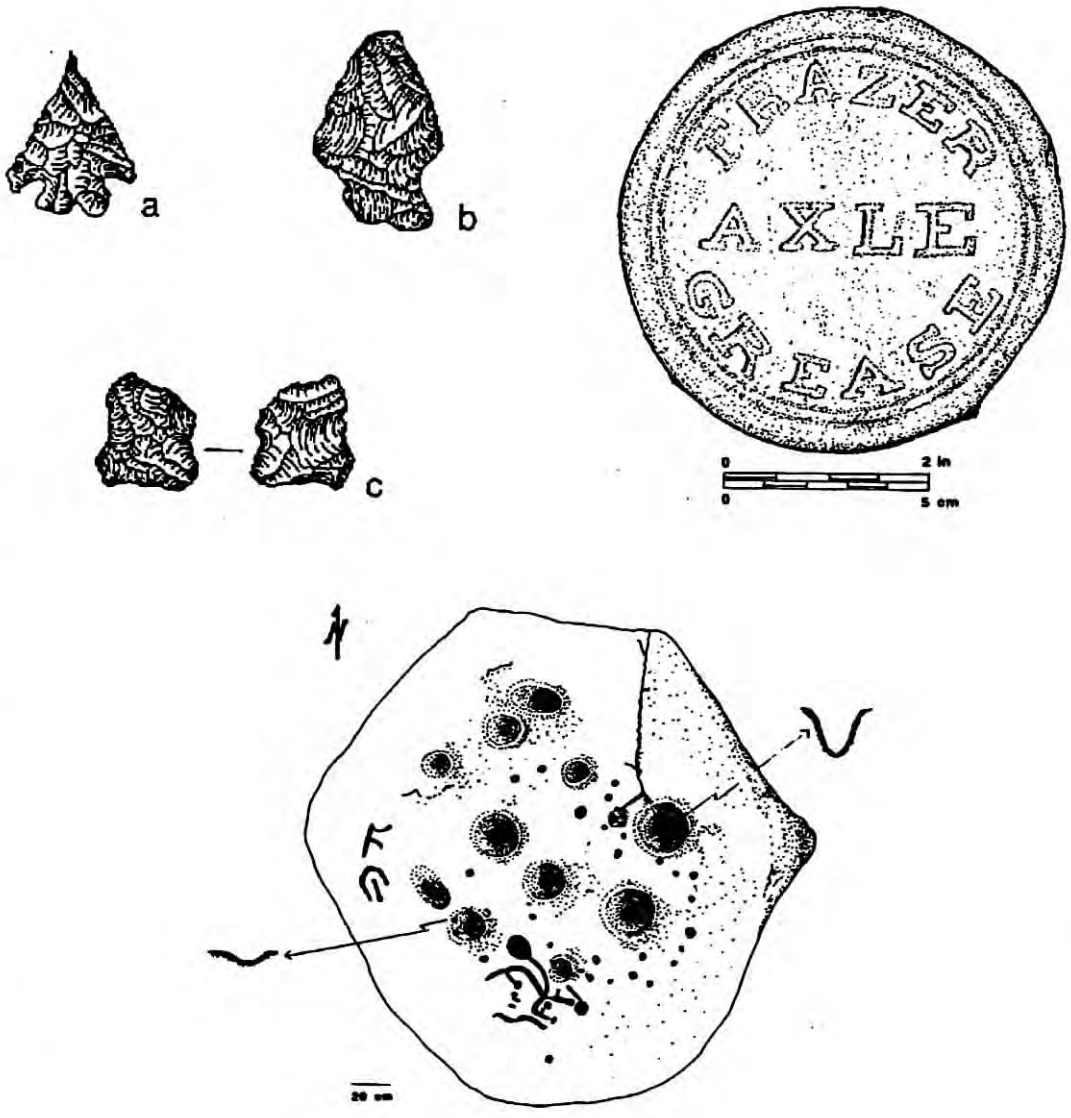

Nevada Archaeologist

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Nevada Archaeological Association

DUBARTON

Nevada Archaeological Association

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

The Nevada Archaeological Association (NAA) is an incorporated non-profit organization in the State of Nevada. Membership is open to any person paying dues to the NAA accompanied by signed affirmation of the NAA Code of Ethics.

The purpose of the Nevada Archaeological Association 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 [above stated] 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.

Signature: Date:

Dues

Student	$5.00
Active	$12.00
Active Family	$15.00
Supporting	$25.00
Patron	$100.00

Membership & Information

All members residing in an area with a local chapter are encouraged to join through their local chapter. Otherwise dues and signed ethics statements or general inquiries about the NAA should be sent to:

Susan Murphy
NAA Executive Secretary
9785 Tropical Parkway
Las Vegas, Nevada 89129

Members will receive a membership card confirming payment, issues of the Association newsletter, *In Situ*, and one copy of the annual publication the *Nevada Archaeologist*.

Manuscript Submission

Manuscripts submitted for publication in the *Nevada Archaeologist* should follow the style guide of the January 1979 issue of American Antiquity. Manuscripts should be typed including notes and bibliography. Illustrations should be camera-ready with a clearly associated typed caption. Authors are encouraged to submit all text, maps and illustrations in a readily available electronic format specified by the volume editor.

Editor's Foreword

I hope you will enjoy reading this volume as much as I have enjoyed compiling the contributions to it. My biggest regret is that the volume did not get into your hands in 1996. I thank the authors of the papers in this volume as well as the Board of Directors of the Nevada Archaeological Association (listed on the inside back cover) for their patience and understanding in accepting this tardy product. There will inevitably be other regrets when I see what was missed when it comes back from the printer. I have never edited a monograph before. It has been a good experience for me and I hope the authors will be pleased with the product. Only a light editorial hand was used because the quality of the initial material seemed quite high and the miracle of wordprocessors made a little tinkering incredibly easy. It was necessary to do quite a bit of work on the graphics in order to blend them into the volume. There are still some graphics presentations that I am not sure are quite what the authors anticipated before I interfered. Again, I hope the authors and the readers will not be too displeased.

As originally conceived this volume was to be organized around the theme of *public participation* in archaeology in concert with the theme proposed for the Nevada Archaeological Association Annual Meeting held at the Eureka Opera House in Eureka, Nevada in May of 1994. The thematic approach may have initially discouraged potential contributors at both the meeting and subsequent pleadings for contributions for the volume. There are a several contributions to this volume clearly tied to public participation and a majority of papers in the volume were presented at the NAA Eureka meeting. In hindsight every contribution to the archeological literature is an opportunity for public participation and for that all of us should be grateful to each author for guiding the virtual reality tour and allowing us to participate in her or his research.

One of the biggest pleasures in taking on this editorial task is the opportunity to read material with a care that is perhaps not usual except for one's own writing. I now share some ownership of what is presented in the volume and recommend each article to you. I learned much from each paper. I thank each author for contributing to the volume and entrusting me with their "literary children." Each volume of the *Nevada Archaeologist* reinforces a desire to see the actual archeological sites we read about between the covers of the journal. I would like to further challenge each author to find ways to help the rest of us visit these places, thus providing this public with an opportunity to participate more fully in the research. One of life's great pleasures is standing on an archeological site that one had previously visited only through the medium of print.

There is some method to the order of presentation of the articles in the volume. The first two papers are essays which examine the *prospects for archeology*. One paper makes a cogent argument for the future of archeology being inextricably linked to our success in integrating all segments of the public into the archeological enterprise. We must strive for ways for everyone with an interest to work shoulder to shoulder with those of us fortunate enough to make our livelihood as archeologists. It is axiomatic that the future of archeology depends on the success of this partnership. The second paper examines the great prospects for Geographic Information Systems to be able to formulate explanations of archeological phenomena linking them with the human behavior and environmental contributions to better understand the archeological record.

Three contributions follow that deal primarily with *prehistoric*, or at least primarily aboriginal, archeological sites. The article on Mud Lake presents a clear (pun intended) exposition of the hydrogeography of a basin and also suggests a function for certain stone piles found on the playa. The contribution on the surface archeology of Tub Spring points to how little we know about how occupation is organized around spring areas. The paper further poses a research agenda for how we might pursue explaining human use of natural water sources in an extremely arid region. The final paper of the "aboriginal" group presents an enigma regarding the function of a semi-circular array of large spalled and battered "hammerstones" at the lower edge of a natural boulder field.

The next group of papers deal with *rock art*. The paper on Hickison Summit is intriguing because it provides a basis for both qualitative and quantitative assessment of public perceptions of rock art sites. We need more of this type of data to better engage the public visiting archeological sites. This paper shows the promise of interpretation as a vital (and underutilized) tool for protection and preservation of all archeological sites. The following two papers compliment each other perfectly. The first provides an overview and distribution of the "scratched" style of rock art in Nevada and the second an overview and assessment of distribution of "cupules" in northern Nevada rock art.

The final set of papers deal with *historical archeology* subjects. The first paper presents a Nevada example of the 'rules of the road' for placement of wagon roads and distribution of artifacts along wagon roads. The second paper of the historical set provides an intriguing investigation that addresses the economics and demographics of a marginal turn of the century timber enterprise. Also this paper shows the added dimension that history can provide in explaining idiosyncratic behavior with an example of animal shoes. The third paper provides a progress report on problem driven archeological research aimed at finding material correlates of ideological constructs associated with sectarian frontier communities. The final paper of the historical set raises the epistemological issue of how archaeological materials can be inferred to have existed in the atmosphere; really a mind twister if you think about it.

The last contribution in the volume is a complete listing of all papers, notes and articles published in the *Nevada Archeologist* in the 25 years since the inception of the journal and the Nevada Archaeological Association. This listing is a reminder that the NAA reflects a true cross-section of individual interests and backgrounds, but with a common bond; perhaps we share a perversion for the past as well as a fascination for the future.

Mark Henderson
Ely, Nevada
31 January 1997

Note on Composition. The body of the text is in Times New Roman 10 point with no right margin justification. The typeface size, serifs and the ragged right margin are intended accommodate ease of reading. The spelling of "archaeology" or "archeology" preserves the spelling in the manuscripts as presented by the authors. The editor was reluctant to alter this presumed political statement on the part of the authors.

Contents

The Volunteer's Role in Archaeology: Come dig with us!!

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At Tiryns, an archaeological site in Greece, there is a sign which declares in four languages that the archaeologists are engaged in important scientific work and have no time to waste in answering any questions.

This paper could have been entitled "Changing the Signs" because that is what it is really about; changing the signs that say archaeologists are too busy to talk to anyone of "non-professional status;" changing the signs that tell the public not to bother us, not to interfere with "our" work; but mostly changing the signs that say archaeology and thus, the past, belongs only to archaeologists.

Archaeologists are inherently suspicious of anyone or anything which is perceived as a threat or challenge to our "authority." We rely on this authority to separate the amateurs from the professionals and thus justify our positions and status in the professional and academic worlds. Therefore, it is not surprising to discover that the mere idea of volunteers as participants in an excavation make many, if not most, archaeologists nervous - perhaps "panic stricken" would be a better term. Other archaeologists see all "non-professionals" as potential pot hunters and thus view the public as a threat. They, frankly, fear that if the excavators are not students with the sword of a grade hanging over their heads, or paid staff they cannot be controlled. This overlooks the fact that if you must "control" participants in this manner, you are declaring that you do not know how to supervise.

Somewhat more enlightened archaeologists claim to see the potential value in public evolvement but state that there is no way for the public to participate without the archaeologist putting forth a great deal of cost and time to train non-professionals. While it is true that there are pot hunters and that volunteers need a certain amount of training to excavate, these factors should not and can not be allowed to become the justification for a rejection of public participation in archaeology.

Education and the education of the public about archaeology is currently a "hot" topic of discussion in archaeology. Both the Society for Historical Archaeology and the Society for American Archaeology have devoted sessions to the topic of education. One thing has become painfully clear: the public must be educated about and interested in archaeology if it is to survive. In short, the future of archaeology depends on public involvement. From a purely selfish standpoint, *archaeologists need the public*. Archaeologists are not a necessity of life. We spend a great deal of time and money answering questions that no one has asked us. Archaeologists need the public's support, understanding and active participation.

Only through participation can we expect the public to come to an understanding of the importance and value of archaeology. Only through participation can the public gain an interest in the past. Only through participation can the public develop a respect for the past, for the rediscovery of yesterday. Only through participation can the public learn the truth in Kent Flannery's statement in *The Golden Marshalltown* that archaeology is, "..still the most fun you can have with your pants on" (Flannery 1982:278). It is this knowledge and understanding that is vital for historic preservation, the preservation of archeological sites and the continued success of archaeology as a discipline.

While many archaeologists have begun the development of classroom instruction as well as the interpretation of famous sites, they continue to overlook the important tool in archaeological education - the excavations themselves. Many people are seriously interested in archaeology but have been excluded from participation by the professionals. Through volunteer programs, a tremendous number of individuals - the public - can be reached.

By embracing volunteers, archaeologists can accomplish many things. First, they can educate the public about what archaeologists do and how it is done. Second, the importance of what archaeologists do can be portrayed in a very powerful and lasting way. Third, the idea that archaeologists attempts to discover and preserve is one that belongs to the public, thereby giving the public a vested interest in protecting it.

Volunteer programs have an advantage over sole classroom education, in that they make the past tangible to the public. This should not be taken as advocating an end to the programs being run in classrooms, on the contrary, many of them are very good and should in fact be supplemented by field programs.

This is not to say that all archaeologists or excavations function to the total exclusion of the public. The Earthwatch organization offers a number of programs involving archaeology. A recent edition of *Archaeology* magazine contained an article by Richard Wertime (1995), *The Boom in Volunteer Archaeology*, which listed some private organizations and forest service programs which invite volunteers. While these are a good start, they are not enough. In general, archaeology remains aloof, segregated and isolated.

Three Examples of Volunteer Participation

This is not to suggest that all archaeological sites be turned over to the amateurs or worse yet to the pot hunters. It is recognized that not every archaeological excavation can handle or function with full volunteer participation. Like most things there is a continuum of possible involvement for the public in archaeology. Three excavations on this continuum will be briefly discussed as possible models for public participation in Nevada archaeology.

The first example is at the extreme end of the continuum, massive volunteer participation, as exemplified by archaeology in Israel. Archaeology has a significant role in Israeli life. Most Israelis have some knowledge of the archaeology of Israel. Visiting archaeological sites is a major form of recreation and yet Israeli's are not looters - the correct name for pot-hunters. Archaeology is embraced, understood, discussed and supported. The idea of destroying an archaeological site for a parking garage is unheard of.

In Jerusalem, right outside the old city, not only was the construction of a parking garage halted for archaeological investigation, but the garage was redesigned so that it was elevated above the archaeological site, thus preserving the site for future generations while still meeting the needs for the parking garage. The archaeological past receives serious attention, if not priority.

A primary reason for this value accorded archaeology is that archaeology in Israel has been and is dependent upon volunteers - public participation. The Israeli Department of Antiquities constantly seeks volunteers for all types of excavations. They advertise for them!!! Archaeology is seen as public and there is remarkable access to on-going excavations and a willingness by excavators to explain their site to the public. The Tiryns sign is inconceivable in Israel.

