H/Whitehorse	1	1	-	-	-	2	4
Hawk's Valley	1	-	-	-	-	-	1
Bog Hot Springs Unknown 1	1	-	-	-	-	-	1
Unknown 4	-	-	-	-	-	1	1
Unknown 5	-	-	-	-	-	1	1
Unknown 6	-	-	-	-	-	1	1
Total	10	8	6	1	2	15	42

DISCUSSION

Temporal Span

Analysis of lithic assemblages from Moonshine Spring South and Moonshadow Spring indicates that the sites were likely occupied during the Terminal Pleistocene and/or Early Holocene. The assemblages contain stemmed projectile points, bifaces, steep-edged scrapers, retouched flakes, and other tools that have been firmly dated to between 11,500 B.P. and 7500 ^{14}C B.P. in this and other regions of the Great Basin (Beck and Jones 1997). Furthermore, the sites do not contain diagnostic artifacts from other periods of Great Basin prehistory, suggesting that they represent temporally-discrete, "clean" assemblages. Unfortunately, no intact cultural deposits were encountered during the testing of the sites, making a more precise temporal assessment of the Moonshine Spring South and Moonshadow Spring assemblages impossible at this time.

Technological Activities

Analysis of the tools and debitage from Moonshine Spring South and Moonshadow Spring permit inferences about the technological activities that took place at the sites. Lithic tools and the debitage samples are predominantly manufactured from obsidian, with significantly less amounts of CCS and FGVR. This pattern is reflected across all tool and debitage classes. Obsidian is ubiquitous in northwest Nevada/northeast California/southern Oregon and appears to represent the primary source of lithic material for Paleoarchaic toolmakers in the region (Amick 1995, 1997; Beck and Jones 1997; Beck et al. 2002; Smith 2004).

Debitage samples from both sites are dominated by biface thinning flakes and retouch chips/ retouch chip fragments. This strongly suggests that the primary reduction of lithic materials took place away from Moonshine Spring South and Moonshadow Spring and that the majority of activity at the sites was associated with the secondary reduction and maintenance of tools. This pattern is supported by the paucity of cortical spalls in the assemblages and is reflected across all raw material types. The relative scarcity of cores further indicates that the primary reduction of toolstone packages did not occur at the sites. The few cores present in the assemblages are predominantly manufactured on CCS and appear to have been produced in a casual fashion with little regard for conserving raw material. This apparently expedient mode of production for CCS cores and flakes differs from the reduction intensity observed with obsidian artifacts, suggesting that some CCS toolstone sources may have been located near Moonshine Spring South and Moonshadow Spring.

Subsistence Activities

The character of the tool assemblages at Moonshine Spring South and Moonshadow Spring permits limited inferences about the kinds of subsistence strategies employed by the occupants of the sites. The presence of a number of stemmed projectile points and unfinished bifaces suggests that hunting was a major activity carried out from the sites. The majority of these tools are fragments, suggesting that tools broken in the field were brought back to Moonshine Spring South and Moonshadow Spring for repair and/or maintenance. The Moonshine Spring South assemblage also contains one unifacially-ground milling stone, suggesting that floral resources, small mammals, insects, or other materials were being exploited to some degree at the site. The milling stone was found on the periphery of the site and was not located in the area of the site with the highest concentration of stemmed points and other lithic artifacts; however, the lack of temporally-diagnostic artifacts from other periods of Great Basin prehistory suggests that it is associated with the Paleoarchaic occupation of the site. Although the presence of groundstone implements in the archaeological record of the late Pleistocene/early Holocene is currently a topic of debate among Great Basin researchers (Elston and Zeanah 2002), evidence from several sites suggests that these technologies played a minor role in the subsistence activities of Paleoarchaic hunter-gatherers (Beck and Jones 1997; Bedwell 1973; Grayson 1993; Jones and Beck 1999; Tuohy 1988; Willig 1988).

Site Function

Moonshine Spring South and Moonshadow Spring appear to represent short-term occupations.

No features or fire-cracked rocks were observed during either the surface survey or subsurface testing, suggesting that the sites did not serve principally as residential loci. Furthermore, the relatively low numbers of debitage, finished tools, and cores suggest that Moonshine Spring South and Moonshadow Spring were not occupied for any great length of time. The relatively high number of projectile points and unfinished bifaces in the assemblages may indicate that the sites functioned as temporary camps with a focus on mammal exploitation; however, this cannot be definitively determined with current data.

Lithic Procurement and/or Subsistence Ranges

When the lithic conveyance zone of Moonshine Spring South and Moonshadow Spring is compared to that of the nearby Coleman site, contrasting patterns emerge (Figure 5). The Coleman site, well-known for its extensive assemblage of Paleoarchaic artifacts (Graf 2001, 2002), is located only 65 km southwest of the spring sites and exhibits a linear north-south pattern of lithic procurement. In contrast, Moonshine Spring South and Moonshadow Spring exhibit a truncated pattern of procurement, with the bulk of raw material originating from sources north of the sites. While the Coleman lithic conveyance zone extends over 350 km north-south, those of the spring sites extend only 165 km north-south. Finally, the lithic conveyance zone of the Coleman site is linear, while that of Moonshine Spring South and Moonshadow Spring is more radial in shape.

Based on these differences, it appears that the lithic procurement pattern from Moonshine Spring South and Moonshadow Spring is more consistent with early-period sites in northwest Nevada/southern Oregon (Amick 1997; Connolly 1999; Oetting 1993; Smith 2004) than sites in the western/central Great Basin (Graf 2002; Jones et al. 2003). Such differences suggest that there may have been regional variation in the lithic procurement strategies and/or subsistence ranges of Paleoarchaic hunter-gatherers. Three potential contributors to this variation are: (1) obsidian source distribution; (2) topography; and (3) site occupation dynamics.

Obsidian sources are much more common in northwest Nevada/southern Oregon than in western/central Nevada (Jones et al. 2003). Paleoarchaic hunter-gatherers were cognizant of this fact and relied primarily on obsidian for tool production in that region (Amick 1997; Beck and Jones 1997). The Moonshine Spring South and Moonshadow Spring assemblages suggest that the occupants of the sites frequently visited northwest Nevada/southern Oregon to satisfy toolstone and/or subsistence needs. The nearby Coleman site; however, does not fit this pattern. If source proximity was the primary consideration of Paleoarchaic travelers, we should expect the bulk of obsidian from the Coleman site to have originated from sources north of the site. Instead, we find sources in the assemblage located up to 200 km southwest (Mt. Hicks) and 240 km south (Bodie Hills) of the site. While the sample of sourced artifacts from the Coleman site is admittedly small (n = 10), it is very informative of the toolstone and/or subsistence range of the site's occupants.

Variation in regional topography may also account for the differences between lithic conveyance zones in northwest Nevada/southern Oregon and western/central Nevada. Northwest Nevada and parts of southern Oregon are characterized by rugged volcanic tablelands. This region lacks the prominent basin-and-range system and north-south valleys present in much of Nevada. Jones et al. (2003) and Graf (2002) conclude that such valleys likely influenced the lithic procurement patterns observed in western/central Nevada. The Coleman site is located within the basin-and-range system and appears to fit expectations of lithic procurement for that topography.

Moonshine Spring South and Moonshadow Spring do not meet these expectations. Situated in the Rabbithole Creek drainage, the sites would have offered relatively easy access to the Humboldt River corridor and the basin-and-range province to the south. Thus, the sites should exhibit a similar lithic procurement pattern to that observed at the nearby Coleman site, with obsidian originating from sources to both the north and south. Instead, we find a north-centered radial procurement pattern consistent with those observed in northwest Nevada/southern Oregon.

Jones et al. (2003) posit that such variation in lithic procurement patterns constitutes evidence for Paleoarchaic foraging territories. They suggest that early-period hunter-gatherers traveled great distances within well-defined areas and rarely ventured into other "territories." Is it possible that Moonshine Spring South/Moonshadow Spring and

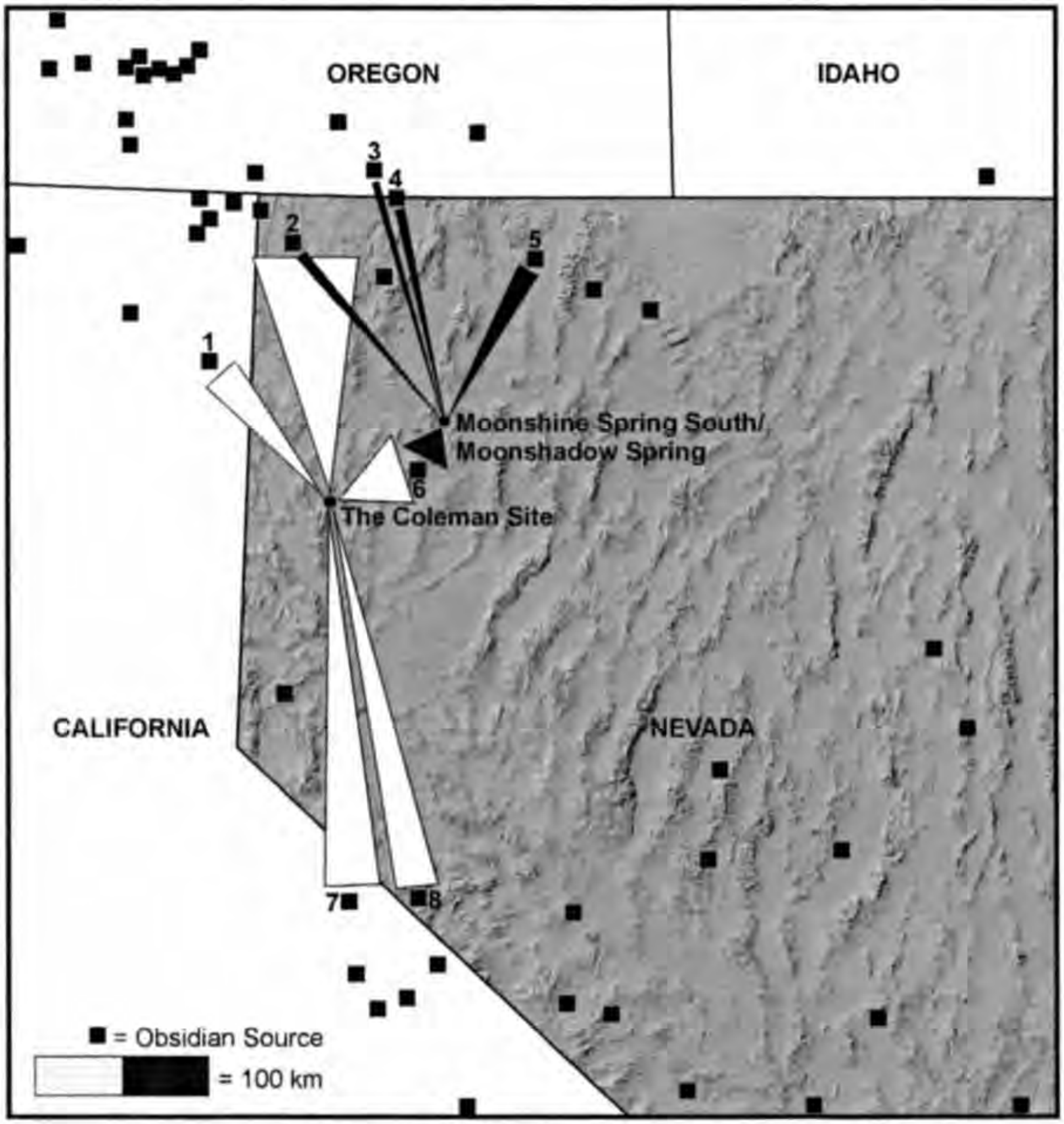


Figure 5. *Moonshine Spring South/Moonshadow Spring and Coleman site lithic conveyance zones. Obsidian sources represented in the samples include: (1) South Warner 2/Unknown B; (2) Massacre Lake/Guano Valley; (3) Hawks Valley; (4) Bog Hot Springs Unknown 1; (5) Double H/Whitehorse; (6) Mt. Majuba; (7) Bodie Hills; and (8) Mt. Hicks.*

the Coleman site are located at a boundary area between two such territories? The data presented above may represent evidence for this model, as it appears that factors other than obsidian source distribution and topography influenced the mobility patterns of the occupants of the sites.