Volunteerism in Israel is international in scope and more than thirty years old. The use of volunteers was pioneered by Yigael Yadin during his excavations at Masada (Stern et al., 1983:974). A single brief announcement brought thousands of applications. During the eleven months of excavations, Yadin had a new group of between 250 and 300 volunteers, both foreign and Israeli, every two weeks. (The volunteers included a young unknown British actor, Peter O'Toole who later starred in the television miniseries "Masada.") This was the beginning of public archaeology and volunteerism in Israel. For the last thirty-one years, archaeology in Israel has thrived on public and international participation. Every year *Biblical Archaeology Review* publishes a list of the excavations which are actively seeking both volunteers and students and every year, thousands of people go to Israel to dig.

Tel Dor, Israel. The Tel Dor excavations in Israel serve as an excellent example for the manner in which Israeli excavations function. The Tel Dor project is a twenty five year project which began

1980. I have participated in the Tel Dor project since 1991. Taking 1993 as a representative season, there were 192 students and volunteers excavating - 93 were volunteers. What is important is that there was little difference between volunteers and students in interest and aptitude. If there was any difference, it was that explanation generally only had to be provided once for most volunteers. Without the volunteers, their willingness to learn, their interest in the past and the their financial contribution to the project, there would be no Tel Dor Project - it is that simple.

Richard Wertime (1995) comments that the volunteer should not be treated simply as a source of shovel labor. His point is well taken. At Dor, while most volunteers excavate, they also participate in lecture series given by major archaeologists, both Israeli and foreign, on their current excavations. Other lectures cover various specific time periods or other archaeological subjects such as ancient technology. They participate in pottery analysis, known in Israel as "pottery reading" during which all the pottery collected during the week is sorted, analyzed, discussed and dated.

The volunteer at Tel Dor is exposed to all aspects of the excavation, from washing pottery and cataloging to preliminary analysis. They are free to attend stratigraphy sessions and many are trained to become unit supervisors. In short, the volunteer in Israel is free to participate at numerous levels. Their input is welcome and encouraged. It must be emphasized that this does not result in anarchy. At no point do the archaeologists loose control over the excavations. At no point do the volunteers declare themselves archaeologists (although I've met some volunteers as, if not more qualified than some archaeologists). On the contrary the system runs smoothly and effectively. Both sides benefit. Many excavations in Nevada and California can embrace full volunteer participation on this level.

Virginiatown, California. The second example lies somewhere in the middle of the continuum of volunteer participation. These are the excavations at Virginiatown, a small California Gold Rush and early placer mining community located in western Placer County along Auburn Ravine. Excavations have been conducted at Virginiatown since 1992, through the archaeological field school at California State University, Sacramento. Virginiatown, established early in the California Gold Rush, was occupied until the early 1880's. Along with a thriving Euro-American community, Virginiatown had a sizable chinatown. Excavations have centered on the southeast quarter of the chinatown.

From the beginning the public has been involved in the Virginiatown excavations. First, a public outreach program was initiated, designed to get the neighborhood involved in the archaeology and history of the area. A meeting was held for the community in which explanations of the project, the archaeologists and the history of the area were provided. Volunteers from the community have been sought out and accepted whenever they arrive.

A definite change occurred in the community as a result. Archaeologists were eyed rather suspiciously upon first arriving at the site. The neighbors would walk slowly by with looks of grave concern on their faces, most clearly apprehensive about approaching the archaeologists or the site. The archaeologists responded to this by making a large effort to talk to these people; neighbors, passers by, children and just anyone within earshot.

It must be emphasized that it is the people in charge of the excavation who stop, walk over, and initiate conversation. An effort is made to take the time, to make sure the sign does not read "don't bother us," but instead says, "please join us." Some people just want to know who we are and what we are doing, while others want details or tours and often return numerous times. Tours are given frequently and an effort has been made to let people know that it is okay to stop by.

Yes, this has absorbed a fair amount of the archaeologist's time but, the archaeology has gotten done anyway and the time spent has been well worth it. The community is much more open to both archaeologists and archaeology now. People come by and check on the progress. They bring friends and visiting relatives to see the excavation. They are aware of the archaeology in the neighborhood, take a certain degree of pride in it, and are aware of its

potential existence on their own land. Landowners come by and report to us about the archaeology, historic and prehistoric on their land. They ask what they should do with what they have found, be it artifact, trash pit or feature. They offer us the opportunity to go look at it, map it and even excavate it. In general the community has become more archaeology conscious.

The second program concentrates on involving the public beyond the immediate neighborhood of Virginiatown. The archaeologists accept volunteers have stated this loudly and clearly. There are numerous volunteers who participate in the field and in the laboratory every week. Actually, the volunteers have a better attendance record than many of the students. The volunteers excavate, take notes, wash artifacts, catalog and restore artifacts. They also provide input into interpretation. In short, they are a valuable asset to the project. Of the three models proposed, there are very few sites in Nevada and California, where this one could not be fully implemented. Yes it takes the archaeologist's time, and yes, time is money, but the alternative to not stopping to educate and talk to the public is far more costly.

The Hermitage, Tennessee. The third model is at the other end of the spectrum involving a very slight amount of participation in excavation, but yet at the same time, it still involves the public in the archaeology. In 1993 I was fortunate to be an intern at the Hermitage - Andrew Jackson's home. This third model, is one based on publicly visible archaeology, public education and archaeology <u>for</u> the public.

Archaeology at public sites like the Hermitage is different from any other type of archaeology. It is conducted on public land, for the benefit of the public in interpretation of the public site. Returning to the "Changing the signs" theme, not only do the excavations take place in full view of the visitors to the Hermitage but Dr. Larry MacKey, the resident archaeologist at the Hermitage, has placed a large sign on the lawn in front of the excavations which provides a basic description of the site and what the archaeologists are doing and looking for. The sign concludes by inviting the public/visitor to come over, look at the excavations, talk to the archaeologists and to <u>ask questions</u>! And they do just that. The visitors come over, they watch, ask questions and learn. They interact with the archaeologists and leave with the sense that history is tangible. A very similar approach has been taken at Virginia City, Nevada under the direction of Dr. Don Hardesty of the University of Nevada Reno (Personal communication with Hardesty 1995).

Groups of school children come to the site and arrange for special tours. The children participate, they dig and sift through screens. They leave with an excitement and enthusiasm as well as a *respect* for the archaeology. Dr. MacKey also accepts volunteers through Earthwatch as well as from the community.

Conclusion

In sum, public involvement in archaeology, be it full participation, partial participation or observational participation, can accomplish many things. First and foremost, it fosters a respect for the archaeology and for the archaeologist. It does not undermine 'our authority' but rather strengthens it by fostering interest and enthusiasm for what archaeologists do as well as an understanding of why it is done. This is so important. The people, including children, are the voting public. The fate of historic preservation laws lies with them. If they are not allowed to participate, allowed to become involved, allowed to have a vested interest in what archaeologists do, archaeology is lost. The public will not and should not be expected to, support things which they perceive as having no impact on their lives. While not every dig can accept hundreds of volunteers, many can accept partial public participation or at least can allow the public access.

It is also recognized that there are a number of sites which are of a sensitive nature and thus can not provide for public involvement, however, there are many more sites out there that can. These three examples provide a glimpse into the many ways both archaeology and the public can be accommodated. Public involvement need not be undertaken to the detriment of the site; if only a few volunteers or one class on a field trip can be accommodated that is fine. It can however, be undertaken to the benefit of

both the public and the archaeologist.

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Railroad Valley Pilot Project

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Introduction

The Paleo-Great Basin Geographic Information System (GIS) pilot project synthesizes the broad historical framework of the anthropologic, biogeographic, and geomorphic evolution of the Great Basin during the last 40,000 years or so. This GIS application will model the archaeological record in the Great Basin during the modern (Holocene) era in relation to environmental and physical indicators thought to be correlated with the distribution of archaeological sites.

The GIS model being built includes themes for topography, hydrology, geology, soils, and plant and animal distributions in both map and image form. It also includes a theme for known archaeological sites. The themes have been produced, and continue to be enhanced, by the Bureau of Land Management (BLM), the United States Geological Survey, the Nevada Bureau of Mines and Geology, the University of Nevada, Reno, and others.

Jim D'Angelo and Jordan Hastings gave a presentation of work on their Paleo-Great Basin Geographical Information Systems (GIS) pilot project in Railroad Valley, Nye County, at the 6th Annual Nevada State GIS Conference held in Las Vegas. Nevada Archaeological Association (NAA) members were introduced to this project by D'Angelo and Hastings in May 1995 at the Annual Meeting of the NAA at Eureka, Nevada. The following is a synopsis of those presentations.

What is so special about GIS?

GIS computer technology allows the coordination of a broad spectrum of information over a common geography in ways that yield testable pictures of life in the past. Thus, GIS offers a unique opportunity for research into larger questions of the effects of cultural processes in relationship to environmental process on the patterns found in the archaeological record.

A GIS model also allows land management agencies to manage natural and cultural resources in a more reasoned and efficient manner. The pilot project in Railroad Valley, being done as a cooperative venture with the BLM, is testing the value of a GIS model for both improving cultural resources management (CRM) in Nevada and as a research tool to further our understanding of Nevada's past.

What is CRM?

Cultural Resources Management (CRM) is defined by noted anthropologist Brian Fagan (1994) as 'the application of management skills to preserve important parts of the cultural heritage.' Since the 1960's, public interest in CRM has been growing due to concern over the destruction of archaeological sites in the United States, and around the world. CRM includes the identification and evaluation of archaeological sites in order to protect them from disturbance or destruction, as well as thorough investigation of those sites that cannot be saved.

Today, most countries have laws to protect their cultural heritage. In the United States, this concern is part of an even larger concern with protecting the environment. Our concern for cultural resources is, as Don Fowler (1986:148-149) has pointed out, 'part of a much larger concern for the fragile ecology of North America, and the finite archaeological record is only part of the context in which decisions are made about projects that affect the landscape.'

Such decisions take into consideration that

cultural remains, like many natural resources, are non-renewable. That is, one can easily imagine a future in which there are no more prehistoric sites in the Great Basin. However, while each archaeological site is unique, each is also part of a larger pattern on the land created by people living out their cultural designs for survival. This means that because sites occur as isolated points on the landscape, deposited through changing environmental and cultural dynamics, it is important to learn as much as possible about their distribution, density, or nature.

One must understand that complex methodological and legal issues are involved in deciding which sites have the greatest potential for increasing our knowledge of the past, and in setting priorities for the protection and recovery of archaeological remains. Implicit in this decision-making process is the understanding that all sites are not of equal value, and that constraints on time and resources make it impractical to fully protect each and every one.

Thus, it is clear to those in CRM that even more attention must be paid to improving the means by which archaeological sites are identified and evaluated, and to improving the means by which decisions are made about protection and archaeological investigation, and what sites can be practically sacrificed.

The Database

Reconstructing past lifeways, one of Archaeology's major objectives, requires assembling large bodies of data. With regard to the Great Basin, the Intermountain Antiquities Computer System (IMACS) was developed by the University of Utah, BLM, Forest Service and others for this purpose. It is a database that now contains over 35,000 encoded archaeological site records for Nevada alone, with up to 100 data fields for each site. As large as this figure seems, it should be pointed out that only 2% of the BLM lands in Nevada have been archaeologically surveyed.

Many archaeologists assume that as long as sites were fully recorded, the data will eventually be useful... somehow. For them, and many avocationals and resource managers, recordation is a end in itself that constitutes full mitigation of impacts to archaeological sites. Because of these assumptions and management practices, we now have so much data that, even if it were readily available, which it is not, it could not be meaningfully used for either research or management with the tools we have been using. Data only becomes useful when it is readily retrievable and manipulatable to answer meaningful questions about the past. On the largest scale, meaningful questions are posed through landscape modeling based on theories and assumptions about past environmental and cultural behavior.

Given this situation - the large amount of data that has been and will be generated by the recording archaeological sites, plus the vast land area that has *not* been inventoried and about which we know very little archaeologically, and the need for adequate models to generate meaningful questions - CRM archaeologists are looking for better ways to access that data we already have and use it to refine basic operational theories that move beyond understanding single sites.

Models in Archaeology

Archaeology, traditionally conceived, has been site specific. Sites have been evaluated with settlement and subsistence system models based on an assumed relationship between past Native American subsistence activity decisions and the distribution and nature of natural resources. These models suggest predictable associations between site significance, and density and environmental features such as ecotones, riparian areas, pinion pine stands. These associations have been given empirical tests in a few areas in the Great Basin, such as the Owens Valley, Reese River Valley, Monitor Valley, Crescent Valley, and the Stillwater Marsh. However, none of these tests accounted for the full range of environmental predictors, archaeological resources, and detailed geographic correlations needed to understand past behavior. Because of these limitations, and because none, except the Stillwater Marsh model, were GIS based, they have limited management applicability.

Since it is clear that the better we can understand archaeological resources, the better they

can be managed, models have an important role in land management decisions. With limited information available, models can be used to discover what types of sites occur in particular places or environmental settings; to estimate the probability of particular site types occurring in particular places or environmental settings; and to estimate site density. Models can also maximize the value of existing data, indicate data gaps, and expedite the site inventory process. Finally, models can yield legally and scientifically defensible rationales for land use management decisions involving archaeological resources.

It is at this point that GIS has enormous potential for the study of site distributions and spatial problems in archaeology, especially of such things as artifacts, settlements, and the distribution of cultures over a landscape. And because GIS has the advantage of manipulating large amounts of data, which is especially useful for solving complex settlement analysis problems, analyses that once took years can be done in minutes, even seconds.

A study of Railroad Valley was initiated by the BLM in order to realize just these kinds of management advantages. Archaeological, biogeographic, and geomorphic studies are extensive in Railroad Valley owing to both petroleum development and potential claims on ground-water. The GIS pilot project is building on this study and demonstrating how archaeological data and information can be integrated with other traditional GIS layers both to address research questions and to create predictive models.

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A Postulated History of Mud Lake

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Abstract

The Pleistocene lake that occupied the common sump of Ralston and Stone Cabin valleys apparently was not climatologically caused. Precipitation entering the valleys appears to have drained out of the basin via groundwater underflow through a fault zone in the Southern Klondyke Hills portion of the San Antonio Mountains, until ground movement constricted the conduit. The blockage created a 118 feet (36 meters) deep lake. Subsequent erosion of parts of the blockage caused the lake level to fall to four successively lower protracted stands. At its lowest stand, the lake barely covered the present hard mud flat. PaleoIndians entered the area while the lake was in the lowest stand. Those people exploited the shallow shores and marshes behind the still prominent shoreline features created by the third and fourth protracted stands. For the purpose of processing plants growing in the shallow lake water, the PaleoIndians built offshore work stations.

Setting and Physiography

Mud Lake is the name given the hard dry mud flat, or playa, that occupies the common topographic sump of Ralston and Stone Cabin valleys in south-central Nevada. The elevation of the playa surface is 5187 feet (1581 meters) above sea level; or 5195 feet (1584 meters) depending on which topographic map is used for reference.

Straddling the Mt. Diablo Base Line, the playa covers the common corners of Townships 1 North, 1 South in Ranges 43 and 44 East. The area is about 16 miles (26 kilometers) by road south by southeast of Tonopah. Bounded immediately to its west by the San Antonio Mountains and by the Goldfield Hills to the south, the playa is approximately 28 square miles (73 sq km) in area.

The climate of the Mud Lake area is arid high desert. The combined weather records from Tonopah and Goldfield show the average annual precipitation to be 5 inches (13 cm) and mean annual temperature to be 51° F (11° C) (Eakin 1962: 5-6; Albers and Stewart 1972:4).

The lake water that stood in the sump had five protracted stands. At the highest stand, the depth of the water was 118 feet (36 m). Each successive stand was at progressively shallower depths; at 73 feet (22 m), 53 feet (16 m), 43 feet (13 m) and less than one foot (0.25 m). Each of the first four protracted stands produced a shoreline feature that extends slightly above the ground on the up slope side of the feature. These berms are locally called "ridges," and each of them can be traced for miles.

Observations and Discussion

The time at which the now extinct lake stood in the basin is generally considered to have been during wetter, cooler lake-causing climate that existed at the close of the Pleistocene. It is generally assumed that a recurrence of that pluvial climate would restore lakes to Nevada's basins and there have been efforts to determine the climate's characteristics. The most rigorous attempt concluded that the pluvial climate was not very different from the present climate; a mean annual temperature 5° F (3°C) lower than present, 68 percent more precipitation than present, and an evaporation rate 10 percent less than present (Mifflin and Wheat 1979:5).

In a pluvial climate, then, the Mud Lake area would experience a mean annual temperature of 46°F (8°C) and an annual precipitation of 8.4 inches (210mm). Even with the lower evaporation rate, the area would be no better than semi-arid. The Mud Lake area would still be in high desert. Evidently the water that stood there was only negligibly dependent on precipitation that fell onto its immediate area. In our opinion, then, most of the water that was in the lower part of the basin (south of present U.S. Highway 6) was in the form of groundwater, within the valley fill, that had been captured as precipitation by the mountains within the

basin north of the highway and along the northern rim of the basin.

The Pleistocene was characterized by alternating warm and cool periods that had a cycle of approximately 40,000 years (Evans 1971:280). If we consider that Mud Lake's water was the inevitable result of the most recent pluvial climate, then we must consider the possibility that a lake would have stood there every 40,000 years and that at least one of them might have overflowed. There are two points where overflow could have occurred if a lake having a depth of approximately 180 feet (52 m) had ever stood there. One of these points is on Nellis Air Force Base, where the Goldfield Hills and Cactus Range bajadas coalesce; overflow through this point would have been into Stonewall Flat. The other point is in a low saddle immediately west of the playa; overflow here would have been into Alkali Spring Valley. A trek to the saddle, however, revealed no trace of an overflowing lake, nor of any lake that had stood higher than the 118 foot (36 m) ridge. The evidence visible on the ground indicates that only one lake has stood in the basin.

Although Mud Lake is within a topographically closed basin, the playa and its environs are remarkably free of 'self-rising dirt," the efflorescence that is indicative of salinity. A basin that is free of salinity must by hydrologically open; if it doesn't overflow, then it must underflow (Langbein 1961:2). The area of Mud Lake's basin is 1,930 square miles (5,000 sq km) (Eakin 1962:12), almost twice as large as the state of Rhode Island. Some of the precipitation that has fallen onto this large area has always been discharged by solar evaporation or plant transpiration, but the major portion has always exited the basin via groundwater flow.

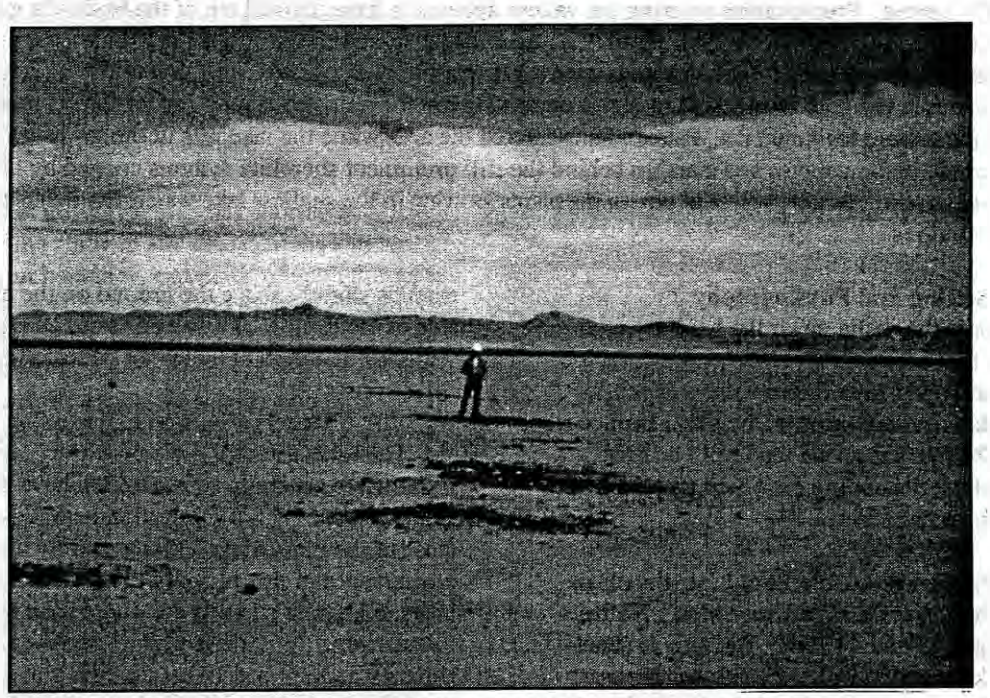

Figure 1. Artificial offshore workstations on Mud Lake Playa.

In Nevada, interbasin groundwater movement is by two means; percolation through carbonate rock and flow through fault zones. At Mud Lake both possibilities exist. Although the tops and sides of the adjacent highlands are almost completely covered by Tertiary volcanics, the upper portion of the mountain block consists of Paleozoic formations that contain

varying amounts of limy rock. In the Basin and Range province, every mountain block and valley block is bounded on all sides by faults. The ridges left behind by the lake rule out percolation.

Progressively younger shoreline features at increasingly lower elevations are normally associated with overflowing lakes at which the overflow point sustained a dramatic down cutting to a lower hard sill. We suggest that Mud Lake's features were similarly formed, even though the lake never overflowed. The lake filled during the most recent pluvial period, but we suggest the timing was coincidental. We theorize that the basin had always drained by underground flow through a fault zone, and that no lake had ever existed there until ground movement constricted the zone.

This blockage caused the groundwater to back up and rise above the sump's surface to the height of the oldest ridge. At this point, the static head provided by the standing water balanced the friction head generated by flow through the constriction, and a constant elevation lake was created. With the opposing heads in balance, the vagaries of precipitation and evaporation were compensated for by changes in flow through the constriction; increased precipitation forced more water through, increased evaporation reduced the pressure causing flow. And the lake surface elevation remained constant.

Resistance to flow through the blockage was dramatically reduced by erosion and the lake level quickly fell to the elevation of the second ridge, where a new balance point was established. After this first opening of the blockage, further erosion proceeded fitfully and created close to a dozen successively shallower constant elevation lakes between the second ridge and the playa. Only two of these lakes were of sufficiently long duration to produce extensive shoreline features.

Ball (1907:83) reported that a well at the playa encountered water at 240 feet (73 m). Unfortunately, he did not elaborate on the purpose of the well nor about the amount of water encountered. If we assume that the well encountered the present water table, then we can assume that the static head trying to force water through the constriction was on the order of 360 feet (110 m) at the lake's initial stand.

By two different methods, two very different estimates of the amount of groundwater annually flowing through, and beyond, the Mud Lake area have been made. The two estimates are about 27,000 acre feet and about 14,000 acre feet (Eakin 1962:15). To put these units into perspective, the equivalent flow of 14,000 acre feet is 8,700 gallons per minute (33 kiloliters per minute). Even if the lower estimate is too high by a multiple of two, a substantial amount of water is underflowing past Mud Lake.

Thomas (1962:308) sensibly concluded that groundwater in a basin that contains a hard dry playa must find its way to a basin that has a soft wet playa. The two wet playas closest to Mud Lake with water level altitudes lower than that in the well at Mud Lake's playa are in Sarcobatus Flat and Clayton Valley. The Sarcobatus Flat playa is due south, beyond Stonewall Flat; the playa in Clayton Valley is west southwest, beyond Alkali Spring Valley.

Regionally, the faults bounding the long sides of the blocks trend essentially north-south, so it would be reasonable to look for Ralston and Stone Cabin Valley fault borne groundwater in Sarcobatus Flat. However, it has been estimated that only about 2,300 acre-feet enters Sarcobatus Flat as underflow from tributary valleys, one of which is Stonewall Flat (Malmberg and Eakin 1962:16). It appears, therefore, that the underflow away from Mud Lake is to the west, through the San Antonio Mountains block.

Bonham and Garside (1979: Plates 1 & 2) mapped a deep-seated high angle fault in the Southern Klondyke Hills, in the southern half of the Township 1 North latitude of the San Antonio Mountains. Even though the sides of the mountain block are hidden by alluvium and volcanic flows, we assume that the fault cuts entirely across the block. The fault location and depth argue for it being the underflow conduit.

It may be sheer coincidence, but an extension of the apparent strike of the fault across Alkali Spring

Valley passes between the General Thomas Hills and Paymaster Ridge, and enters Paymaster Canyon. This canyon empties into the east end of Clayton Valley.

PaleoIndians and Marshes

The stone artifacts left behind by PaleoIndians in the Mud Lake area have been heavily collected since their discovery in the mid-1960's. Enough artifacts, primarily chips, flake tools, and less than spectacular scrapers and choppers are still lying about to tell quite a bit about the people who produced them. Gary Noyes, one of the principal collectors, graciously allowed us to view his collection and journals. Combining the evidence on the ground and in the Noyes collection with our understanding of the lake history allows interpretation of the use of the area by PaleoIndians.

That the PaleoIndians hunted is attested to by the points, both small and large, that were used to tip killing sticks, both hurled and held by hand. Most of the distinctive point shapes belonging to the Western Stemmed Tradition are represented. Scottsbluff and Clovis points have also been collected. If the distinctively different point shapes indicate that the people who produced them were somehow otherwise different, then Mud Lake was a cosmopolitan place. Whether any of the locally available game was any larger than deer is unknown. We only know that hunting was part of the food gathering strategy, and we suspect it was a minor part.

Artifacts line much of the north shore of the playa, but occur in concentrated clusters on the third and fourth ridges. The artifact locations indicate that the lake was in its lowest protracted stand, barely covering its mud bed, when PaleoIndians entered the area. The primary attraction of the area was not the lake itself; rather it was the extensive marshland that formerly covered much of the lake bed.

Plant and animal foods are in abundance in a stable marsh. All the requirements for the creation of a stable food producing marshland - low slope topography, low salinity water, and stabilized lake level (Smith 1985:123)- were more than met in the lower reaches of Ralston Valley. Wave action during the many short term, progressively lower lake stands enhanced the marshland creation by sorting out gravels from the sediments and concentrating fine particles into semi-impermeable pond beds. The sorting action during the long-term stands created the extensive ridges with ponds on the up slope side. The paucity of artifacts associated with the first and second ridges indicates that the upper extent of the marshland was between the second and third ridges when PaleoIndians arrived.

Harvesting a marshland of great areal extent normally entails a lot of slogging through mud and muck for most of the round trip. However, the ridges threading through the marshland of Mud Lake provided the PaleoIndians with the unique opportunity to live on high and dry ground within the marsh and to gain access to most of the area while walking along dry routes.

By coincidence, the forks of the playa access road pass through most of the ridge areas that were used for living. Instead of stringing their living sites along the length of a ridge, the PaleoIndians concentrated the camps at a few locations. Campsites on one ridge were located directly across from camps on the adjacent ridge. This strategy was most likely a common sense approach to maximizing the harvest of animal food. In other words, the people confined their camp activities to a few concentrated locations to avoid scaring the animals away from the rest of the area.

Plant Processing Work Stations

Plants were apparently harvested on a fairly grand scale for purposes other than being eaten. Along the northwest shore of the playa, at the base of the volcanic hill located there, are pairs of stones that were once part of the hill and have often deep flaking along one edge. The flaking is unmistakably the result of human effort but is just as clearly unintentional. One of each pair of stones is smaller than the other. Offshore in the same area there are discrete groups of stones with each cluster containing at least one pair of these unintentionally flaked stones.

We theorize that a reedbrake grew in this portion of the lake, and that the reeds were probably

used to make woven items. The reeds were uprooted and carried to a work station where the two stones were used to shear off the unwanted portions. With the human serving as the hinge, the pair of stones provided a giant scissor. The reed stem was placed on the sharp edge of the stationary larger stone, and the sharp edge of the hand held smaller stone was forcibly brought down onto the stem.

The offshore groups of stones provided work stations either within the brake or along the open water side of the brake (see Figure 1). Each of the offshore work stations was deliberately assembled a few stones at a time, by people carrying stones from the base of the volcanic hill.

There are presently none of these artificial islands along the north shore of the playa, but there used to be. We found what we assumed to be the burial of someone's favorite horse. The stones of about half a dozen work stations were gathered and used to armor the dirt mound.

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Water and Nevada Test Site Subsistence Strategies: Investigations at Tub Spring

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Abstract

In the arid environment typical of much of the south central Great Basin, a reliable water supply is of preeminent consideration to prehistoric people. Yet little is known about the nature of archaeological sites found at water sources because most Nevada Test Site (NTS) work has focused on site specific compliance in areas removed from spring sources. This report summarizes intensive survey and recordation completed at Tub Spring, located on the northeastern corner of the NTS. The variety and extent of prehistoric and historic occupational debris discovered at this site is summarized, the role of spring sites within NTS subsistence strategies is clarified, and the need to adequately sample all environments within a study area is emphasized.

Introduction

Traditionally, archaeologists view food foragers as relatively mobile groups who move about in order to secure adequate food supplies. This is because natural food resources become available at different times of year and in varying amounts and locations depending on fluctuating climatic conditions. In arid environments however, access to water resources may be more important than food sources. When compared to other resources, the rarity of water is likely to make it of tantamount importance. Consequently, the location and quantity of water resources influences social and economic structures of people living in arid environments.

The Desert Research Institute (DRI) has been conducting archaeological surveys on the Nevada Test Site since 1979; yet only about 5 percent of the vast acreage encompassed by the Test Site has been surveyed. Much of the area that has been surveyed has focused on specific projects that tend to be located within open desert or pinyon-juniper woodland environmental zones. While some parts of the NTS have been subjected to sampling strategies in order to gain information about a variety of sites within different environments, these samples are small and none includes springs. Thus, while archaeologists are aware of sites centering on springs on the NTS most have not been systematically recorded in order to characterize their nature. This information is nevertheless vital to understanding the relationship between people and water.