Finally, occupation dynamics may account for differences in the lithic conveyance zones of Moonshine Spring South and Moonshadow Spring and the Coleman site. Both Moonshine Spring South and Moonshadow Spring appear to represent short-term occupations. Graf (2001) concluded that the Coleman site, with its extensive lithic assemblage, likely represents a site repeatedly visited over a long span of time. The lithic procurement pattern at the Coleman site may indicate that Paleoarchaic groups from both the northern and southern Great Basin visited the location during their subsistence and/or lithic procurement rounds. Conversely, the geographically-discrete lithic procurement pattern at Moonshine Spring South and Moonshadow Spring may be a function of limited visits to the sites by groups from the northern Great Basin. Additional investigation of the relationship between site function and lithic procurement patterns may further our understanding of Paleoarchaic settlement patterns and regional variations in mobility.

Conclusion

Moonshine Spring South and Moonshadow Spring appear to represent short-term Paleoarchaic occupations at upland springs during the Terminal Pleistocene/Early Holocene. Geological source provenance analyses of artifacts from the sites suggest a radial pattern of lithic procurement and/or subsistence range. This pattern contrasts greatly with that of the nearby Coleman site, which exhibits a linear north-south lithic conveyance zone. Factors other than source proximity and topography appear to have influenced the mobility patterns of the sites' occupants. Differences in occupation intensity may provide a possible explanation for this variation in lithic procurement patterns; however, I conclude that it may have more to do with the existence of a boundary between two conveyance zones—the northern being represented at the spring sites, and both being represented at the Coleman site.

While Moonshine Spring South and Moonshadow Spring are significant when considered independently because they represent temporally-discrete early-period occupations, their true research potential lies in the contributions they can make to broader analyses of Paleoarchaic mobility. Data from the sites are currently being included in a regional study of early-period archaeological resources in northwest Nevada. An examination of the relationship between variation in lithic technology and lithic procurement ranges based on Paleoarchaic sites from a range of geographic settings promises to reveal differences that may lead to a better understanding of how and why people moved across the landscape during the Terminal Pleistocene/Early Holocene.

Acknowledgments. Thank you to very much to Ted Goebel and Kelly Graf for co-directing the testing of Moonshine Spring and Moonshadow Spring, and to David Valentine, Linsie Lafayette, Cassandra Albush, Doug Kalley, Barbara Malinky, Neil Puckett, Travis Wiltse, and Zandra Winter for participating in the project. Also, thanks to Craig Skinner of the Northwest Research Obsidian Lab in Corvallis, Oregon, for conducting XRF analysis of obsidian artifacts from the sites. Special thanks go to the Sundance Archaeological Research Fund, UNR Anthropology Department, Nevada Archaeological Association, Am-Arcs, and the Winnemucca Field Office of the Bureau of Land Management for generously supporting this project.

REFERENCES CITED

Amick, Daniel S.
1995 Raw Material Selection Patterns Among Paleoindian Tools from the Black Rock Desert, Nevada. *Current Research in the Pleistocene* 12:55–57.
1997 Geochemical Source Analysis of Obsidian Paleoindian Points from the Black Rock Desert, Nevada. *Current Research in the Pleistocene* 14:97–99.

Beck, Charlotte, and George T. Jones
1990 Toolstone Selection and Lithic Technology in Early Great Basin Prehistory. *Journal of Field Archaeology* 17:283–299.
1997 The Terminal Pleistocene/Early Holocene Archaeology of the Great Basin. *The Journal of World Prehistory* 11(2):161–236.

Beck, Charlotte, Amanda K. Taylor, George T. Jones, Cynthia M. Fadem, Caitlyn R. Cook, and Sara A. Millward
2002 Rocks are Heavy: Transport Costs and Paleoarchaic Quarry Behavior in the Great Basin. *Journal of Anthropological Archaeology* 21:481–507.

Bedwell, Stephen
1973 *Fort Rock Basin: Prehistory and Environment.* University of Oregon Books, Eugene.

Butler, Robert
1970 A Surface Collection from Coyote Flat, Southeastern Oregon. *Tebiwa* 13(1):34–42.

Connolly, Thomas J.
1999 *Newberry Crater: A Ten-Thousand-Year Record of Human Occupation and Environmental Change in the Basin-Plateau Borderlands.* University of Utah Anthropological Papers Number 121. University of Utah Press, Salt Lake City.

Eiselt, B. Sunday
1997 Fish Remains from the Spirit Cave Fecal Material: 9,400 year old evidence for Great Basin Utilization of Small Fishes. *Nevada Historical Society Quarterly* 40(1):117–139.

Elston, Robert G., and David W. Zeanah
2002 Thinking Outside the Box: A New Perspective on Diet Breadth and Sexual Division of Labor in the Prearchaic Great Basin. *World Archaeology* 34(1):103–130.

Goebel, Ted, Kelly E. Graf, Bryan S. Hockett, and David Rhode
2003 Late-Pleistocene Humans at Bonneville Estates Rockshelter, Eastern Nevada. *Current Research in the Pleistocene* 20:20–22.

Graf, Kelly E.
2001 Paleoindian Technological Provisioning in the Western Great Basin. M.A. Thesis, Department of Anthropology and Ethnic Studies, University of Nevada, Las Vegas.
2002 Paleoindian Obsidian Procurement and Mobility in the Western Great Basin. *Current Research in the Pleistocene* 19:87–89.

Grayson, Donald K.
1993 *The Desert's Past: A Natural History of the Great Basin.* Smithsonian Institution Press, Washington, D.C.

Hughes, Richard E.
1984 Obsidian Sourcing Studies in the Great Basin: Problems and Prospects. In *Obsidian Studies in the Great Basin*, edited by Richard Hughes, pp. 1–20. Contributions of the University of California Archaeological Research Facility, Number 45, Berkeley.

Jones, George T., and Charlotte Beck
1999 Paleoarchaic Archaeology in the Great Basin. In *Models for the Millennium*, edited by Charlotte Beck, pp. 83–95. University of Utah Press, Salt Lake City.

Jones, George T., Charlotte Beck, Eric E. Jones, and Richard E. Hughes
2003 Lithic Source Use and Paleoarchaic Foraging Territories in the Great Basin. *American Antiquity* 68:5–38.

Kelly, Robert L.
1988 The Three Sides of a Biface. *American Antiquity* 53:717–734.

Kelly, Robert L., and Lawrence C. Todd
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. *American Antiquity* 53:231–244.

Layton, Thomas N.
1979 Archaeology and Paleo-ecology of Pluvial Lake Parman, Northwestern Great Basin. *Journal of New World Archaeology* 3(3):41–56.

Leonardy, Frank C. and David G. Rice
1970 A Proposed Culture Typology for the Lower Snake River Region, Southeastern Washington. *Northwest Anthropological Research Notes* 4(1):1–29.

Oetting, Albert C.
1993 *The Archaeology of Buffalo Flat: Cultural Resources Investigations for the Conus OTH-B Buffalo Flat Radar Transmitter Site, Christmas Lake Valley, Oregon.* Submitted to the U.S. Army Corps of Engineers, Seattle District, Washington.
1994 Early Holocene Rabbit Drives and Prehistoric Land-Use Patterns on Buffalo Flat, Christmas Lake Valley, Oregon. In *Archaeological Research in the Northern Great Basin: Fort Rock Archaeology Since Cressman*, edited by C. Melvin Aikens and Dennis L. Jenkins, pp. 155–169. University of Oregon Anthropological Papers 50. Eugene.

Pendleton, Lori S.
1979 Lithic Technology in Early Nevada Assemblages. Unpublished Master's Thesis. California State University, Long Beach.

Pinson, Arianne O.
2004 Of Lakeshores and Dry Basin Floors: A Regional Perspective on the early Holocene Record of Environmental Change and Human Adaptation at the Tucker Site. In *Early and Middle Holocene Archaeology of the Northern Great Basin*, edited by Dennis Jenkins, Thomas J. Connolly, and C. Melvin Aikens, pp. 53–76. University of Oregon Anthropological Papers 62. Eugene.

Simms, Stephen
1988 Conceptualizing the Paleo-Indian and Archaic in the Great Basin. In *Early Human Occupation of Far Western North America: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 41–52. Nevada State Museum Anthropological Papers 21, Carson City.

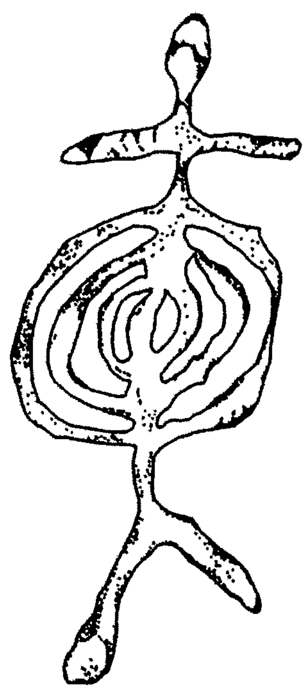
Smith, Geoffrey M.
2004 The Paleoarchaic Occupation of Five Mile Flat, NV. Paper presented at the 29th Biennial Great Basin Anthropological Conference, Sparks, Nevada.

Smith, Geoffrey M., Travis Wiltse, and Ted Goebel
2004 Cultural Resource Report CR2-2970(P). *The Paleoarchaic Archaeology of Moonshine Spring and Moonshadow Spring, Pershing County, Nevada.* Prepared for the Bureau of Land Management, Winnemucca Field Office, Nevada.