More than twelve hundred extracting and processing localities have been recorded on the NTS, but only six sites have been characterized as residential bases. The large numbers of extractive and processing sites recorded to date represent those aspects of prehistoric life associated with obtaining and processing food and raw materials, but little is known about the activities occurring at residential

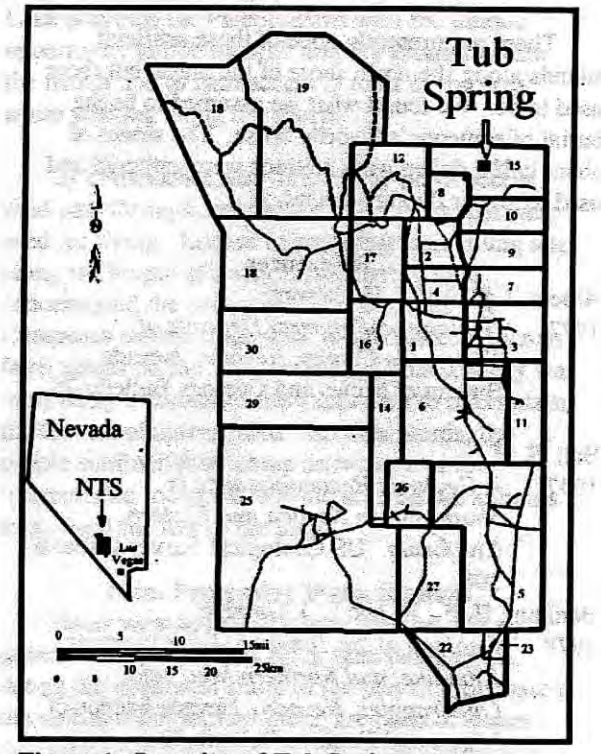

Figure 1. Location of Tub Spring on the Nevada Test Site (NTS).

bases centering on springs. This contribution characterizes a type of site that is important to prehistoric settlement and subsistence and yet in the region is incompletely studied.

Location and Environment

The Tub Spring site is located in the southern Great Basin on the NTS at an elevation ranging between 5000 and 5300 feet (Figure 1). The spring is located in a long, broad valley that is surrounded by hills and cliffs of volcanic rock (Figure 2). The spring itself has been dug out so that the standing water is restricted to a small cave at its mouth.

Typical vegetation includes widely spaced pinyon (*Pinus monophylla*), juniper (*Juniperus osteosperma*), oak (*Quercus turbinella*), Joshua tree (*Yucca brevifolia*) and Mojave yucca (*Yucca schidigera*). Shrubs such as rabbitbrush (*Chrysothamnus nauseosus*), saltbush (*atriplex canescens*), shadscale (*Atriplex confertifolia*), artemesia (*Artemesia tridentata*), ephedra (*Ephedra nevadensis, Ephedra viridis*), blackbush (*Coleogyne ramosissima*) and cliffrose (*Cowania mexicana*) are abundant to common. Deer and other animals frequent the spring on a daily basis.

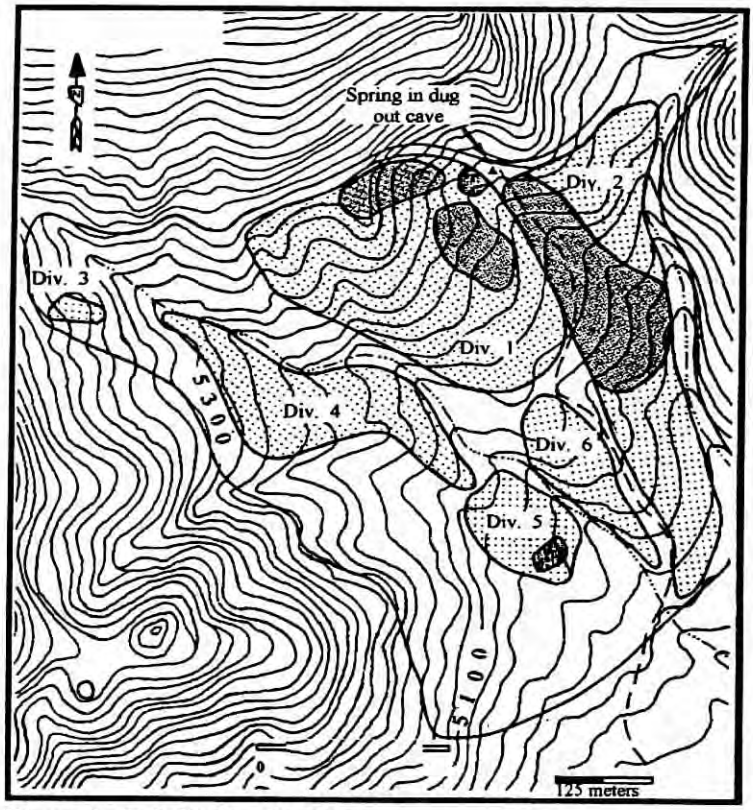

Figure 1. Tub Spring Site Map.

Site Structure and Description

Diagnostic materials indicate that the site has been utilized for thousands of years. The oldest diagnostics include Pinto style projectile points (Figure 3), while the most recent occupation of the site relates to historic mining and Native American use. Our 1994 intensive survey and recordation effort covered almost 1 kilometer and distinguished six divisions within the Tub Spring site (Figure 1). We also identified other sites in the vicinity that appear to be associated with the spring. The major site divisions define discrete areas that can be separated in terms of geomorphic, chronologic, and functional criteria.

Division 1. Division 1 includes the area directly adjacent to the spring and extends westward from the road to one of the two major drainages that bisect the site. The northern boundary of the divisions is defined by steep cliffs while the southern boundary is defined by a shallow drainage (Figure 1). This division is characterized by dense artifact concentrations including obsidian and silicified volcanic debitage, Anasazi and Shoshonean pottery, groundstone, bifaces, a drill, and projectile points (Figure11). Three concentrations of artifacts were located within Division 1.

Concentration 1 is directly adjacent to the spring and is characterized by dark midden, and dense artifact concentrations including pottery, projectile points, and numerous pieces of groundstone. A circular depression found in Subdivision 1 may be

the remains of a house pit or a storage feature, but these identifications are tentative without testing.

Elko Corner-notched and Rosegate points were found in Division 1. Warren and Crabtree (1986:187-191) assign Elko style projectile points to the Gypsum Period, circa 2,000 B.C. to A. D. 500 and place Rosegate points in the Saratoga Springs Period, with dates from A.D. 500 to 1200.

Both Intermountain brownwares and corrugated graywares were found in this Subdivision. This indicates the spring was used by both Shoshone and Anasazi people, or alternatively, it suggests trade between Shoshonean and Anasazi groups. Most analysts assign dates to brownware pottery within the last 650 years (post A. D. 1300) (Bettinger and Baumhoff 1982; Thomas and Bettinger 1976), but brownware pottery from the southern Great Basin is not well dated (Pippin 1986). Thermoluminescence dating of brownware pottery recovered from the

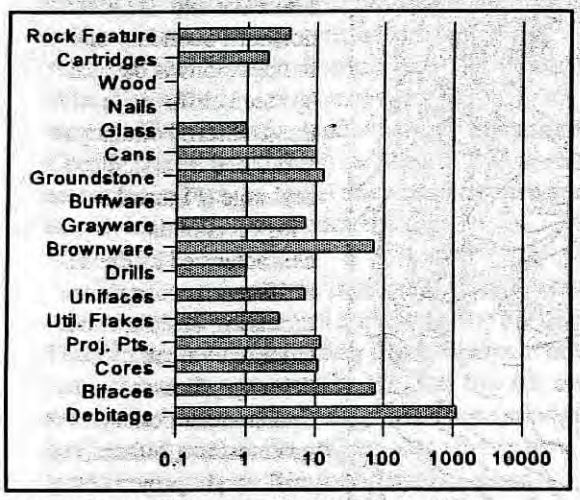

Figure 3. Tub Springs Division 1 Artifact Frequencies (note logarithmic scale)

Nevada Test Site extends this range, with samples dating from A.D. 1081 +/- 100 to A.D. 1814 +/- 100. However, the earliest date in this sequence is questionable (it may not be a brownware) (Rhode personal communication 1993). The corrugated gray pottery found in this Division is of the type termed Moapa Corrugated (Colton 1952:75) which dates to Pueblo II through Pueblo III times (900-1300 A.D.).

Concentration 2 is located on a low ridge just above the spring. A high proportion of bifaces and pressure flakes suggest that final stages of tool production occurred in this area. Two Elko projectile points also were found in Subdivision 2. This Subdivision also includes a rock feature constructed of large welded tuff boulders that were probably four courses tall at the time the structure was built. Some juniper logs found on the ground alongside the feature are probably structural remains (Figure 4). Inside, projectile point preforms and lithic debitage were found. Tin cans were found just outside the structure as well.

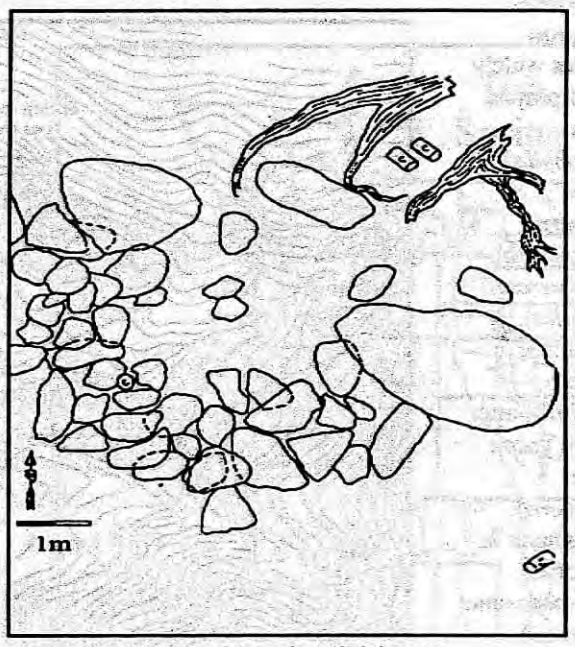

Figure 4. Rock Feature in Division 1, Concentration 2.

Concentration 3 is situated on a slope just above Concentration 1 and extends to the ridge top. Two rock features are found within the concentration. One is a partially buried rock circle and the other is a cairn of the type typically used as claim markers. No artifacts were found in direct association with these features. Artifacts found in the concentration include plain Intermountain brownware and undecorated Anasazi grayware, cores, utilized flakes, unifaces, bifaces in various stages of reduction, projectile points, debitage, and at least twenty

millingstone fragments. Projectile points included 2 Rosegate series, and 15 unidentified types.

Division 2. Division 2 is defined by a dirt road on the west and by a large drainage on the east (Figure 2). Artifacts consist of a diffuse scatter of materials including debitage, bifaces, untypeable projectile point fragments, cores, a hammerstone, utilized flakes, scrapers, and historic debris (Figure 5).

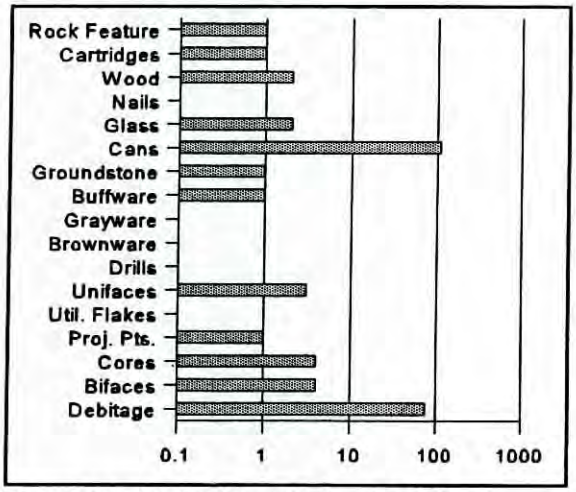

Figure 5. Tub Springs Division 2 Artifact Frequencies (note logarithmic scale).

A concentration of artifacts is located in the middle of Division 2 (Figure 2) and includes heavy concentrations of historic period artifacts and a rock structure (Feature 1) that represent late prehistoric to historic period occupation of the site by American Indians. Steward describes groups of Northern Shoshone people occupying winter camps at nearby Oak Springs (*Wi:va* is the name of the Shoshone group centered at Oak Spring) during the late 1800s to early 1900s and it is likely that related groups also lived at Tub Spring. These groups were part of the Belted Range Shoshone (Steward 1938: 93-99).

The rock structure is made of several courses of large rocks placed against a boulder that forms one side of the structure (Figure 6). Inside, a buffware ceramic sherd (tentatively identified as Lower Colorado Buffware) , debitage, a groundstone fragment and pieces of planed wood were found. The planed wood may have been part of a roof. Outside the feature hundreds of historic period cans were recorded. Vent hole, hole-in-top and sanitary types were found, including: meat, milk, fruit/vegetable, coffee, kerosene, and paint cans.

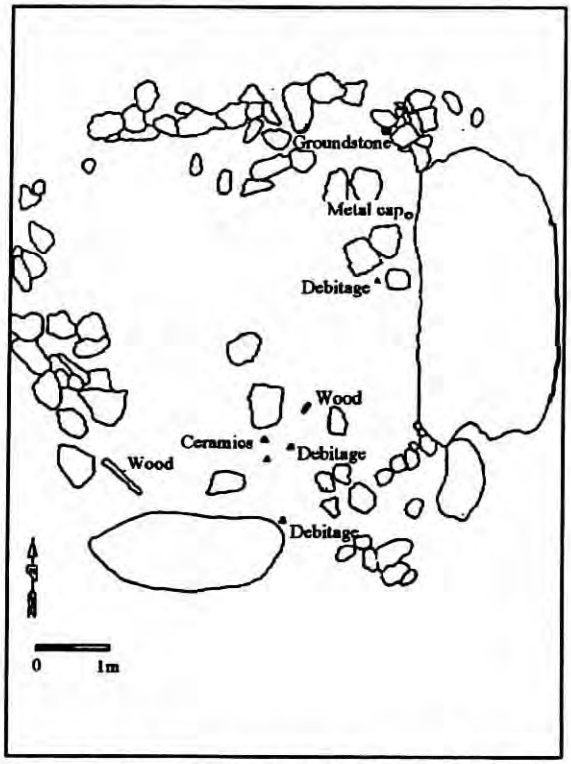

Figure 6. Rock feature found within Division 2.

Analysis of these materials by Dave Ferraro, using a dBASE program he developed, indicates most of the cans were deposited in Subdivision 1 from 1910 to 1930 (personal communication 1994). Amethyst glass found at the site also can be used to date the historic occupation. A time range between 1904 and 1914 is likely for the molded glass bottle fragments noted. A 12-gauge cartridge also was discovered in this Division. It was inscribed with the logo of the Winchester Repeating Arms Company and has a date of 1901.

Division 3. Division 3 is a small isolated area in the extreme northwestern portion of the site (Figure 2). It features artifacts that indicate prospecting was the main activity at this locus. Only artifacts dating to

the historic period were found. These included glass lamp chimney fragments, cans, and ore samples (Figure 7).

Four rock features were recorded. Feature 1 is a rock lined platform situated next to a juniper tree. Inside, ore samples, metal strapping, and wire nails were found. Outside, purple glass lamp chimney fragments and cans were scattered about. Feature 2 is a rock pile or cache. It is located under a juniper whose limbs have been cut to facilitate construction of the feature. Downslope from this feature slag and cans were noted. Feature 3 is an L-shaped rock enclosure built against a large boulder. It is at least 3 courses high and was probably a rectangular structure at one time. One side of the structure is made of a cut juniper log with a burned end. Feature 4 is a U-shaped rock feature that may have been 2 courses high when it was built. No artifacts are associated with this feature.