Tuohy, Donald R.
1988 Artifacts from Northwestern Pyramid Lake Shoreline. In *Early Human Occupation of Far Western North America: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 201–216. Nevada State Museum Anthropological Papers 21, Carson City.

Willig, Judith A.
1988 Paleo-Archaic Adaptations and Lakeside Settlement Patterns in the Northern Alkali Basin, Oregon. In *Early Human Occupation of Far Western North America: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 417–482. Nevada State Museum Anthropological Papers 21, Carson City.
1991 Clovis Technology and Adaptation in Far Western North America: Regional Pattern and Environmental Context. In *Clovis: Origins and Adaptations*, edited by Robson Bonnichsen and Karen L. Turnmire, pp. 91–118. Peopling of the Americas Publication, Corvallis.

Wriston, Theresa A.
2003 The Weed Lake Ditch Site: An Early Holocene Occupation on the Shore of Pluvial Lake Malheur, Harney Basin, Oregon. Master's Thesis, Department of Anthropology, University of Nevada, Reno.



The Prehistory of Burnt Rock Spring Mound in the Northern Mojave Desert

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The Springs Preserve

Archaeological excavations and geological trenching at Burnt Rock Spring Mound 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 correlate with regional climatic models. The mound is located on the northwest periphery of the known extent of Puebloan Ancestors and Patayan peoples. Artifacts recovered from the mound formed after a mid-Holocene scouring episode suggests long-term use of this vital resource by Late Archaic populations through ceramic peoples.

INTRODUCTION

In March of 2000, archaeologists for the Las Vegas Springs Preserve had the opportunity to investigate the archaeology and paleo-hydrology of 26CK3601, Burnt Rock Spring Mound. Named for the staggering quantities of fire-cracked rock on its surface, the mound is located in the northwestern part of the Las Vegas Valley, to the northeast of the intersection of Decatur Boulevard and Ann Road. One of several dozen known spring mounds along the Quaternary fault scarps in the Valley, Burnt Rock has been known to amateur and professional archaeologists for decades. C. Vance Haynes briefly investigated it during the project that led to *Pleistocene Studies in Southern Nevada* (Haynes 1967). Burnt Rock Spring Mound lies along the Eglington Scarp, which was named by Haynes. Today, these spring formations are rapidly disappearing as the wave front of urbanization advances.

Spring Mounds

Springs in general are commonly formed in southern Nevada and east central California when underground water from aquifers escape to the surface along faults. In the central part of the Las Vegas Valley, there are large numbers of individual segments comprising the four major Quaternary-age faults. Rate of flow is thought to be a major determinant of whether a spring becomes a spring mound or a cauldron pool. Spring Mounds are formed when water flow is insufficient to carry away the aeolian sediments captured by the sedges, grasses, and shrubs growing in the wet soil around the spring (Quade et al. 1998). In time, these organically rich sediments become incorporated into the mound stratigraphy as "black mats." As sediments accumulate, the raised silhouette of the mound increases the rate of sediment capture. As elevation of a mound increases, hydrostatic pressure decreases along with the rate of flow.

Examples of spring mounds other than Burnt Rock in southern Nevada include Torrance Ranch near Beatty in the Oasis Valley, Corn Creek Flat north of Las Vegas, Big Spring at the Las Vegas Springs Preserve, an unnamed mound near the intersection of Martin Luther King, Jr. Boulevard & Cheyenne, and Gilcrease Ranch. Gilcrease Ranch was also investigated by Vance Haynes as part of his Tule Springs studies in the 1960s (Figure 1).

Caldron Pools

When a spring's discharge is high enough to flush the captured sediments out of the pool and surrounding vegetation, caldron pools form preventing the accumulation necessary for spring

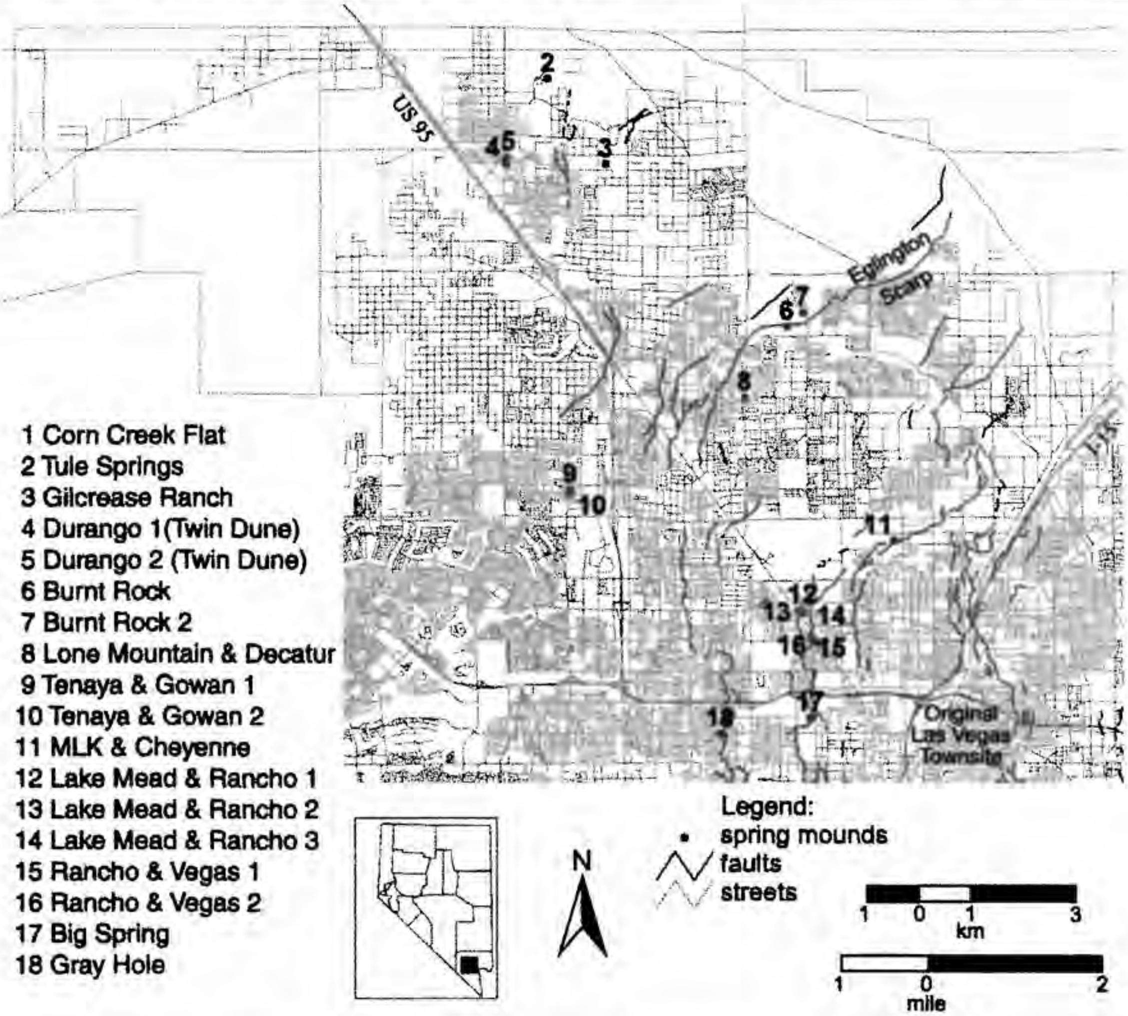


Figure 1. *Map of the Las Vegas Valley delineating spring mound and fault locations.*

mound formation. Black mats can also form in these water sources and in the spring-fed streams typically associated with cauldron pools. Point of Rocks at Ash Meadows; Little, Middle, and Big Springs at the Las Vegas Springs Site; and Corn Creek are some examples in the Las Vegas Valley. These are the more typical conception of a spring.

PALEOGEOLOGY OF BURNT ROCK SPRING MOUND

Quade et al. (1998) has summarized the history of Late-Glacial recharge and development of spring mounds in the Las Vegas Valley, Amargosa Desert, and Northern Mojave. Corn Creek (Haynes 1967; Quade 1986; Quade et al. 1998), Gilcrease Ranch (de Narvaez 1995; Haynes 1967), and Tule Springs (Haynes 1967) are geographically the closest and part of the hydrologic system that includes Burnt Rock Mound. These spring mounds are rather typical of the dozens of spring mounds that formed along the Eglington Escarpment in the north central Las Vegas Valley.

It is uncertain when the faulting occurred that ultimately redirected the aquifer flow to the surface that became Burnt Rock Spring Mound (Figure 2). However, the earliest dateable spring flow evidence is a remnant black mat that dates to 12,530 ± 60 B.P. (Beta-143475). This earliest spring stratum is intrusive into 'D' horizon sediments (16,000–30,000 B.P.) (Haynes 1967) that predate the black mat ^{14}C date. The profile exposed on the western side of the spring throat by trenching has relatively uncomplicated stratigraphy. The eastern profile, however, is not as straightforward. Burnt Rock is situated immediately below the Eglington Scarp.

Figure 2. Photograph of Burnt Rock Spring Mound in 1970 (courtesy of M. Lyneis).

The scarp is dissected by small surface drainages that coalesce into a larger ephemeral drainage roughly oriented from the northwest to the southeast. This drainage is situated nearby to the north and ultimately runs east of Burnt Rock Mound. Perhaps in association with these transitory mild surface dissections, a substantial portion of the eastern side mound stratigraphy has a disconformity that appears to be an infilled fluvial erosion channel. This event apparently occurred after the final black mat (9,610 ± 60 B.P.) (Beta-143479) in Unit 'E$_2$' (11,500–7,500 B.P.) (Haynes 1967), but prior to the episode of spring throat deposition at 6,470 ± 40 B.P. (Beta-143478) (this article). This is likely Haynes' (1967) disconformity between the E and F units from 7,500–7,000 B.P. corresponds to this local event. Subsequently, F unit deposition restored the nominal ground surface obliterating any surficial evidence of the channel event. There was adequate spring flow as evidenced by the ^{14}C dates from the spring throat and final black mat at 6,470 ± 40 B.P. (Beta-143478) to produce a symmetrical mound profile. In other words, there is no surficial expression of this channelization event (Figure 3).

The archaeological component of artifacts, midden strata, and fire-cracked rock is entirely post- disconformity. It is unknown if there was an earlier Archaic or Terminal Pleistocene-Early Holocene archaeological component that was removed by this Middle Holocene fluvial event.