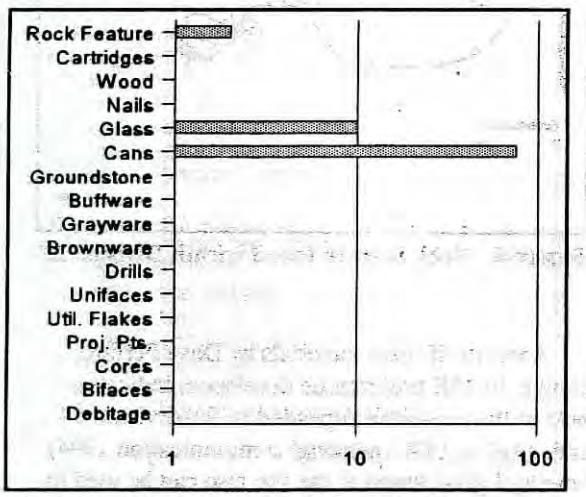

Figure 7. Tub Springs Division 3 Artifact Frequencies (note logarithmic scale).

Division 4. This Division is situated on a low bench which is delineated by a large ephemeral drainage on the west and by a more shallow ephemeral drainage on the east. The northern boundary is just below Division 3 and the southern boundary ends at a knob that overlooks Division 5 (Figure 2).

No subdivisions were identified for Division 4. It features a diffuse scattering of cultural materials across the entire area (Figure 8). This locus is defined by a relatively high proportion of unifaces and utilized flakes. Five utilized flakes and two unifacial tools were found within the 4800 square foot Division. Other remains included obsidian and silicified volcanic cores and debitage, with obsidian dominating the assemblage. Only one biface was recorded.

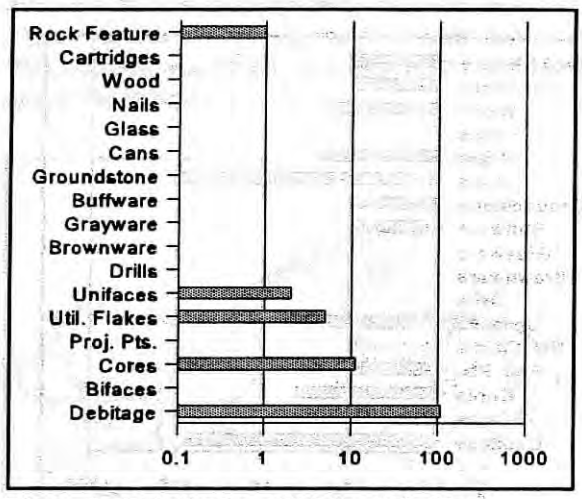

Figure 8. Tub Springs Division 4 Artifact Frequencies (note logarithmic scale).

Division 5. Division 5 is found on a flat, high bench that is differentiated from the surrounding area by two drainages that converge at the northern boundary of the site. It is located directly below Division 4 (Figure 2). It was subdivided into two loci and the general Division 5 area.

Artifacts found in the general Division area include projectile points, bifaces, cores, utilized flakes, and debitage (Figure 9). Four rock piles, or cairns, also were noted in this Division. They may relate to prospecting during the historic period. Division 5 featured fifteen utilized flakes, suggesting some kind of specialized processing activity for this area.

A concentration of debitage, utilized flakes and cores is located at the southern part of Division 5. While the artifacts are similar to those found throughout the Division, their relative concentration differentiates them. Projectile points found in this

Subdivision include Pinto, Elko, and Humboldt styles.

A second concentration of materials includes an area of historic debris that overlies a good part of the previously described prehistoric artifact concentration. More than 200 cans were found in the area including hole-in-top and sanitary fruit and vegetable cans, Log Cabin syrup cans, sardine and meat cans, baking powder cans, and kerosene cans. Other metal artifacts include bailing wire, can lids, and metal fragments. A brown glass beer or soda bottle with a grooved bail closure and amethyst window glass also were noted. This Subdivision is probably associated with prospecting and mining within the Oak Springs district.

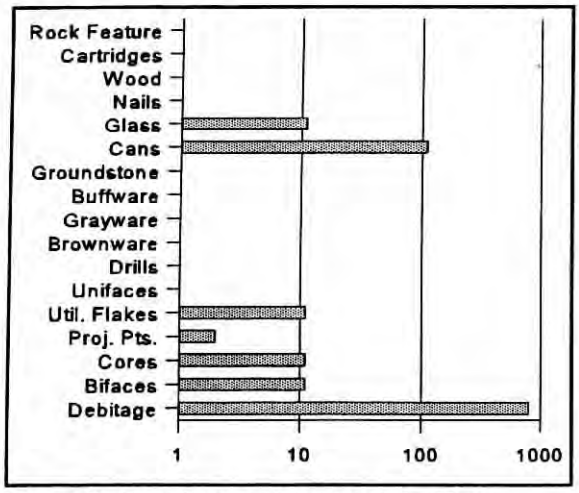

Figure 9. Tub Springs Division 5 Artifact Frequencies (note logarithmic scale).

Division 6. This Division is defined by the dirt access road on the eastern side and by a large ephemeral drainage on the western side. Division 5 is located directly across this drainage to the west (Figure 2). The northern periphery of the Division is differentiated by a shallow drainage that divides it from Division 1 to the north. On the south this Division ends where the dirt road curves around and cuts across the previously described drainage. No artifact concentrations were identified within Division 6.

Both prehistoric and historic period materials were found in Division 6.The prehistoric artifacts include debitage, bifaces, cores, projectile points, utilized flakes, unifaces and a drill (Figure 11). Historic period materials include wire nails and one cartridge. Two Humboldt and one Gatecliff style projectile points were recorded in the Division (Figure 11).

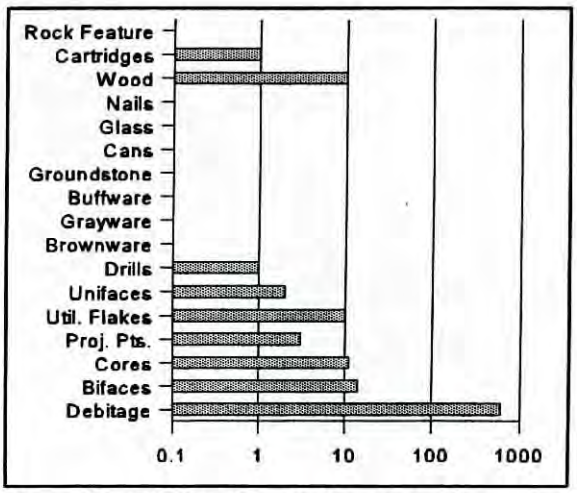

Figure 10. Tub Springs Division 6 Artifact Frequencies (note logarithmic scale).

Summary and Conclusions

Intensive survey and recording efforts at Tub Spring provide provocative data that contribute to our understanding of the relationship between more permanent occupation sites and temporary camps or special activity sites. Six distinct loci are documented at the Tub Spring site, some of these indicate chronologic variability, while others suggest specialized activities. While a much greater level of detail will be necessary before we can answer questions relating to settlement and subsistence at spring sites in the southern Great Basin, this preliminary data provides a starting point.

The nature of Anasazi and food forager relationships in the southern Great Basin has been identified in the Nevada Historic Preservation Plan as an important research realm (Lyneis 1982:21-24 and Table III-1), but so far data has been very limited. The patterning of these materials can provide clues that may help us to answer questions

about these kinds of relationships. Pippin and Henton (1990:35) state "... one would expect that if these Anasazi cultural remains signify the presence of these horticulturalists, then they should be distributed according to different patterns than those of hunters and gatherers." Conversely, if these materials were traded to hunters and gatherers then they should have a distribution similar to the remains of those groups. The few Anasazi cultural items that have been discovered on the NTS consist mainly of distinctive painted ceramics. It is not known if these sherds represent visits to the NTS or if these wares were traded to people living in the vicinity. Virtually all of these sherds are found at sites where local wares are also found. Numerous whole or reconstructable vessels attributable to the Intermountain Brownware tradition have been recovered on the NTS. Anasazi ceramics when encountered consist of a few or just a single painted sherd. This pattern supports the notion that Anasazi ceramics were traded to people living in the southern Great Basin. Clearly more information needs to be collected before this hypothesis can be substantiated. Our intensive recording at spring sites on the NTS may help to better define the role of the Anasazi in the southern Great Basin.

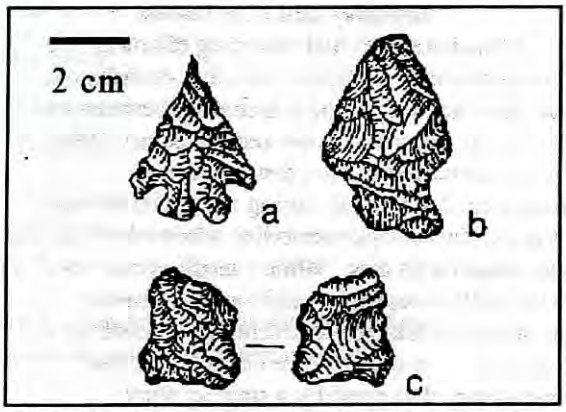

Figure 11. Diagnostic projectile points found at Tub Spring (a. Elko, b,c Pinto).

The patterning of prehistoric settlement in the southern Great Basin has been of interest to archaeologists for many years. A variety of models have been used to interpret the variability in hunter-gatherer subsistence practices since Steward first studied Great Basin groups in the 1930's (Steward 1938). Thomas (1983) has applied Binford's (1980) forager-collector model to ethnographic hunter-gatherers of the Great Basin. Although these groups shared essentially the same technology, their settlement patterns were very different.

Thomas classified the Owens Valley Paiute as collectors. These people occupied centralized valley-floor villages for prolonged periods and were able to store enough resources to support these villages. The Reese River Shoshone were characterized as intermediate between Binford's two extremes. They moved about during the summer, but reoccupied fall, winter, and spring sites close to pinyon groves that were "owned" by particular groups. The Kawich Mountain Shoshone were classified as foragers. Small family groups moved frequently during the spring and summer to take advantage of seasonally available resources, while more permanent winter camps were centered around pinyon groves.

Thomas' (1983:38-39) analysis of ethnographic Great Basin settlement patterns provides important insights, and reveals some problems with Binford's model. His analysis showed that Great Basin hunter-gatherers run the gamut between forager and collector, yet the expected variation in technology and environment proposed by Binford was not evident. Binford hints that population pressure may play a role in these differences, although his main thesis is that climate was the main driver. However, if population pressure is contributing to the variability in hunter-gatherer variability, why isn't this variability expressed by the concomitant kinds of technology (curated vs. expedient) Binford's model leads us to expect?

Bettinger (1991) argues that Binfords model is faulty. According to Bettinger, the argument that population pressure should decrease residential mobility and increase logistical mobility does not follow (1991:72). He states that if residential mobility is restricted by surrounding populations, then logistical mobility will also be restricted. He argues, that for the Owens Valley Paiute the difficulties encountered when trying to transport resources made it impossible for them to rely on increased logistical mobility in Binford's sense

(1989:344). Bettinger believes that this is why Great Basin hunter-gatherers share essentially the same exploitative technology and exhibit the same degree of reliance on logistical mobility despite differing settlement patterns (1989:346-347).

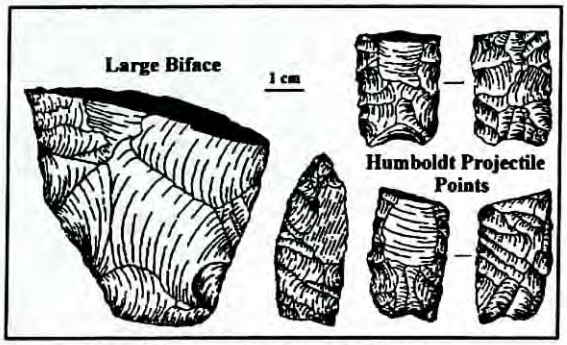

Figure 12. Biface and Projectile Points from Division 6.

Despite these problems, Binford's model is a useful tool for the understanding of hunter-gatherer behavior. If we apply this model to the Tub Spring region, the prehistoric occupants could be categorized somewhere between the collector and forager extremes. While Thomas felt the nearby Kawich Shoshone fell within the forager definition, the evidence at Tub Springs suggests a more complex pattern. Diagnostic projectile points suggest the site has been occupied for thousands of years, although it is unclear whether the same groups returned to the site every year or how long they stayed.

The artifact diversity typical of the spring sites supports the idea that these kinds of sites are more properly termed a residential bases rather than temporary camps. Camps and extractive sites found in nearby pinyon groves and lowland areas do not feature such diversity. It is argued here that many spring sites served as bases where groups could venture forth to the pinyon groves on the mesas and to the lowlands for other resources, while hunters found the prey attracted to the springs easy targets. The storage of resources stipulated by Binford (1980) may be represented in some of the rock features that have been described although this cannot be determined without excavation and analysis of these features.

The intensive survey and recording conducted at Tub Spring has generated much useful data, but also has shown us that much more work is needed before some of our questions about hunter/gatherer settlement and subsistence patterns can be answered. While the importance of dependable water sources to the people living in arid southern Great Basin environments has been emphasized for many years, the relationship between spring sites and temporary specialized activity sites found throughout the region is still poorly understood. Some of the questions that have been generated as a result of this research include:

- What was the duration of occupation at spring sites? Did some people remain at springs all year while others ventured out to collect and hunt, or were springs completely abandoned at certain times of the year?

- What kind of interaction between the various regional groups is represented by the artifactual materials found at Tub Springs? Do the Anasazi and Lower Colorado ceramics found at the site represent use of the spring by these people or do they represent trade between the areas' occupants and these groups?

- While it seems obvious that springs would attract a variety of animals that prehistoric hunters might pursue, what other resources were being gathered and processed at the springs as represented by the numerous utilized flakes and scraping tools found in several of the Divisions?

- Were resources gathered from surrounding areas and then transported to Tub Spring for storage and winter consumption?

The research conducted at Tub Spring and has generated direction for future studies. Palynological and paleoenvironmental studies can provide information about seasonality of site occupation and can tell us more about the kinds of plant materials used by the people at the site. Test excavations could provide answers to questions relating to food storage, seasonality, and intensity of site occupation, and could help to more precisely determine the time range during which the site was utilized. Faunal

analyses could help us to understand questions relating to logistical mobility. Microscopic use wear studies of butchering and processing tools found at the springs might help us to understand the kinds of plants and animals that were processed there.

Many of these approaches are costly in terms of labor and equipment costs but may prove valuable to understanding relationships between prehistoric people and the most important resource found in arid environments-water.

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The Hammerstone Site (26 CH 2082)

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The purpose of this brief report is to call attention to a recently (July, 1996) recorded site. The site contains an unusual surface concentration of twenty-four large hammerstones. The site also contains two additional hammerstones at a distance from this cluster and also three rock shelters. No flakes, debitage or dark earth were noted in any of the loci.

The Site Setting

The major portion of the site is located in the extreme southern part of Section 14, Township 17 N, Range 27 E, south of Fallon, Nevada. One rock shelter is in the adjacent Section 23.

The elevation ranges from 4199' for the three surface loci to 4365' for the rock shelters. The surface items are on a pebbly beach terrace and the rock shelters are in undercut basalt and tufaceous formations. Both are remnants of Lake Lahontan.

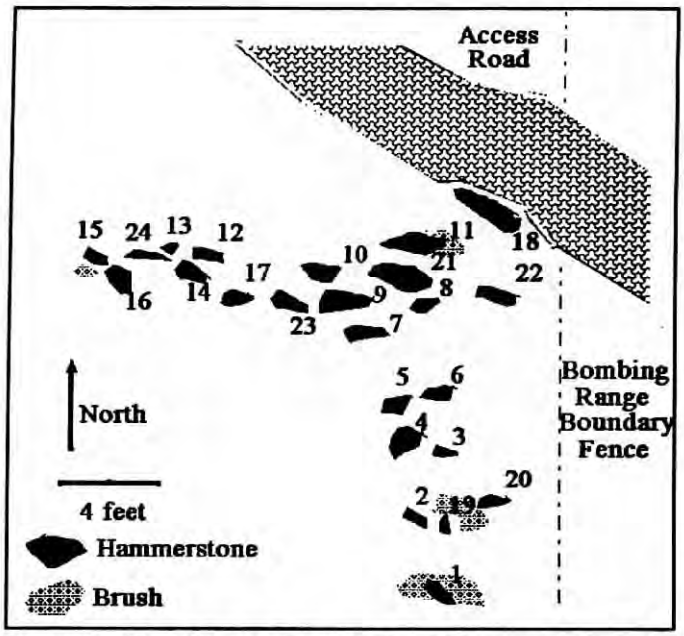

Figure 1. Map showing Distribution of Hammerstones at Site 26CH2082 Locus 1.

Vegetation consists of hopsage and rice grass thinning out to barren badlands half a mile to the east.

The Hammerstone Cluster- Locus 1

The maximum measurements and weight for each of the stones in this locus are shown in Table 1.

The distribution of the stones is shown in Figure 1. With the exception of stones 18, 21 and 24, all are of the same dense basalt as found in the immediately adjacent talus slope boulders. The three exceptions merely are more vesicular than the others.

The surfaces of the stones show the same degree of weathering, varnish and lichen growth as do the neighboring boulders. The stones are imbedded into the soil to depths of ¾" to 1½" with stone 24 having a buried depth of 2½". All have a definite soil line on their perimeters and the buried surfaces are significantly lighter in color.

The wear patterns of the stones are shown in Table 2. Stone 21 is a large, oval, vesicular basalt piece and is smooth to the touch on all surfaces. In size, it is a duplicate of Stone 6, which shows heavy end spalling and was found in two pieces after having been broken along its short middle axis.

Stone 24 is the largest and heaviest. The spalls along one of its edges, plus its weight, suggests its use as an anvil, rather than a hammerstone.

Several stones show combinations of wear, such as light cones overlaid by spalling, or heavy spalling on one end and medium spalling on the other.

Table 1: Locus 1 Stone Sizes

Stone #	Max. Length	Max. Width	Max. Thickness	Weight (lbs)
1	9½"	4¾"	2½"	7
2	8½"	6"	3½"	8
3	7½"	5"	3"	6
4	11"	7½"	3½"	10
5	9½"	6½"	2"	6
6	13"	6½"	4½"	20
7	7"	5"	3"	5
8	5"	4"	3"	2
9	11½"	8"	3¾"	15
10	8"	8"	4"	11
11	11½"	5"	3"	8
12	7½"	4½"	4"	7
13	6½"	6"	2¼"	4
14	7½"	6"	3½"	6
15	5½"	4½"	4½"	5
16	9"	6½"	4"	12
17	6½"	4¾"	3"	4
18	14"	7"	3"	13
19	9½"	5½"	2"	7
20	9½"	3½"	2"	3
21	13"	6½"	4½"	19
22	10"	5½"	3"	8
23	7½"	4½"	4"	7
24	15"	8"	5½"	35

Table 2. Wear Patterns of Locus 1 Hammerstones

Wear Pattern	Stone Number
No wear	21
Light end cones	3, 5, 8, 9, 12, 15, 17, 23, 24
Medium end spalls	7, 22
Heavy end spalls	1, 2, 4, 6, 10, 11, 13, 14, 16, 17, 18, 19, 20
Heavy edge spalls	24

Isolated Hammerstones- Loci 2 and 3

These both are isolated hammerstones 50' and 180' respectively from Locus 1. Both fit within the size parameters of Locus 1 stones.

Rockshelter- Locus 4

This is a small rock shelter (3' long, 1' deep and 2' high) containing one basalt stone with heavy spalling on one edge and one igneous, cubic shaped stone with smooth facets on four edges.

Rockshelter- Locus 5

This rock shelter measures 13' long, 2½' deep and 3' high. It contains one unshaped basalt metate (15" x 11" x 4½") with a light grinding area in the center.

Rockshelter- Locus 6

This larger rock shelter is 25' long, 7' deep and 3' high. A natural rock slide encloses the south end and a piled rock wall formed a windbreak on the north end. Two unshaped basalt metates (9" x 7" x 3" and 19" x 14" x 7") with light grinding areas and a rounded, oval, igneous mano (?) measuring 4" x 4" x 2½" are within the shelter.

Observations and Questions

The most obvious question is, why are so many big used stones found in this one spot? Their degree of varnish, depth in the soil and amount of lichen growth indicates they have been there for quite some time. Are they the same age as the rock shelter items?

The fenced Navy Bombing Range restricts survey

access to the east, south and west. It would be interesting to see what is around those corners. The two Salt Caves, with their hundreds of pictographs, are about half a mile to the northwest in Section 15.

Acknowledgments. Appreciation is extended to the professionals of Archaeological Research Services, to Alvin McLane and Gene Hattori for examining sample stones and confirming their status as artifacts. Don Tuohy is thanked for urging me to write a brief report on the site.

Visitor Use at Hickison Petroglyph Recreation Area

Roberta McGonagle
US Bureau of Land Management
Battle Mountain, Nevada

The US Bureau of Land Management has managed the petroglyphs at Hickison Summit (about 20 miles east of Austin Nevada on US Highway 50) as a Recreation Area since the 1960's. But not until 1991, when a visitor register was installed, was any data collected about who visited the site. A vehicle counter had been in use for several years before this but only recorded the total number of vehicles entering the area. This provided no information about the demographic profile or attitudes of the visitors.

It is unfortunate that the register was not in place prior to the establishment of Great Basin National Park or the promotion of US Highway 50 as the "Loneliest Highway in America." It would be interesting to assess changes in where visitors are coming from and to establish some baseline to explain the dramatic increase in visitors in the late 1980's.

The visitor register, which has space to record date, name, address (state or country), number in party and comments, shows some interesting patterns.

Visitor Origin and Season of Use

Ninety-two percent (92%) of all visitors are from the United States. Every state including Alaska and Hawaii has had at least five visitors. The top five states represented are:

California	37%
Nevada	19%
Oregon	5%
Washington	3%
Utah	3%

The States with the fewest visitors are:

North Dakota	N=5
Rhode Island	N=6
Delaware	N=7

Six percent (6%) of visitors listed foreign nations as their address of origin:

Germany	1%
Canada	0.8%
France	0.8%

Over a three year period (1991-1995) since the register was installed there is an average of 385 visitors each month and 4279 visitors each year.

There is an average of 2.3 people per party of visitors. The month with the most visitors is August 1991 with June, July and August all being popular months.

Visitor Comments

A remarkable number of visitors, over 50%, have provided comments on the register. About 90% of the comments indicate that visitors appreciated the visit. A sampling of positive comments follows:

290 "Nice"
255 "Great"
160 "Thanks"
140 "Beautiful"
111 "Interesting"
71 "Good"
50 "Cool"
46 "Neat"
40 "Wonderful"
35 "Lovely"
26 "Enjoyed" or "Enjoyable"
25 "OK"
24 "Peaceful"
20 "Excellent"
20 "Wow"
18 "Fantastic"
16 "Fascinating"
16 "Pretty"
14 "Awesome"
1 "Natural"

A number of comments (46) indicated that BLM needed to take action of some sort including: a map; better maps; clean restrooms; stop vandalism. Even so less than 10% of the comments are negative. Though BLM has tried routing one way traffic both clockwise and counter clockwise, someone always dislikes the routing. Eleven visitors thought it was too "cold" and eight visitors thought it was too "hot." Some visitors want BLM to provide water. Some think water shouldn't be provided. Twelve visitors couldn't find the petroglyphs.

About 25% of the comments refer to vandalism, including three visitors that wanted to "Shoot the Vandals." Several suggested physical measures to protect the petroglyphs including fencing and plexiglass covers.

A handful of commentators interpret the meaning of the petroglyphs:

> After much thought on this place-it is a place where boys became young men. Half oval shape cut in half denotes "not quite" men. When they are "fixed" they leave this place as men... Place has a sadness and lonely feeling to it.

> Petroglyphs to left (facing) sign - on cliffs are mostly junk - only 2 yoni's are real. Map rock to west of sign in middle of clearing to right of sign - facing - are real. That is the map rock.

Finally another group might be labeled as political comments:

> Another California attitude. No public subsidies for cattle; we can no longer afford it. Beautiful place though.

> As a taxpayer, I am goddamn irate that the BLM spends money subsidizing welfare cattle ranchers to destroy my rangeland, rather than spending the relatively small amount it would take to protect this rock art. You have allowed it to be completely ruined.

> I was shocked but pleased that I didn't see a cow or mine claim while on this walk. Has the BLM set this land aside for the "non-useful" multiple use? You know, the recreation that most of us tax-payers (non-welfare ranchers) enjoy?

> Columbus fucked up. This is not India, we are not Indians, if you ignorant people would care to ask we will tell you the name of this once great land, ... etc... Seminole

The Easter Rock Art Site

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Abstract

This paper describes the Easter Site (CrNV-62-6395) with 77 scratched rock art panels located 25 kilometers southeast of Battle Mountain, Lander County, Nevada. The site is situated at an elevation of 1926m on a lineal basalt outcrop just below the upper reaches of the Shoshone Range. The site is unique because all of the panels are scratched style, and such a site has not previously been found in Nevada. Elements consist of straight and curvilinear lines, cross-hatching and chevrons. Many of the panels are superimposed and some are blackened with patina suggesting considerable antiquity. There are over 1 ,000 scratched lines on some panels. Several basalt engravers that are inferred to have been used to make the scratches were found below the petroglyph outcrop.

Site Setting

The Easter Site (CRNV-62-6395) was located through a Class III cultural resources survey and was named for the Easter Sunday in April 1992 when my crew and I (JJD) first identified it. The site is located in the Shoshone Range, Lander County, in north-central Nevada (Figure 2) at an elevation of 1926 m (6320 ft) and encompasses approximately 1 ha (2.5 acres).

Intervening alluvial valleys are on either side of the Shoshone Range. Whirlwind and Crescent valleys are located to the east, while the Reese River Valley is located to the west. Active hot geysers once dominated Whirlwind Valley, but are now dormant due to modern geothermal drilling. The Humboldt River flows westward 15 ha (9 miles) north of the site. Twenty kilometers (12 miles) to the west the Reese River flows north to reach the Humboldt. Small springs are scattered throughout the Shoshone Range. The nearest spring to the site is located five km (3 miles) to the north.

The Easter Rock Art Site is situated on the east-facing slope of the Shoshone Range and has an expansive view of Whirlwind and Crescent valleys and the Cortez Mountains to the east. The rock art site consists of 77 recorded scratched panels on basalt rock. Most of the panels are on a lineal basalt outcrop. However, a few of the panels are on dislodged boulders below the outcrop. Most of these appear to have been scratched after they were dislodged.

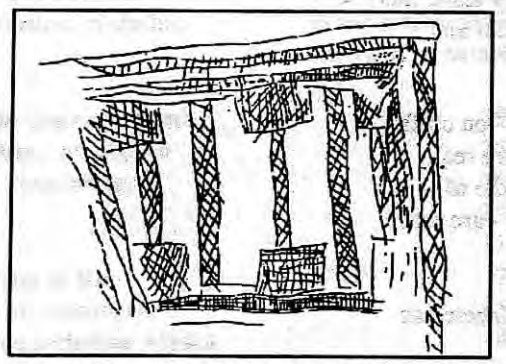

Figure 1. "Temple" portion of Panel 42. Size of figure: ~14w x 11h cm.

Site Description

The site is unique in that none of the panels have been pecked. All of the panels have been scratched. The scratched elements consist of straight lines, curved lines, cross-hatching and chevrons. Many of the panels consist of over 1000 scratched lines. Some are superimposed over earlier ones blackened with heavy patination, suggesting considerable antiquity.

Scratches are found on a variety of stone used for a variety of purposes. Scratches are made on stone with a hard, fine-grained flake tool made from obsidian, chert or basalt. A scratched petroglyph has a minimum of one single stroke made by a cutting

tool. These scratches form a variety of designs, such as cross-hatching, diagonal parallel lines and a rectangular grid or checkerboard.

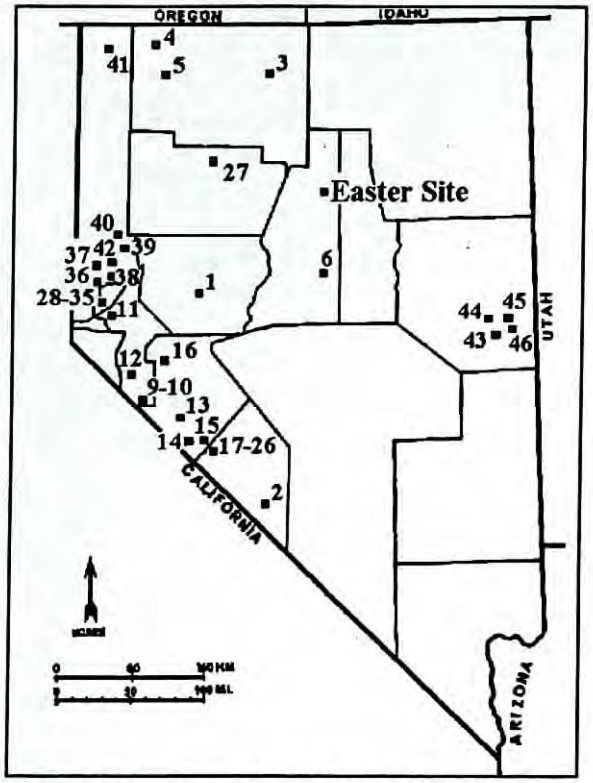

Figure 2. Location of Easter Rock Art Site in Lander County, and other scratched art sites in northern Nevada.

Thirteen basalt tools (Figure 3) found at the site include seven basalt engravers similar to those found at an adjacent quarry (site CrNV-62-6394). These tools consist of two cores, a knife, a Stage II biface and a Stage III biface. One white chert projectile point fragment was also recorded. Basalt debitage flakes and cores are scattered around the petroglyphs and repatination on the basalt artifacts also suggests great age.

Associated with the site is a rock alignment that consists of four basalt boulders aligned along the top edge of a 1.25-m high vertical rock face. There is an open area in front of the rock face that measures about 1.25 x 3.0 m and is bounded on two sides by large basalt boulders forming a U-shaped area.

The basalt quarry is extensive, covering 64,000 square meters, and is located just west of the Easter site. The fine-grained basalt quarry has been extensively assayed for tool stone. Within the quarry zone are hundreds of cores, numerous primary and secondary flakes and 21 flaked tools. Large basalt Stage I bifaces found at the quarry are elsewhere usually associated with Early Archaic or Pre-Archaic periods. Some of the bifaces are heavily patinated which required a considerable amount of weathering time. Two piled-up rock features in the quarry appear to be wind breaks. Engraving tools were also found here as well as at the rock art site.