One of the chief impressions derived from the trench stratigraphy of Burnt Rock is that of successive, cyclic spring activity punctuated by intervening ablation and erosional episodes which appears to correlate well with Quade's scheme of *Black Mats, Spring-Fed Streams, and Late Glacial-Age recharge in the Southern Great Basin* (Quade et al. 1998). In summary, he reports that the collapse of the late full-glacial marshes causesd deep channel cutting in soil Unit D which dates before 14,000 B.P. Alluvial backfilling, comprised of soils Unit E1, commenced subsequently and ended sometime

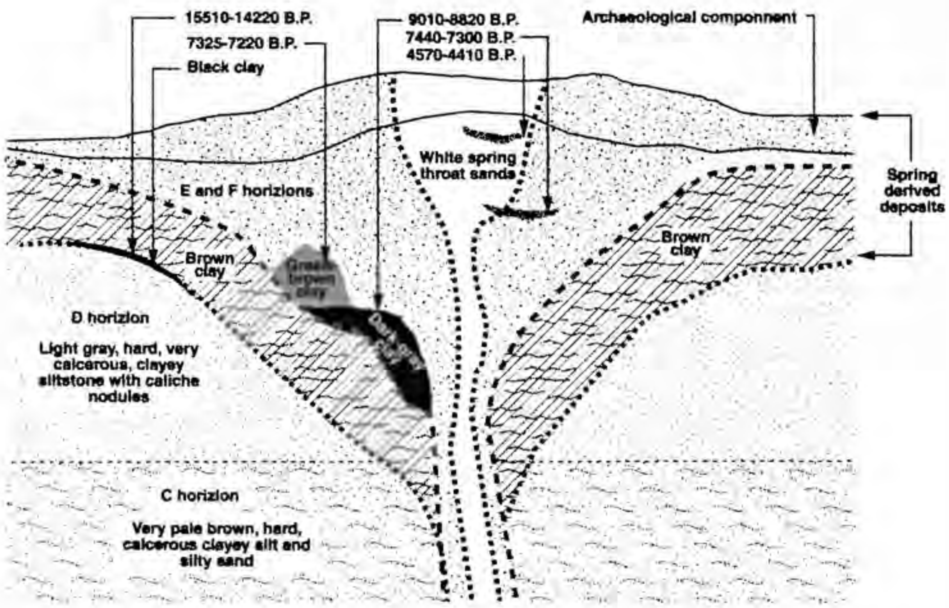


Figure 3. Profile of the stratigraphic sequences of Burnt Rock Spring Mound.

between 12,000 and 11,000 B.P. Then, a new cycle of downcutting during the early Holocene repeated until approximately 8,500 B.P. when depositional soils defined as E_2 are identified. This final period marks the episode of the rise in the water table and resulting spring fed channels and spring mounds lasting until 7,000 BP.

Quade's work suggest that ^{14}C dates from black mat cluster into two groups 11,800 to 6,300 B.P. and 2,300 B.P. to present. Five of our dates ranging from 15,000 to 7,300 B.P. fall generally within his earlier range. One date from the vent throat, however, at 4,500 B.P., lies between Quade's two ranges.

^{14}C dates derived from preserved black mats represent only the final period of spring discharge rather than the entire episode because groundwater in southern Nevada has a high oxidizing capacity. This acts within the reducing environment necessary for black mat formation to eliminate organic material from the older part of the record (Quade et al. 1998:133–134). Using this as a guideline, there are three distinct episodes of black mat formation at BRM. The earliest black silt-clay black mat (Beta-143475, 12,530 ± 60 ^{14}C 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 ^{14}C B.P., is the largest observed at BRM in terms of strata thickness and extent. The green color and ^{14}C dates (Beta-143476, 9,680 ± 60 ^{14}C B.P.; Beta-143479, 9,610 ± 60 ^{14}C B.P.) of this strata corresponds to Quade's (1998) discussion of E_2 unit mats at several locations in the Pahrump and Las Vegas Valleys. 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 ^{14}C B.P.) corresponds with the end of the first of Quade's group of black mat formation in the region at 6,300 ^{14}C B.P. (Quade et al. 1998). As a group, the later three black mat ^{14}C dates at BRM 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 ^{14}C B.P.) is the same as the final black mat. The later date (Beta-143474, 4,200 ± 40 ^{14}C B.P.) stands outside the chronology of black mat formation in the area (Table 1). It may be that this represents a period of rejuvenated spring flow after the postulated middle Holocene drought that was insufficient to contribute to black mat formation, but was doubtless critical to wildlife and perhaps humans at this time.

Archaeological Excavations

Comparisons of the mound at the time of the project to an early photo revealed that a significant portion of the western edge of the mound had been removed in the intervening years. A portion of the remaining area was removed to surrounding ground level to allow the backhoe direct access to the throat of the mound. The first trench started west of the spring throat and continued east for approximately 15 m. This trench was eventually taken to approximately 6.5 m below ground surface. A second trench extended from Unit 14 southward to expose water-lain sand.

In all, over 10,000 artifacts, including ceramics, ground stone, faunal bone, and lithics were re-

Table 1. *Conventional and calibrated radiocarbon dates from geologic trenches.*

Sample ID	Material	_^{13}C value	Conventional radiocarbon	Calibrated* radiocarbon (2_)
Beta-143477	Organic sediment	_^{13}C = -23.0%	6,340 ± 40 B.P.	7,325–7,220 cal B.P.
Beta-143479	Organic sediment	_^{13}C = -25.3%	9,610 ± 60 B.P.	11,175–10,715 cal B.P.
Beta-143476	Organic sediment	_^{13}C = -25.1%	9,680 ± 60 B.P.	9,010–8,820 cal B.P.
Beta-143475	Organic sediment	_^{13}C = -22.4%	12,530 ± 60 B.P.	15,510–14,220 cal B.P.
Beta-143474	Organic sediment (60 cmbs)	_^{13}C = -21.7%	4,020 ± 40 B.P.	4,570–4,410 cal B.P.
Beta-143478	Organic sediment (170 cmbs)	_^{13}C = -24.5%	6,470 ± 40 B.P.	7,440–7,300 cal B.P.

* INTERCAL98 Radiometric Age Calbration.Stuvier et al. 1998

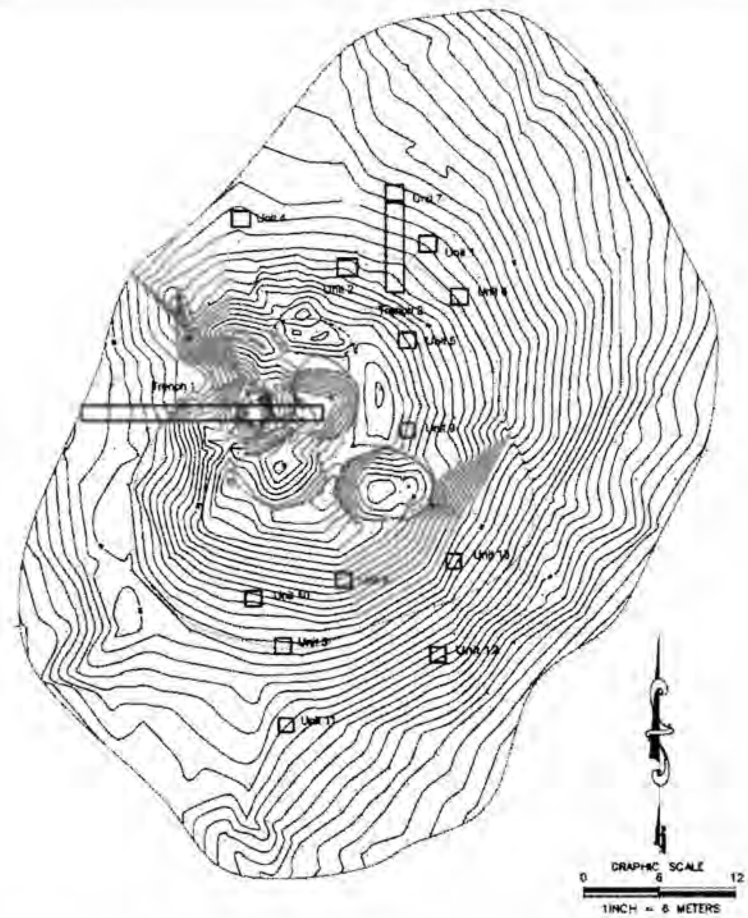


***Figure 4.** Plan map of Burnt Rock Spring Mound showing unit and trench locations.*

covered during from the 2,300 square meters (m^2) surface collection, two excavated trenches, and from the 14 sub-surface archaeological test units (Figure 4). Here data from excavation units from the north side of the mound (Unit 1) and the south side (Unit 8) were compared. Midden was deep and dark black-gray in color on the south side. This contrasts to the north where cultural fill above the natural D horizon was much lighter in color. Interestingly, radiocarbon dates and artifact assemblages exhibit differences also.

^{14}C dates reveal that the mound's south exposure is dramatically younger that the north side. It can be seen here that only levels above 30 cm from Unit 1 on the north, correspond to the deepest deposits in Unit 8 on the south at 70 cm.

Lithics

The lithic assemblage at Burnt Rock Mound spans the Late Archaic through Ceramic Period, which is approximately 2,500 B.P. to the time of Euroamerican Contact. This is based on the presence of Elko series projectile points (3,250–1,250 B.P.) (Thomas 1981:20) for the Late Archaic and Desert series (post-A.D. 1300 B.P.) (Thomas 1981:15–16, 18) for the Ceramic Period. Conventional radiocarbon dates from four of the five archaeological excavation levels in Unit 1 on the north side of the mound ranged from 1,960 ± 60 B.P. in the 40–50 cm level to 580 ± 50 B.P. in the 10–20 cm level. An Elko point was recovered from the 30-40 cm level, which had a conventional date of 1930 ± 60 B.P. radiocarbon years. Six of the seven levels of Unit 8, on the south side of the mound, were dated. The 60–70 cm level dated to 1,160 ± 80 B.P., and the 10–20 cm level dated to 200 ± 60 B.P. (Table 2).

Several attributes recorded during the debitage analysis can be used to discriminate between populations at an archaeological site. One that has been successful is the comparison of the populations of biface-thinning flakes to pressure/retouch flakes. Here, the two highest dated levels in Unit 1 (10–20 and 20–30 cm) were compared to the sum of the levels in Unit 8. Based on the radiocarbon dates these populations should be chronologically

Table 2. *Conventional and calibrated radiocarbon dates from Units 1 and 8.*

Sample ID	Material	_13C value	Unit/level	Conventional radiocarbon	Calibrated* radiocarbon (2_)
Beta-143491	Charred material	_13C = -25.3%	U1/10–20	580 ± 50 B.P.	390–320 cal B.P.
Beta-152721	Charred material	_13C = -23.0%	U1/20–30	1,270 ± 40 B.P.	1,280–1,080 cal B.P.
Beta-152722	Charred material	_13C = -25.0%	U1/30–40	1,930 ± 60 B.P.	2,000–1,720 cal B.P.
Beta-143484	Charred material	_13C = -25.3%	U1/40–50	1,960 ± 60 B.P.	2,030–1,795 cal B.P.
Beta-143485	Charred material	_13C = -24.5%	U8/10–20	200 ± 60 B.P.	4,570–4,410 cal B.P.
Beta-152723	Charred material	_13C = -25.0%	U8/20–30	230 ± 50 B.P.	430–380 cal B.P. and 320–260 cal B.P; 220–140 cal B.P. and 30–0 cal B.P.
Beta-152724	Charred material	_13C = -25.0%	U8/30–40	540 ± 50 B.P.	640–510 cal B.P.
Beta-143486	Charred material	_13C = -25.7%	U8/40–50	980 ± 50 B.P.	970–755 cal B.P.
Beta-143487	Charred material	_13C = -24.6%	U8/50–60	1,280 ± 60 B.P.	1,300–1,065 cal B.P.
Beta-143488	Charred material	_13C = -25.0%	U8/60–70	1.160 ± 80 B.P.	1,270–9300 cal B.P.

* INTERCAL98 Radiometric Age Calbration.Stuvier et al. 1998

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. The assumption being that the archaic population has a different lithic manufacturing strategy and will be divergent from the Ceramic period population.

The 100% stacked histograms contrasting the Late Archaic of Unit 1 and Ceramic Period of Unit 8 are very satisfying because there is a tangible difference. This disappears immediately 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 may be a spatial rather than a chronological difference.

Methodology

When appropriate, all artifacts were ranked according to 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.

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.

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.

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. Pressure or biface thinning flakes represent final preparation or maintenance of a formal unifacial or bifacial edge or tool (Amick 1992; Flenniken and Raymond 1986). These flakes are typically very small (often less than 1.2 cm) and are the result of soft hammer removals or the direct application of pressure rather than the percussive striking of the object. 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. 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).

Discussion

A total of 5,843 pieces of debitage were recovered from subsurface contexts at Burnt Rock. All have vertical provenience derived from the arbitrary 10 cm levels of the 1 x 1 m excavation units. The series of ^{14}C dates for all levels of excavation units 1, 8, 9, and 14 provides an uncommon opportunity to examine the artifacts from these units in a chronological context. If we associate each level to a time period of the commonly accepted chronology, the artifacts in those 10 cm levels can be examined in the context of lithic or ceramic traditions. The radiocarbon date ranges returned from the Burnt Rock excavations span the end of the Late Archaic to the Ethnohistoric.

The lithic assemblage is overwhelmingly small-sized, late-stage reduction debitage of variously colored cryptocrystalline silicates (CCS) including flint, chert, and chalcedony. Few formal or expedient tools were identified from the surface collection or from subsurface contexts. Ten biface edge fragments were recovered, four from the surface and six subsurface.

The oldest ^{14}C dates, 2,030–1,795 cal B.P. (Beta-143484) and 2,000–1,720 cal B.P. (Beta-152722), are from the middle of the Late Archaic. This period is correlated with diagnostic Elko series, Gypsum, and Humboldt projectile points since 5,000 B.P. We have assigned the category of Artifact Group 1 (AG1) to this assemblage. 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. In the second half of the Late Archaic at about 1,600 B.P. to 1,100 B.P. the Rosegate series, a smaller point style (Thomas 1981), appears in the archaeological record (Artifact Group 2-AG2) (Table 3)]. This implies that the bow and arrow was introduced, perhaps initially used in conjunction with the atlatl. Ceramics make their earliest known appearance in the northern Mojave during the Early Ceramic. The distinctive Ancestral Puebloan ceramic styles occur in this region from 1,100–700 B.P. Any excavation levels that produced radiocarbon dates within this time span were assigned to the Early Ceramic period (Artifacts Group 3-AG3). 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 700 B.P. were assigned to the Late Ceramic period and Artifacts Group 4 (AG4).

Assumptions and expectations

One expectation for this exercise is that debitage typological categories will change through time based on the technological trajectory used. During the Archaic, groups were more mobile so the debitage ratios should show a greater dependence on formal tool manufacture from a curated

Table 3. *Correlation of lithic and ceramic dates.*

	Lithic Assemblage Chronology			Ceramic Assemblage Chronology		
Period	B.P (1950)	A.D.	Artifact Group	Projectile Pt.	B.P. (1950)	A.D.
Late Ceramic	0–700	1250–1950	4	DSN	0–700	1200–1850
Early Ceramic	700–1100	850–1250	3	Rosegate	700–1250	700–1250
Late Archaic	1100–1600	350–850	2	Late Archaic	1250–1650	300–700
Late Archaic	> 1600 B.P.	< A.D. 350	1	Elko/Humboldt	> 1650 B.P.	< A.D. 300

bifacial core tool kit. As groups came to focus more on specific resources, they became tethered to the specific places in the landscape where those resources were available. There is a relationship between mobility and lithic technology. As mobility decreases, formal tool manufacture decreases and expedient tool use increases. Therefore, the debitage from levels dated to the Archaic should have a higher percentage of biface thinning flakes (BTF) compared to pressure flakes (PRF). As groups become less mobile, and presumably this peaked during Ancestral Puebloan times, the amount of biface reduction and maintenance would decrease, resulting in a decrease in the percentage of BTF in relation to PRF flakes. As well, there should 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.

The Ancestral Puebloan (700–1,200 B.P.) population is expected to show the greatest divergence from the Archaic population. If groups utilizing the resources at Burnt Rock Mound during that time were semi-sedentary agriculturists, then the debitage should have highest percentage of expedient retouch flakes. These will be small pressure flakes, probably of size grade 1. Additionally, percentages of shatter should be the highest in this population as Ancestral Puebloan groups are thought to have the least emphasis on lithic technology.

The four groups of debitage (artifact group [AG] 1–4) can be informally described according to several characteristics. The Archaic levels (AG 1) have the absolute highest percentage of BTF flakes and the lowest percentage of manufacture shatter. These levels also contain the highest ratio of BTF to PRF technological types and almost no size grade 1 debitage. This is similar to what would be expected for highly mobile, sub-band hunter-gatherers. It is interesting to contrast this with the Ancestral Puebloan levels as they have the least ratio of BTF to PRF flake types.

The portion of the Late Archaic corresponding to AG 2 levels have a slight increase in the percent of PRF and decline in the percentage of BTF making the PRF/BTF ratio closer to 1:1. Production shatter appears as a significant percentage of the debitage for the first time. Indeterminate flake shatter (IND) percentages remain about the same as for the Late Archaic. Debitage size grade ratios between the two parts of the Late Archaic populations are nearly identical.

The Early Ceramic (Ancestral Pueblo) levels (AG 3) have over twice the percentages of PRF debitage compared to the Late Archaic. The PRF BTF ratio is the highest for this sample (> 2:1). The higher percentages of size grade 1 debitage is during this period.

The Late Ceramic levels (AG 4) have PRF/BTF ratios slightly greater than 1:1. Approximately the same percentage of IND debitage as the Archaic levels, while the percentages of SHA debitage are consistent with the other Ceramic level (AG 3). Approximately the same ratios of size grade 2 and 3 debitage as Archaic levels (AG 1-2).

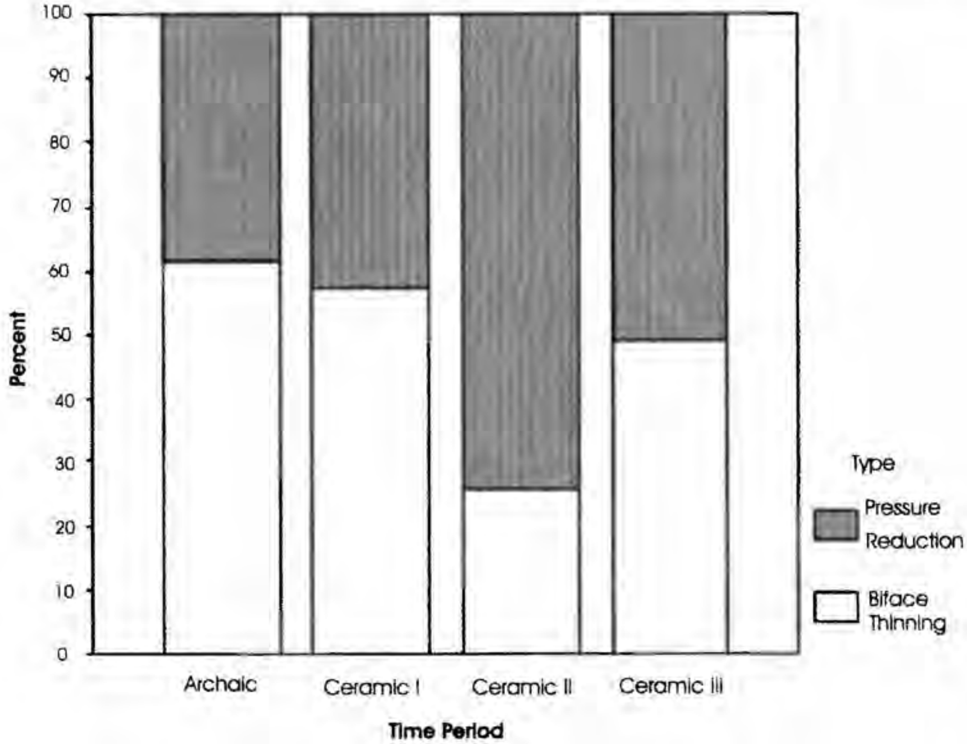
The Early Ceramic period (AG 3) is significant as a time of expedient tool production as shown by the lowest percentages of Biface Thinning Flakes and highest percentages of Pressure/Retouch Flakes ($\chi^2 = 13.447$; df=3, $p = .004$, n=480). Since $p < .05$, the null hypothesis of 'no difference' can be rejected. However, we cannot reasonably infer that this is, in fact, the result of a shift to an expedient tool trajectory from the curated biface strategy that is suspected for the Late Archaic levels. In the context of this analysis, it would be impossible at size grade 1 to differentiate expedient scraper maintenance debitage from bifacial edge finishing and rejuvenation debitage (Andrefsky 1998). When the same flake population is segregated into members of size grade 1 and all other size grades, the results of the 100 percent stacked histograms are promising. However, these can not be tested statistically due to the small population numbers of Late Archaic level size grade 1 debitage.

This supports that there are differences between the four populations when grouped according to radiocarbon dates. The differences are the greatest between the Archaic and Late Ceramic lithic debitage populations.

The 100 percent stacked bar graphs for debitage type plotted against chronological period and size grade plotted against chronological period are below (Figure 5).