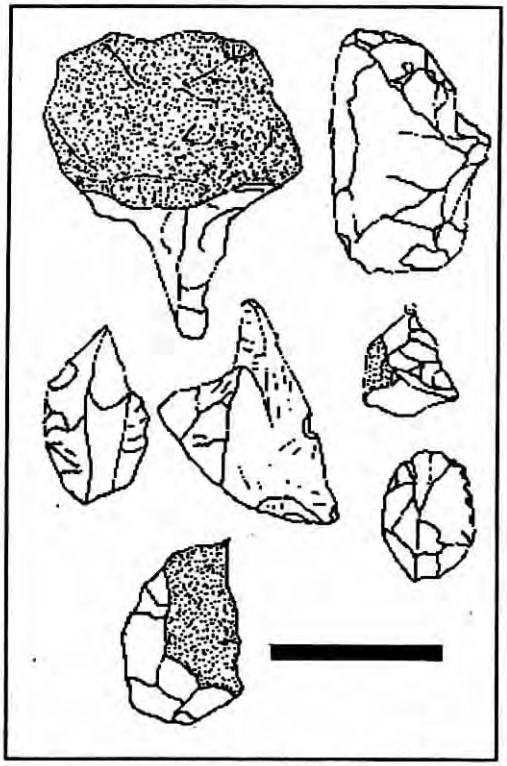

Figure 3. Some basalt gravers from the Easter Site. Scale: 4cm.

The scratched elements include crosshatching, vertical or parallel scratched lines, curvilinear lines, and chevrons (Figures 1, 4-9). One panel in particular is very striking with its use of crosshatched "columns" combined to form a unique geometric design. Panel 42 (Figure 1) resembles, to the Euro-American eye at least, a "temple." As the entire figure is less than 150 sq. cm.; the design

represents handicraft of a very high degree. Compared to the work on the remaining 76 panels, as well as to work at other scratched rock art sites, the perfectly symmetrical geometric design of Panel 42 is astonishingly unique. Although this panel appears to be among the more recent of the 77 panels, were it not for repatination, which suggests a measure of antiquity, one would be tempted to surmise that the design was executed by a Euro-American who had knowledge of Greek and Roman architecture! Of course the figure is a design, not an architectural "elevation."

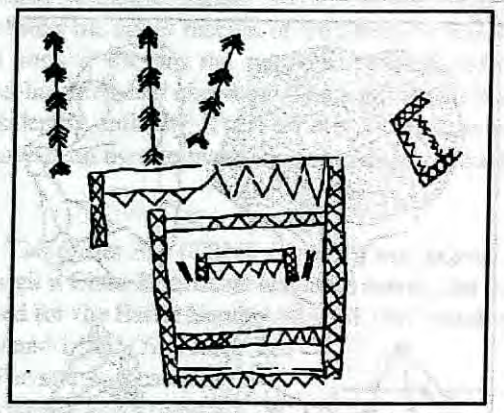

Figure 4. Panel 77. Size: 26w x 24h cm.

Comments regarding the age of the panels are based on observation of patination and repatination, and are inferred and relative rather than measured and absolute. An attempt was made to establish congruence between these relative ages and a recognized chronological sequence divided into four time periods for the central Great Basin: Pre-Archaic (11,000 to 8,000 B.P.), Early Archaic (8,000 to 4,000 B.P.), Middle Archaic (4,000 B.P. to A.D. 500), and Late Archaic (A.D. 500 to Historic Contact). Details of our assessments of the number of episodes of rock art manufacture are included on the Intermountain Antiquities Computer System (IMACS) Rock Art Attachments on file at the Battle Mountain Bureau of Land Management office and the Nevada State Museum in Carson City, Nevada.

Discussion

There has been interest in petroglyphs and pictographs in the Great Basin since the days of early exploration (McLane 1993). The first major American studies were made by Garrick Mallery (1886, 1893). Though Mallery described a few Nevada petroglyph sites, he made no mention of the scratched motifs. Julian Steward (1929) is the first anthropologist to deal significantly with the rock art in the Great Basin. Steward's field documentation was limited, relying mainly on data obtained by others. He defined the rock art into curvilinear, rectilinear and naturalistic types. These types were later expanded and characterized into styles by Heizer and Baumhoff (1962: 197-209). Overall, they delineated seven styles:

1) Great Basin Representational,
2) Great Basin Curvilinear Abstract,
3) Great Basin Rectilinear Abstract,
4) Great Basin Painted,
5) Great Basin Scratched,
6) Puebloan Painted [Western Fremont],and
7) Pit-and-Groove.

Heizer and Baumhoff (1962:200, 208, 234) defined the Great Basin Scratched style with elements of sun disc, parallel lines and cross-hatching, and felt that the Great Basin Painted and Scratched styles must be very recent, that is, no older than 1000 years. The authors stated that the scratched style had a very limited geographic distribution with four known scratched sites in Nevada (Heizer and Baumhoff 1962:208, Figure 31c).

Today we know that rock art sites with scratches are quite common. Stoney (1990:1) inventoried 40 scratched style sites in the western United States gleaned from the rock art literature. For a large, multi-component site in Mineral County, Ritter and Hatoff (1993) inventoried 462 panels, of which 13 percent, or 62 panels, had scratched elements. For northern Nevada alone, 46 sites with scratched motifs have been inventoried. When researchers begin looking for scratched elements, many more sites will have been found than those presented in this report.

Heizer and Baumhoff (1962) interpreted Northwestern Nevada rock art in connection with big game hunting magic. Beyond that, they made no interpretation of the scratched petroglyphs, which

may have been made for no different reason than that for other types of Nevada rock art. McLane (1989:31) theorized that rock art sites are associated with specific events in the life of the rock art maker, such as birth, death, general living activities and spiritual well-being.

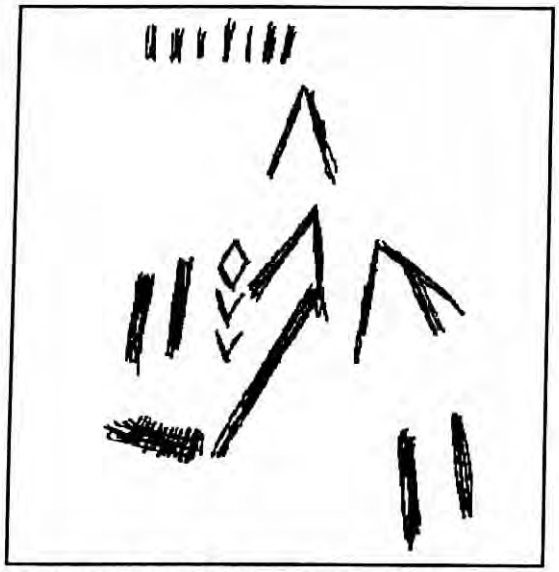

Figure 5. Panel 45. Size: 162w x 184h cm.

We may well dispose of the Bettinger and Baumhoff (1982:494) hypothesis that scratches represent an effort by the historic Numic people to obliterate older prehistoric petroglyphs, at least for the Easter Site, since no pecked elements are found there.

Rafter (1986: 138-140), in studying the Agua Dulce sites in Los Angeles County, California, hypothesized that scratched sun-like elements might function as solstice markers. Sun elements are not found at the Easter Site.

At the Black Mountain Site (26MN2001) Ritter and Hatoff (1993) have proposed that the scratched and pecked petroglyphs may be related through shamanic intervention to large ungulate hunting and food gathering and processing, especially pinyon.

McLane has independently developed the idea that petroglyphs may be related to pinyon nut food. While hiking a ridge on the Nevada and California boundary north of Owens Valley during the fall of 1992, he found five petroglyph sites and several rock rings, which he thought may relate to pine nut gathering. A petroglyph at the Lagomarsino site in Storey County, Nevada appears to depict an image of pine cones falling from a pinyon tree. Eugene Hattori (personal communication with McLane 1992) related that a Moapa Indian elder said that when she was a small child her grandfather stopped at a boulder to make a petroglyph when they went pinyon nut gathering in the fall.

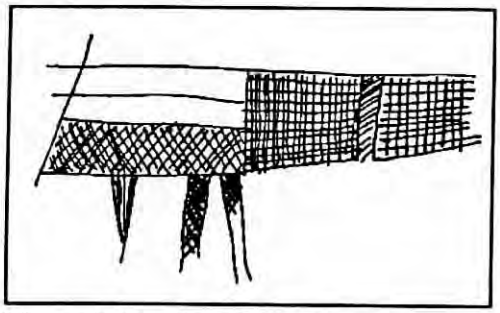

Figure 6. Panel 67. Size: 75w x 42h cm.

According to Lyneis (1982), the study of rock art sites may give insight into aboriginal ideology and belief systems, a particularly elusive field of research with regard to mobile and non-literate peoples. In trying to understand the functional significance of this type of symbolic behavior, questions must address the placement of rock art on the landscape, and the role of images in the ideology and symbolic systems of those who made them (Hartley 1992). Theories abound that rock art is shamanistic, especially with regard to the hunting of game and food gathering; that rock art may be related to other activities or life events, or that it conveyed information about proprietary rights or the landscape (Hartley 1991) .

The Easter Rock Art Site is located at an elevation of 1926m on a largely barren basalt-capped ridge. Though located above a major drainage, there are no identifiable game trails. This, and the presence of only one white chert projectile point tip and the conspicuous absence, today, of the ubiquitous shot-gun shell casing, suggest that the

ridgetop petroglyphs were not associated with hunting activity.

That the petroglyphs were made in connection with exploitation of pinyon nuts is not applicable here either, given the absence of pinyon trees in the vicinity. The explanation that scratches were made to deface older pecked designs can also be discounted, as there are no pecked forms at the Easter Site. No evidence was identified to connect the site with possible astronomical events.

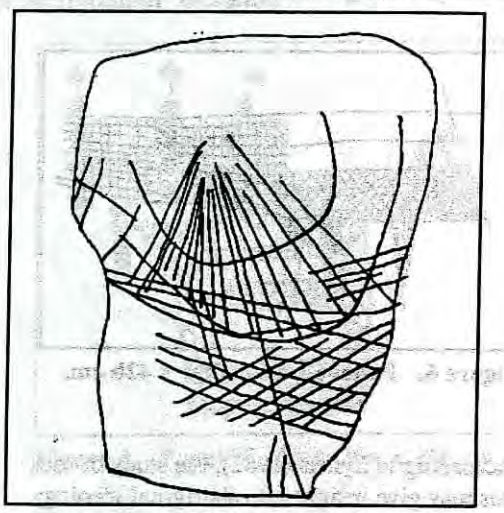

Figure 7. Panel 40. Size: 42w x 53h cm.

Located just west of the petroglyphs is the extensive, Early Archaic basalt quarry. The proximity of the petroglyphs to the quarry suggests that we look to that association for an understanding of the rock art. Heavy patination on many of the panels, as on the basalt artifacts located around the panels and within the quarry, suggests considerable antiquity for both. Reuse of the petroglyph site is obvious, as indicated by the many incidences of superimposition, each exhibiting a different degree of repatination. We may infer that the quarry was also used after the Early Archaic. Although no tools were observed that could be clearly associated with a more recent culture, the degree of repatination on some of the engravers clearly suggests a more recent time of manufacture. Yet, having established this proximal and functional relationship between the two sites, the connection between quarrying activity and symbol system and behavior is not apparent.

The Northern Shoshone Range is rich in archaeological sites as has been demonstrated in large archaeological surveys carried out in the vicinity. Prehistoric occupation in the Shoshone Range dates back to 8000-11,000 B.P. Site types range from small field camp lithic scatters to large residential base camps and tool stone quarries and, now, a unique rock art site. Aboriginal activities included hunting, quarrying raw material, lithic tool manufacture and repair and plant processing. To this we can now add, the symbolic expression in rock art of a variety of cultural and natural systemic aspects, not yet completely understood.

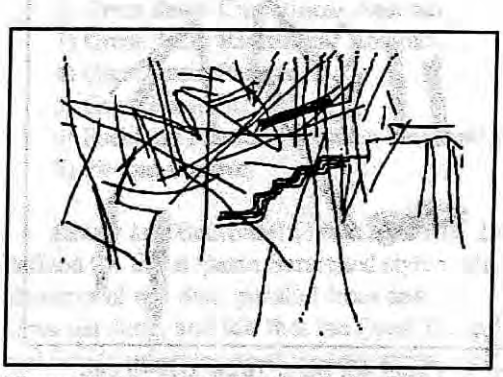

Figure 8. Panel 22. Size: 100w x 63h cm.

The Easter Rock Art Site is unique in the Great Basin. No known comparative data exists in the literature to assess the role of the Easter Site in regional prehistory. Additional surveys and recording of new scratched sites are needed.

Acknowledgments. This paper is the result of a joint effort by myself, Robert Vierra, whose firm conducted the survey, and Alvin McLane who, subsequent to the original survey, assisted us in the detailed recordation of the site as well as in the writing of reports and papers. The original "discovery" crew included Lee Duryee , Jim Kenny and myself. Assisting with the recordation of the site were Cal Nichols (recently deceased), Scott Crownover, and Jeff Johnston.

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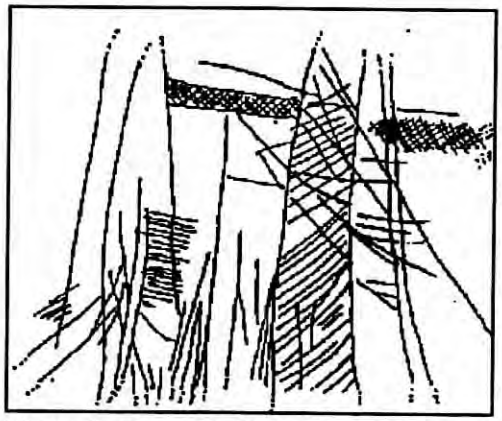

Figure 9. Panel 15. Size: 44w x 38h cm.

Northern Nevada Cupule Sites

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Abstract

Despite the well documented global occurrence of cupules, until recently their incidence in the Great Basin has been considered to be relatively scarce. The intent of this paper is to review the results of several recent recordings of cupule sites in northern Nevada through the presentation of brief descriptive accounts. Our goals are simple. We offer these data as a means of amplifying the inventory of known Nevada cupule sites and we wish to call attention to the fact that such sites occur less infrequently than previously published overviews have recognized.

Recognition of Cupules

Cupules are rock art elements composed of pits which have been pecked or ground into horizontal or vertical rock faces. They normally occur in clusters rather than singly and can occur on a single boulder or on numerous boulders at a single site. Although they are sometimes mingled with other types of rock art elements, they often occur independently. Cupules vary in dimensions from shallow quarter-size indentations to deep mortar-like depressions. They are found around the world in a wide variety of temporal and functional settings and are known to have been produced by societies ranging in organizational complexity from small bands of hunter-gatherers to large stratified entities such as chiefdoms and states.

In most cases, cupules are singularly nondescript, an attribute which makes them difficult to detect, particularly because they often mimic natural concavities which occur regularly in boulders and bedrock. Doubtlessly, this explains the failure of many field inspections to identify Great Basin cupule sites.