Burnt Rock Ceramics

Like most sites in the Las Vegas Valley, Burnt Rock Spring Mound contains ceramic wares generally affiliated with Ancestral Puebloan groups, Patayan, and the Southern Paiute. Low numbers of



Chi-Square (χ^2) Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.447[a]	3	.004
N of Valid Cases	480		

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

Figure 5. *Histogram detailing flake types by arrtifact group.*

Table 4. *Ceramics from Burnt Rock Spring Mound excavations in 2000.*

Area	Patayan Tradition Buff/Brown	Puebloan Gray	Southern Paiute Brown	Prescott Gray	Fremont Gray	Unident*	Total
Subsurface-n/s	28	84	10	4	0	16	143
Surface-n/s 1972	52	178	66	0	0	0	296
Surface-n/s 2000	17	145	18	5	1	17	205

* sherds too small for identification

intrusive wares from southern Utah and central Arizona were also identified. These included Prescott Gray and San Juan Red Ware. These are frequently found on sites throughout southern Nevada. For the most part, it is difficult to make any sense of ceramic assemblages on local archaeological sites due to disturbances, a lack of stratigraphy, or depth of deposits. Stratigraphy was subtle at Burnt Rock; there was depth to the midden and the majority of the disturbance was confined to the top of the mound.

For this study, a total of 644 sherds from Burnt Rock Spring Mound have been analyzed (Table 4). Two hundred ninety-six of those had been previously surface collected by the University of Nevada, Las Vegas in the 1970s. Archaeologists from The Springs Preserve collected 348 sherds from surface and subsurface contexts. A comparison of these two assemblages provides some interesting results. The earlier surface collection and our recent subsurface assemblage are similar, while the two surface assemblages exhibit some differences. From the 30-year-old collection, 60 percent of the total sherds were gray or red wares. The Springs Preserve recovered a slightly higher number, 71 percent. Lower frequencies of Patayan tradition and Southern Paiute Brown wares were recovered by us, 17 and 8 percent respectively compared to the previous collection with 22 and 9 percent. We believe that this may be the result of illegal digging and artifact collecting.

Overall, surface numbers were highest in disturbed areas of the site, which was on the top of the mound. To support this contention, percentages of wares from undisturbed subsurface contexts are similar to pre-disturbance surface collection numbers from the 1970s. Gray and red wares represented 60 percent of both assemblages. A difference between the two groups of sherds being the lower numbers of Southern Paiute Brown ware in the subsurface contexts. This might be expected if one were to believe that this kind of ceramic was initially being manufactured later than the other wares.

Of the 14 excavated units, all but three contained ceramics. Five of the excavation units produced more than 10 sherds each. Of these, all but one was situated on the south aspect of the mound. Unit 14 was on the north side, but most of these recovered ceramics may have represented one North Creek Gray vessel. As expected, approximately 60 percent of the subsurface assemblage was recovered from the upper 30 cm. Another 20 percent came from the next 10 cm. The relative percentages of wares were constant from surface to 80 cms. This would suggest that all three culture groups commonly identified as inhabiting the valley during prehistoric times visited this mound throughout the ceramic period.

Previous hypothesis suggested that, based on ceramics, prehistoric cultural affiliation was regional within the valley. i.e., Patayan in the south and Virgin Anasazi to the north. Clearly larger sites were situated around water sources. At Burnt Rock, gray wares were dominant. Southern Paiute Brown Ware was more common at the spring mound at the Las Vegas Springs. Gray wares, however, dominated the assemblage at the nearby caldron springs. Recent ceramic studies have shown that ceramics are found either mixed or with one affinity dominating at specific sites across the valley. Patayan tradition ceramics dominate assemblages on sites in all areas of the valley (Seymour 1997, 2001). Gray wares dominate at selected sites in those same areas. Because of the low numbers, it is not even clear whether these different wares even represent distinct culture groups or just the use of that vessel by one group. In short, it is yet to be determined why the users of these prehistoric ceramics chose Burnt Rock over another locale.

CONCLUSION

Prehistoric group mobility and sedentism through time has a research direction in Great Basin archaeology since Jesse Jennings proposed the Desert Archaic (Beck 1999; Beck and Jones 1992; Bettinger 1993; Grayson 1993; Kelly 1997; Madsen and Rhode 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 group mobility and sedentism 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.

In general, ceramic production and sedentism are considered to have co-evolved throughout the Southwest. Most hunter-gatherer groups had little use for ceramics, preferring lighter, but much more labor-intensive basketry. Throughout the Southwest researchers have defined a link between the first manufacture of ceramics and a change of settlement from one of wandering to residential stability. A tethered existence is, more often than not, based on plant cultivation (Crown and Wills 1995). Cultivation in most cases allows for and necessitates a more sedentary life style. As the supply of food resources change and available amounts increase, preparation and storage methods also change. We must assume that some level of agricultural knowledge, if not practice, had spread west from Arizona along with the paddle-and-anvil ceramic technology.

Current paleoenvironmental models for the Southwest and southern Nevada suggest that a period of aridity had developed around AD 900 lasting until 1300 (Jones et al. 1999). These researchers suggest that this climactic anomaly stressed cultural evolution in these populations. With less overall effective moisture, areas such as the Las Vegas Valley with aquifer fed perennial springs, spring mounds, and streams would become more attractive (Sheehan 1994).

The large percentage of local and riverine buff Patayan Tradition ceramics in the valley, more than 40 percent overall, suggests a strong presence here during the Late Ceramic Period (Seymour 1996; 1997; Seymour and Perry 1997). Schroeder's Willow Beach phase corresponds to this period also (Schroeder 1950).

Based on these dates and artifact assemblages found there, Leonard and Drover (1980:251–253) suggested that the "prehistoric occupants of northeastern Mojave Desert from A.D. 900 to A.D. 1500 may have been the same cultural linguistic group as the Patayan of northwestern Arizona." Patayan ceramics identified in the Las Vegas Valley show that those populations inhabited the Las Vegas Valley. Ceramics also suggest that the Anasazi and Southern Paiutes were occupying Las Vegas during the same general period of time. The assemblages studied indicate that the Anasazi occupied the area during the Early Ceramic Period Pueblo I (A.D. 800-1000) and continued to do so through Pueblo II (A.D. 1000-1150). The Basic Site (26CK1098) provided a date of AD 705 ± 145 below excavation levels containing Patayan ceramics (Brooks and Larson 1975). Two other dates at the Rattlesnake site shortly after the turn of the millennium provide beginning occupation of Site 26CK1081.

Because ceramic wares are represented in equivalent percentages from all ceramic period levels, we would be tempted to believe that a deal of mixing of cultural midden had occurred. This appears not to be the case, however. Radiocarbon samples run in sequence from bottom to top in the two units where samples were run. Debitage also shows significant differences between archaic and Early Ceramic Period levels. Gray ware ceramics were being manufactured and used by those people we call the "Virgin Anasazi." At about AD 1200, they are no longer visible in the archaeological record. Numbers of gray ware continue to be represented at Burnt Rock well after this date up to European contact. This might suggest that remaining local populations curated these vessels. Even late into the Late Ceramic Period gray wares dominate the assemblage. Perhaps the local population simply reflected those other populations surrounding them. They made limited numbers of brown ware vessels, but also used grey and buff ceramics extensively. The Virgin Anasazi visited and lived in the Las Vegas Valley before AD 1200. In fact, pithouses have been found at the Springs Preserve, Corn Creek and the Las Vegas Wash. They built a few pueblos, and made, traded, and left ceramics before disappearing from the archaeological record. In the Las Vegas Valley, Patayan migration may have begun after A.D. 1000. Excavation of rockshelter sites in the mountains east of the Mohave Valley, in northwestern Arizona, suggests that they had been continually inhabited by Late Archaic peoples for hundreds of years before their abandonment in A.D. 900 (Geib and Keller 1987; Wright 1954). Before A.D. 900, visitation to the Las Vegas area may have been limited to short, infrequent collecting trips as part of their foraging activities. Desert-wide resource patches would be worked from temporary short-term camps as described by Doelle (1980) and then abandoned. Over time, major environmental stress in other areas focused populations to permanent springs and streams in the Las Vegas area. This change to fixed settlement locations with permanent water required a change in subsistence. Wild resources at lower elevations were clustered for the most part in riparian strips along Las Vegas Wash and Duck Creek. Sites along these water courses would act as bases from which resources such as mesquite would be gathered, not unlike the collector model, double-looped central based, or seasonal camp models described above (Binford 1980; Doelle 1980; Warren 1981). Rather than a reliance on an endless series of low-intensity/low yield resources, mesquite provided an annual high-intensity/high yield food source. Mesquite provided a surplus that could be stored and perhaps supplemented by some incipient agricultural practices. The adoption of ceramic technology increased storage efficiency. Some Las Vegas Buff vessels were manufactured here while others were imported. At the same time, this model allows for the beginnings of horticulture. Growing populations overexploited wild resources, which out of necessity created a dependence on cultivated resources (Minnis 1985).

In conclusion, the hydrological history of Burnt Rock Mound appears to correlate well with the published sequences of the Late Pleistocene and Holocene of the northern Las Vegas Valley and southern Great Basin. Fluctuations in western and continental precipitation patterns and effects to aquifers and surface water availability may account for the variety of human adaptations observed throughout prehistory. Spring mounds and spring-fed stream deposits provide an additional source of environmental proxy data for continuing to test and refine what is known about the history of climate change. Hopefully, archaeological sites in southern Nevada will continue to contribute to what is known about human adaptation and the responses to those environmental changes.

REFERENCES CITED

Andrefsky, W., Jr.
1998 *Lithics: Macroscopic Approaches to Analysis.* Cambridge University, Cambridge.

Beck, Charlotte (editor)
1999 *Models for the millennium: Great Basin anthropology today.* University of Utah Press, Salt Lake City.

Beck, C. and G. T. Jones
1992 New Directions? Great Basin Archaeology in the 1990s. *Journal of California and Great Basin Anthropology* 14:22–36.

Bettinger, R. L.
1993 Doing Great Basin Archaeology Recently: Coping with Variability. *Journal of Archaeological Research* 1:43–66.

Binford, Lewis R.
1980 Willow Smoke and Dog's Tails; Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45:4–20.

Brooks, Richard H. and Daniel O. Larson
1975 Ceramic Ware Analysis in *Prehistoric and Historical Research Along the Navajo-McCullough Transmission Line Right-of-way.* Prepared for the Los Angeles Water and Power Company by Nevada Archaeological Survey. University of Nevada, Las Vegas.

Crown, Patricia and W. H. Wills
1995 Economic Intensification and Origins of Ceramic Containers in the American Southwest. In *The Emergence of Pottery Technology and Innovation in Ancient Society*, edited by William K. Barnett and John W. Hoopes, pp. 241-254. Smithsonian Institution Press, Washington, D.C.

Doelle, William H.
1980 *Past Adaptive Patterns in Western Papaguería: An Archaeological Study of Nonriverine Resource Use.* Unpublished Ph.D. Dissertation, University of Arizona, Tucson.

Enzel, Yehouda, William J. Brown, Roger Y. Anderson, Leslie D. McFadden, and Stephen G. Wells
1992 Short-Duration Holocene Lakes in the Mojave River Drainage Basin, Southern California. *Quaternary Research* 38:60–73.

Flenniken, J. J., and A. W. Raymond
1986 Morphological Projectile Point Typology of the Great Basin: Replication, Experimentation and Technological Analysis. *American Antiquity* 51:603–614.

Geib, Phil R., and Donald R. Keller
1987 *An Archaeological Evaluation of Bighorn Cave, Mohave County, Arizona.* Northern Arizona University and Museum of Northern Arizona, Flagstaff.

Grayson, D. K.
1993 The Desert's Past: A Natural Prehistory of the Great Basin. Smithsonian Institution, Washington, D.C.

Haynes, C. Vance,
1967 Quaternary Geology of the Tule Springs Area, Clark County, Nevada. In *Pleistocene Studies in Southern Nevada*, edited by H. M. Wormington and D. Ellis, pp. 15–104. Nevada State Museum Anthropological Papers 13. Carson City.

Jones, Terry L., Gary M. Brown, L. Mark Raab, Janet L McVickar, W. Geoffrey Spaulding, Douglas J. Kennett, Andrew York, and Phillip L. Walker
1999 Environmental Imperatives Reconsidered. Demographic Crisis in Western North America during the Medieval Climatic Anomaly. *Current Anthropology* 40(2):137–170.

Kelly, R. L.
1997 Late Holocene Great Basin Prehistory. *Journal of World Prehistory.* 11:1–49.

Lyneis, Margaret M.
1995 The Virgin anasazi, Far Western Puebloans. *Journal of World Prehistory* 9:199–241.

Madsen, D. B., and D. Rhode (editors)
1994 *Across the West: Human Population Movement and the Expansion of the Numa*. University of Utah, Salt Lake City.

Minnis, Paul E.
1985 Domesticating People and Plants in the Greater Southwest. In *Prehistoric Food Production in North America*, edited by Richard I. Ford, pp. 309–339. Museum of Anthropology, Anthropological Papers No. 75. University of Michigan, Ann Arbor.

de Narvaez, Cynta
1995 Paleohydrology and Paleotopography of a Las Vegas Spring. Unpublished Master's thesis, Department of Geoscience, Northern Arizona University, Flagstaff.

Quade, Jay
1986 Late Quaternary Environmental Changes in the Upper Las Vegas Valley, Nevada. *Quaternary Research* 20:261–285.

Quade, Jay, Richard M. Forester, William L. Pratt, and Clarie Carter
1998 Black Mats, Spring-Fed Streams, and Late-Glacial-Age Recharge in the Southern Great Basin. *Quaternary Research* 49, 129–148 (1998).

Schroeder, Albert H.
1950 *The Archaeological Excavations at Willow Beach, Arizona, 1950*. University of Utah, Department of Anthropology No. 50, University of Utah Press, Salt Lake City.

Seymour, Gregory R
1996 Native American Ceramics from 26CK1214 in *The Las Vegas Mormon Fort Data Recovery*, edited by John Hohmann. Louis Berger and Associates Inc., Cultural Resource Group, Las Vegas Nevada.
1997 *A Reevaluation of Lower Colorado Buff Ware Ceramics: Redefining the Patayan In Southern Nevada*. Unpublished Master's thesis, University of Nevada, Las Vegas.
2001 Cultural Resource Management Plan for the Las Vegas Springs Preserve, Clark County, Nevada. Harry Reid Center for Environmental Studies (HRC) Report 4-9-3. (contributions by Elizabeth von Till Warren, Hal Rager, Fred Nials, and Catherine Fowler)

Seymour, Gregory R., and Laureen Perry
1997 A Guide to the Ceramic Type Collection at the Harry Reid Center for Environmental Studies, University of Nevada, Las Vegas and the Bureau of Reclamation. Harry Reid Center for Environmental Studies (HRC) Report No. 1-3-31.

Sheehan, Michael S.
1994 *Cultural Responses to the Altithermal: The Role of Aquifer-Related Water Resources.* Geoarchaeology: An International Journal 9(2):113–137.

Sigleo, A. C.
1975 Turquoise Mine and Artifact Correlation for Snaketown Site, Arizona. *Science* 189:460–495.

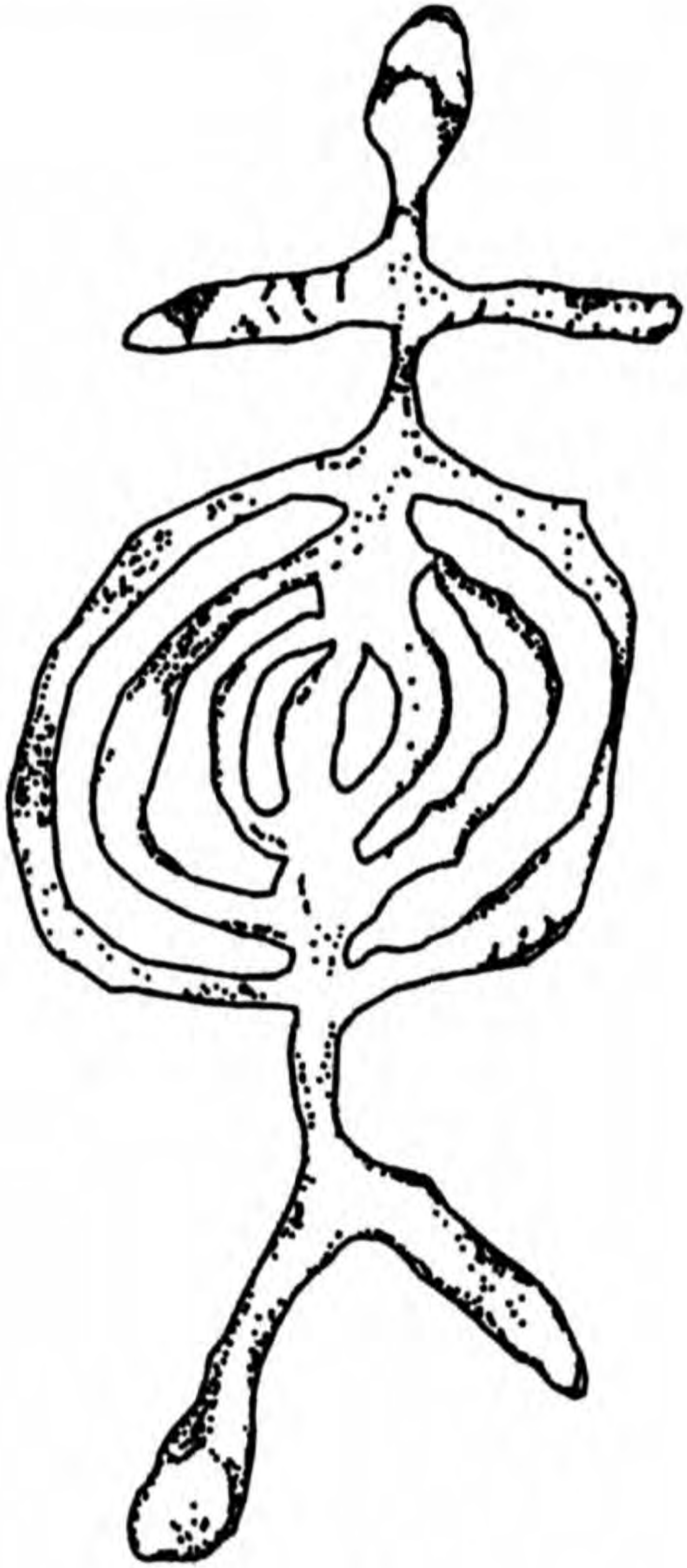
Stuvier, M., P. J. Reimer, E. Bard, J. W. Beck, G. S. Burr, K. A. Hugen, B. Kromer, F. G. McCormac, J. v.D. Pilcht, and M. Spurk
1998 INTCAL98 Radiocarbon Age Calibration 24,000–0 cal B. P. *Radiocarbon* 40:1041–1083.

Sutton, M. Q.
1996 The Current Status of Archaeological Research in the Mojave Desert. *Journal of California and Great Basin Anthropology* 18(2):221–257.

Thomas, David Hurst
1981 How to Classify the Projectile Points from Monitor Valley, Nevada in *Journal of California and Great Basin Anthropology* 3:7–43.

Warren, Claude N.
1981 *Mesquite and Subsistence in the Eastern Mojave Desert.* Paper presented at the XLIth Annual Meeting of the Society for American Archaeology, San Diego, California.
1984 The Desert Region. In *California Archaeology*, edited by Michael J. Moratto, pp. 338–430. Academic Press, New York.

Wright, Barton A.
1954 Excavation of Catclaw Cave, Lower Colorado River. Unpublished Masters thesis, Department of Anthropology, University of Arizona, Tucson.



Rockshelter Roof Sticks in Southern Nevada

Mark C. Slaughter, Daron G. Duke, and Renee Corona Kolvet

Over the last few years archaeologists working in southern Nevada have identified eight wooden stick features at seven different rockshelter sites (Figure 1). At these locations, archaeologists found evidence of single or multiple sticks or twigs (Figures 2 and 3) wedged either into cracks and/or crevices near the ceiling and wall interface (Duke et al. 2001; Duke et al. 2004; Kolvet et al. 2000).

Rockshelters in which these features occur are typical of those found throughout the west; that is, there is nothing noticeably unique to them such as aspect, artifacts, rock art, or springs to explain why these features are present. The shelters range in size from fairly small (about 1.5 m x 1.5 m) to those with large openings over three meters wide with adjoining chambers (Figure 4).

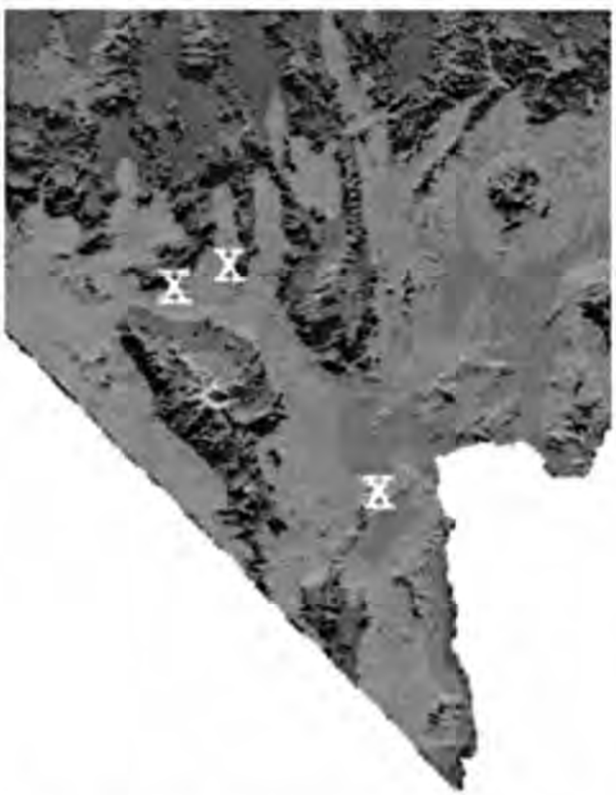


***Figure 1**. Southern Nevada project areas where rockshelter roof sticks have been identified.*

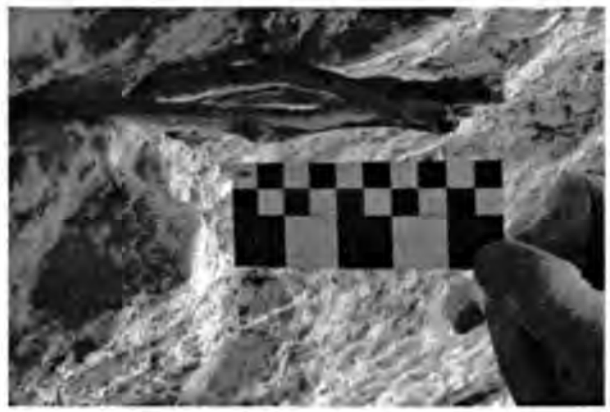


***Figure 2**. Three roof sticks at site 26CK6045 (photo by Mark Slaughter).*

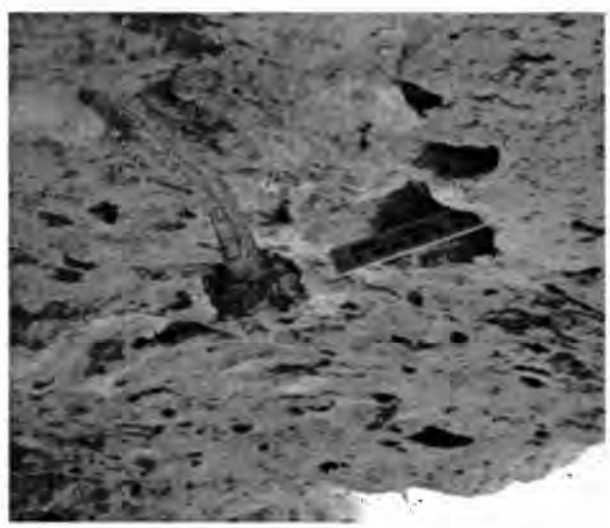


***Figure 3**. Looking up at A Roof Stick at Site 26CK6985; the top of the dry shelter entrance is at the bottom right of the photo (photo by Daron Duke).*

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Figure 4. View looking out of one of the larger shelters. This one (26CK6045) had two roof stick features (photo by Mark Slaughter).

It is unlikely that any of the three surveys independently found unique features. Rather, these stick features may be more common than has been recorded in the literature. The reason for this omission may be due to several factors, not the least of which is their inherent resemblance to natural phenomena, such as dead roots, packrat transported material, etc. In most cases they do not exhibit obvious modification and only present themselves as a cultural item upon close inspection. Lastly, since these are perishable items that are shoved into cracks, evidence of many such features may not survive.

NATURAL VS. CULTURAL

Several lines of evidence suggest that the sticks represent cultural features rather than natural manifestations. The locations of the stick features, in the middle of the shelters' roofs, are places where vegetation cannot grow. Further, there was no evidence that these were placed there by animals, such as packrats and birds. There was no other organic debris suggesting any animal nesting. The sticks are simply too large and systematically placed to have been inserted by birds, and the features are not in locations where packrats could establish a nest. Moreover, the placement of multiple sticks side-by-side (Table 1) indicates that these are cultural features. Finally, minimal modification, in the form of minor shaping or whittling and limited burning, is indicated in a few instances.

***Table 1.** Roof Sticks by Site and Count.*

Site Number	Associated Artifacts: Cultural Period/Dates
26CK5485	Late Prehistoric/Early Historic A.D. 1475 to 1655[1]
26CK6952	Anasazi/Patayan
26CK2240/2621	Patayan
26CK6985	Anasazi/Patayan
26CK6044	Possibly late Prehistoric
26CK6045 (a)	Anasazi
26CK6045 (b)	Anasazi
26CK6046	Anasazi/Patayan

[1]Radiocarbon 1 sigma date (Kolvet et al. 2000:Appendix A)

***Table 2.** Roof Sticks and Possible Dates.*

Site Number	Number of Sticks in Feature
26CK5485	4
26CK6952	1
26CK2240/2621	1
26CK6985	1
26CK6044	1
26CK6045 (a)	1
26CK6045 (b)	3
26CK6046	2

FEATURE FUNCTION(S)

When these features were used is unknown. There are no direct dates from the sticks; however, artifacts found in association suggest that these features date to sometime after the Archaic period, and may be associated with Anasazi and/or Patayan occupations (Table 2). These data primarily come in the form of ceramic types representative of certain date ranges, but one radiocarbon date has been collected from charcoal in 26CK5485, in the southern reaches of the Pintwater Range. Recent work in the Sloan Canyon National Conservation Area suggests that use of the rockshelters in the north McCullough Range south of Las Vegas is largely restricted to a timeframe between A.D. 500 and 1500 when population was highest in the region (Duke et al. 2004).

The possible functions of these features are numerous and difficult to prove. Some of the roles they could have served include:

- Healing Features (Arnold et al. 2001)
- Ceremonial offerings (Fowler 2002:177)
- Pegs to hold items up (Duke et al. 2001)
- Cached tools (Duke et al. 2001; Harrington 1933)
- Torches (Harrington 1933:46; Shutler 1961:58)

- Poker Sticks (*sensu* Laird 1976:228)
- de facto refuse, items fortuitously placed in ceiling cracks
- Fuelwood (kindling)

Perhaps the most intriguing and difficult issue for an archaeologist to resolve is the possible affiliation of these features with religious and ceremonial undertakings. Native Americans who accompanied archaeologists surveying Nellis Air Force Base lands provided their interpretation of these types of features. They recorded that "the sticks are associated with a possible burial of a highly respected person" (Arnold et al. 2001:4–9). They further suggested that another possible use may have been medicine sticks that were used to "draw the power from the rock to heal people" (Arnold et al. 2001:4–9). These authors noted that similar features are known to exist in the general southern Nevada area in a variety of areas and that these probably represent ceremonial use.

The location and angle of the sticks suggest that they could have been used as hangers to keep foodstuffs, water, and other items off the ground. The purpose of hanging items in a rockshelter would be to keep the animals from eating or drinking collected resources, or to keep items off the ground and out of the way within the shelter. The sticks are all stuck straight into cracks (Figure 5) and nearly parallel shelter floors. This placement would have allowed items to be hung without them sliding off. Four of the stick features seemingly were firmly lodged into the rock crack; the others looked fairly loose and would not currently support any weight. However, they were probably wedged together before shrinking over time.

None of the sticks appear to have been modified into a tool form. In fact, only one stick was recorded to have been modified, and this stick exhibited only minimal working on its exposed end (Duke et al. 2004). However, it is possible that these were collected with the intent for later modification or use, and they simply were left behind when the people moved on.

In the rock shelters near the Anasazi ruins of "Lost City," Shutler (1961:58–59) recorded the remains of small sticks that he called torches on the floor of Salt Cave. Harrington (1933:46, 72) also briefly mentions "torch sticks" in Gypsum Cave, also on the floor or in buried contexts. This is yet another possible explanation of features found during the more recent surveys. They were found in places that could have been used to light a shelter's interior for economic, domestic, and/or ceremonial use. Arguing against this interpretation is that only one of the stick features in this study appeared charred, and it remains unclear if the burning was done at the time of occupation or attributed to other activities (Duke et al. 2001). Also, the context of torch sticks on the floors of Salt Cave and Gypsum Cave is inconsistent with that of our finds in roofs and walls.

Figure 5. *Four nested roof sticks at site 26CK5485 (Kolvet et al. 2000).*

The function of these features remain unknown. It is possible that they did not all share the same function. They may have had singular or multiple uses representing distinct activities. Heizer and Baumhoff (1962:47), in their survey of Nevada and eastern California rock art state that "three small sticks were found forced into a crack in the wall of the cave" at Prayer Cave (26LY5). We are unaware of similar occurrences in Northern Nevada. It is possible that other such features remain undetected.

THE FUTURE

We propose that there are many more of these features. Is it possible that these feature types are distributed across the state and elsewhere, but have been overlooked? Hopefully, future research will refine their function and distribution. A first starting point is examining the roofs of rockshelters to see if these features are present; only then can we adequately attempt to understand their function and distribution.

REFERENCES CITED

Arnold, Richard, Ken Watterson, and Lee Chavez
2001 Native American Interpretations. In *Field Test of the Traveler-Processor Model on the South Range, Nellis Air Force Base, Nevada*, by Daron Duke, Mark C. Slaughter, Chris Lowry, Martin Goetz, and Brian Knight, pp.4-1 to 4-16. U.S. Air Force Combat Command Series, Report of Investigations No.13, Geo-Marine, Inc., Las Vegas, Nevada.

Duke, Daron, Amy Gilreath, and Jerome King
2004 *Cultural Resources Survey (Random and Non-random) of the Sloan NCA, Clark County, Nevada.* Far Western Anthropological Research Group, Inc. Report No.5-2480-P, Virginia City, Nevada.

Duke, Daron, Mark C. Slaughter, Chris Lowry, Martin Goetz, and Brian Knight
2001 *Field Test of the Traveler-Processor Model on the South Range, Nellis Air Force Base, Nevada.* U.S. Air Force Combat Command Series, Report of Investigations No.13, Geo-Marine, Inc., Las Vegas, Nevada.

Fowler, Catherine S.
2002 *In the Shadow of Fox Peak: An Ethnography of the Cattail-Eater Northern Paiute People of Stillwater Marsh*. Nevada Humanities Committee, Churchill County Museum, and Nevada State Museum. Carson City, Nevada.

Harrington, Mark Raymond
1933 Gypsum Cave, Nevada. *Southwest Museum Papers Number Eight.*

Heizer, Robert F., and Martin A. Baumhoff
1962 *Prehistoric Rock Art of Nevada and Eastern California*. University of California Press, Berkeley.

Kolvet, Renee C. Richard Deis, Susan Stornetta, and Mary K. Rusco
2000 *A Stratified Archaeological Sample of Low Elevation Areas on Nellis Air Force Range, Nevada*. Western Cultural Resource Management, Inc., Sparks, Nevada.

Laird, Carobeth
1976 *The Chemehuevis*. Malki Museum, Rubidoux Printing Company, Riverside, California.

Shutler, Richard, Jr.
1961 *Lost City: Pueblo Grande de Nevada*. Nevada State Museum Anthropological Papers No.5. Carson City, Nevada.