For our purposes we have employed two hallmarks to characterize northern Nevada cupule sites. First, their production generally entails minimal to modest modification of parent stone. Their manufacture is invariably simple in concept; the most noticeable sites are those where repetition of the production process has resulted in anomalous quantities of altered surfaces. Secondly, their relative placement or positioning is clearly non-representational in pattern. That is, no recognizable motif, either abstract or naturalistic, is formed by clusters of cupules. While sometimes incorporated into abstract meanders, the cupules themselves offer no apparent conceptual patterns. Although viewed as vulvi-forms or bearpaws by other researchers, the authors fail to see these representations in the northern Nevada sites. This observation serves to distinguish the cupule sites in this region from those in other culture areas where both abstract and naturalistic interpretations are quite valid.

Early studies of Great Basin rock art (see below) classified the rarely observed cupules as part of a "pit-and-groove" complex. More recent work (again, see below) relates cupules to an ancient style of faceting on the edges of free-standing boulders. It is our view that cupules, pits-and-grooves, and faceting (if this style is indeed cultural--see below) are correctly classified under a similar taxonomic rubric, since all three conform to a production technique which consists of minimal, non-representational modification of the host rock surface resulting in the creation of smooth depressions in the bedrock. This view is reflected in the list of sites which are described below.

Although not specifically referred to as "cupules," cupule petroglyphs have been documented in Nevada since Elsasser, Heizer and Baumhoff (1958) included them in their definition of the "pit-and-groove" complex. Initially, this style complex was characterized by Heizer and Baumhoff (1962) as:

(1) being rare;
(2) having no distinct pattern of distribution;

and
(3) as being extremely ancient, the oldest of the recognized Great Basin rock art styles--dating to between 5000 and 3000 B.C.

Since that time, an even earlier style, the Stillwater Faceted, has been identified near Fallon, Nevada (Heizer and Nissen 1977; Nissen 1975, 1982). The faceted style may date to as early as 7000 B.C. While controversy does exist as to whether the faceted style is cultural or natural, this style, if valid, supports the posited antiquity, regardless of persistence duration, of cupule-like sites in Nevada (Clewlow 1981).

Subsequent studies of cupule and "pit-and-groove" styles by Heizer and Clewlow (1973) a decade and a half later (primarily in California) yielded seemingly contrary findings:

(1) This style seemed to occur in abundance, at least in specific areas;

(2) cupules exhibited a tight distribution pattern, with the main concentration located in the northern coastal zone of California; and

(3) they were determined to be of very late origin, lasting into ethnographic times.

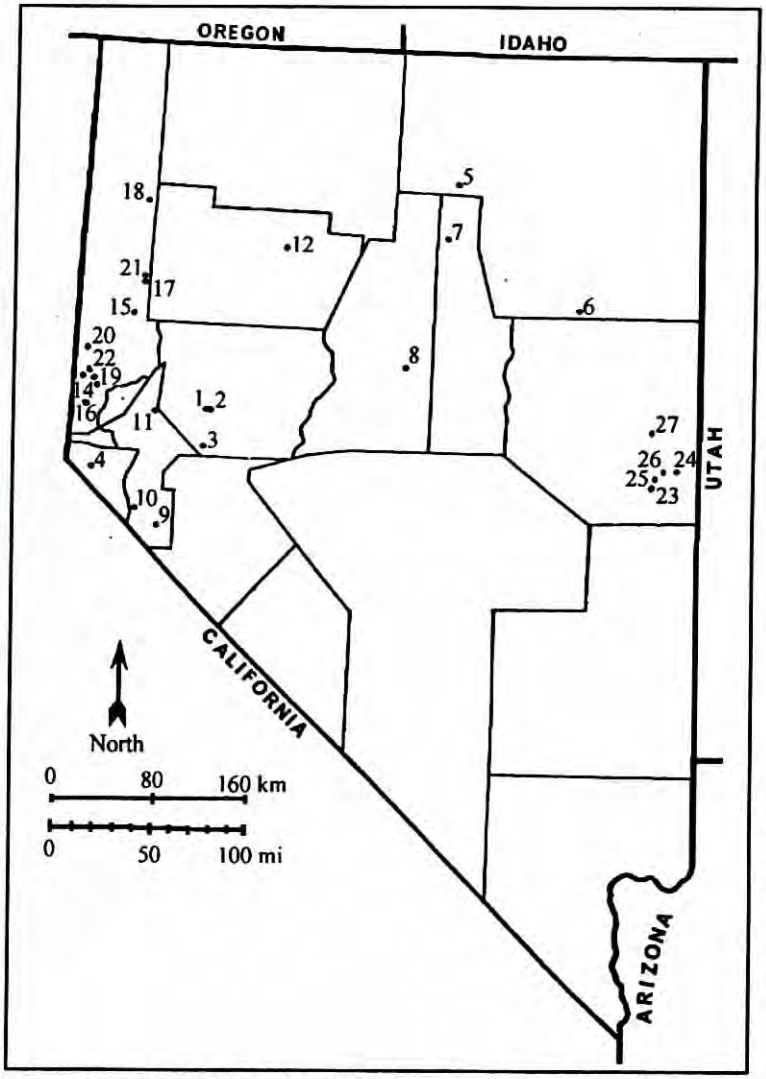

Figure 1. Distribution of Cupule Sites in northern Nevada.

Moreover, informants were emphatic that cupules served dual purposes. Ethnographic accounts of California Hokan speakers indicated that the Pomo utilized cupules in rituals aimed at enhancing fertility in women, while the Karok and other Klamath River groups employed cupules in efforts to induce rainfall during periods of extreme drought to allow salmon runs (Driver 1939; Goddard 1903, 1904; Hedges 1983; Heizer 1953; Loeb 1926). As a consequence of these ethnographic observations, cupules gained the tags of "baby rocks" and "rain rocks".

During the past 20 years, research in California and the Great Basin has expanded our knowledge of cupule petroglyphs in these locales. Moreover, an increased interest in rock art worldwide has amplified the body of reliable comparative data by which more elegant interpretations may be generated. This allows for revision and modification of prior scholarly observations on Nevada cupules. It also permits an integration and re-evaluation of cupule studies from these areas into the emerging network of knowledge on various rock art styles with global visibility, and

points to aspects of future research and cultural resource management programs which should be afforded priority in project planning.

Recent identification of cupules in northern Nevada reported herein makes clear that earlier discussions were basically accurate at the factual level, but that sampling error, coupled with the general archaeological disinterest in rock art at the time, led to certain misperceptions. Thus, the comments below must be considered derivative, and not derisive, of the perspectives presented by our academic ancestors.

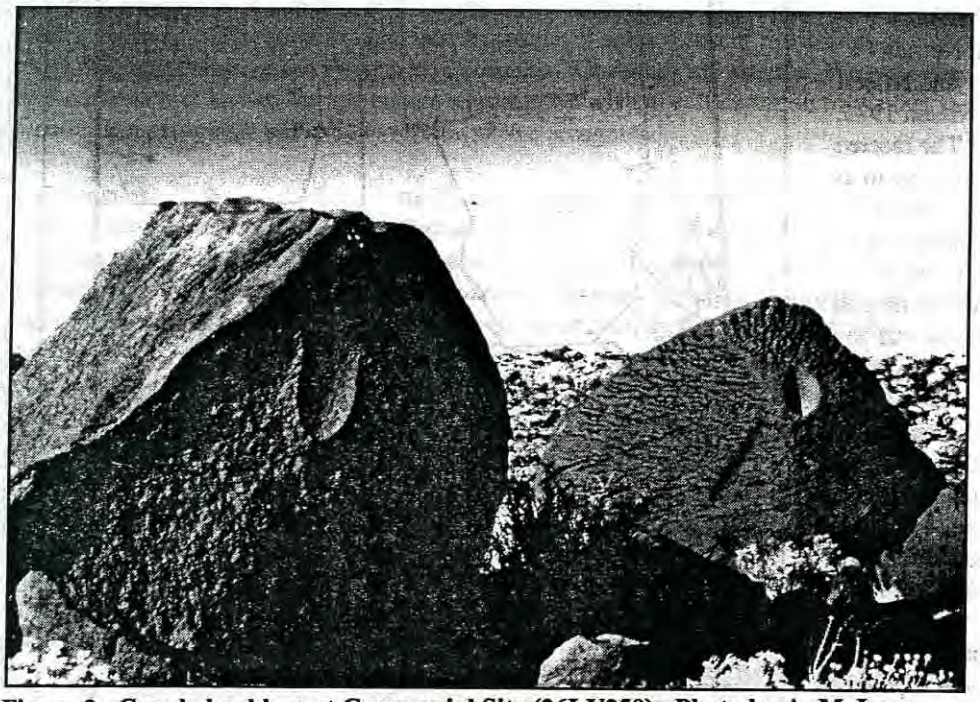

Figure 2. Cupule boulders at Ceremonial Site (26LY250). Photo by A. McLane.

1. Cupule art in Nevada is much more common than antecedent research suggested. Although this paper is focused on northern Nevada, we submit that future research, if properly oriented, will reveal a wealth of cupule sites in all parts of the state.

2. Cupule art in northern Nevada appears to manifest patterned distribution, particularly as regards proximity to reliable water sources, especially canyon derived streams. We predict, however, that if explicit attention is paid to the recognition of cupule sites, they will prove to occur in a far wider range of eco-contexts than those currently known. This speculation is based on the history of cupule studies in California and a number of other culture areas.

3. Regarding chronology, it may still be stated that cupule art, in the form of "pit-and-groove" sites, and other petroglyphic evidence that is characterized by relatively minimal modification of the parent boulders, is probably the most ancient of Nevada styles. This is not surprising if serious consideration is given to the contention of Grieder (1982) that cupule art can be traced to origins of over 20,000 years in many parts of the Old and New worlds, appearing in a wide range of ritual and ceremonial contexts, most of which are shamanic in nature, and many being related to fertility, phallicism, or vulva fascination. He states that "Whatever else we may learn

from cup and groove marks, they demonstrate the remarkable tenacity with which a symbol may be maintained" (Grieder 1982:43).

Distribution of Cupule Sites

Figure 1 depicts locations of currently known cupule sites in northern Nevada including those recently found by the authors. A total of twenty-seven cupule sites are shown with each one briefly described below. Of these, seven were recently recorded by the authors (nos. 6, 12, 14, 16, 18, 22, and 26).

Churchill County

1. 26CH3 Grimes Point. At this site cupules (or pits) have been largely integrated with groove elements. Nissen (1982:296-299) suggests that more than 1000 petroglyph boulders occur at this site, of which 29% are pit and groove (or cupule) elements. Most of the site appears to be quite old because of the heavy repatination. The site is not presently near water. However, excavations at nearby Hidden Cave indicate the presence of marshlands in the proximity (Lake Lahontan basin), particularly between 4000 and 3000 B.P. (Thomas 1985).

Figure 3. Cupule boulder at Star Creek Petroglyph Site, Pershing County. Photo by R. Danner.

2. 26CH20 Fish Cave. Numerous petroglyph boulders are at this site, of which only one contains a possible cupule (pit) (Nissen 1982:312). The site is adjacent to the Carson Sink, a remnant of Lake Lahontan which appears to have been periodically full throughout the Holocene.

3. 26CH926 Rawhide Flats. Two large boulders here contain numerous cupules. Boulder 1 has 43 randomly spaced pits on its north side. The cupules vary in size and depth. Boulder 2 is 1 m high and contains 24 cupules on the southeast side. The pits range from shallow and 4 cm across to 21 cm in diameter and 25 cm deep. This site first recorded by Heizer and Baumhoff (1962:26) is not presently near water.

Douglas County

4. Gardnerville Boulder. Heizer and Baumhoff (1962:35) describe a boulder at the Nevada State Museum which came from the vicinity of Gardnerville. The rock contains three wavy lines which connect to a pit 5 cm in diameter.

Elko County

5. Boulder Creek. More than 30 cupule boulders at this site are part of an extensive settlement complex with large dense lithic scatters (McLane 1988; Price 1990). A large creek flows past the site.

6. Medicine Rock. This boulder near the Ruby Marshes is covered with cupules and is locally known as Medicine Rock.

Eureka County

7. 26EU1 Dunphy Boulder. An isolated boulder near the Humboldt River is almost completely

covered with cupules (Heizer and Baumhoff 1962:37, Plate 3a).

Lander County

8. Callaghan Village. One cupule boulder was noted at this site (Knudtson 1975:120). The site itself appears to be late prehistoric in nature. It is adjacent to abundant perennial water sources.

Lyon County

9. 26LY1 Walker River. This large site contains one cupule boulder with some pits on the side of the rock (Nissen 1982:333).

10. 26LY4 Desert Creek. Heizer and Baumhoff (1962:45) note several pit and groove petroglyph boulders at this site. Several cupules are on the side of at least one boulder.

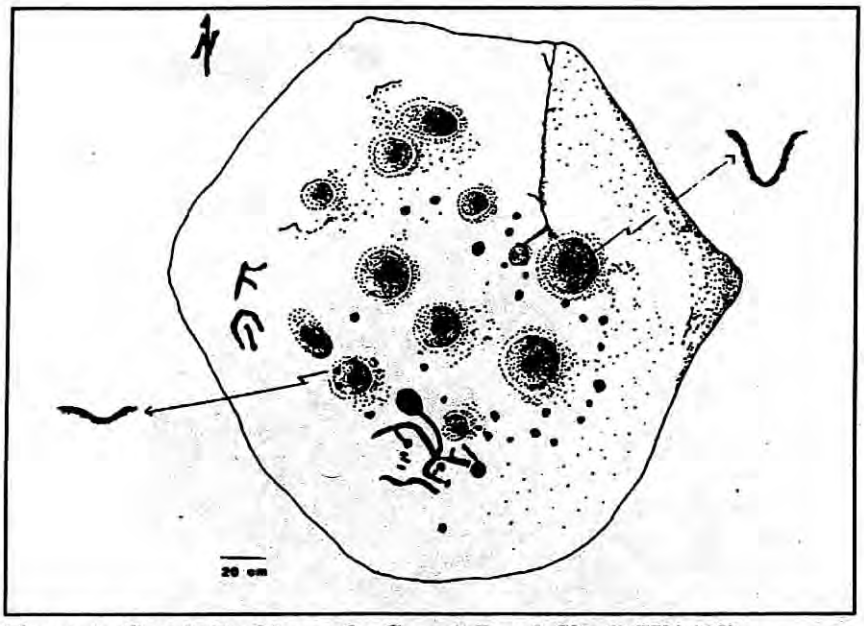

Figure 4. Cupule Boulder at the Canepa Ranch Site (26WA128). Rendering by Tanya Thompson and Sandra Uchitel, from a field sketch by A. McLane.

11. 26LY250 Ceremonial Site (Erickson Point Site). This distinctive pit-and-groove and cupule site is located high on a ridge (Tuohy 1973). The pits and grooves and cupules are the deepest of those described herein. Some of the cupules are on the side of large boulders (Figure 2). This site is not presently near water.

Pershing County

12. Star Creek Petroglyphs. Several boulders in this large site complex in Buena Vista Valley contain cupules. One boulder contains over 100 small cupules (Figure 3). Star Creek is on the south side of the site.

Washoe County

13. 26WA28 Smokey Flat. A granite boulder near a small seep in the Truckee Meadows contains a petroglyph element with small cupules (Heizer and Baumhoff 1962:62-63).

14. 26WA128 Canepa Ranch Site. A large, flat-surfaced boulder (Figure 4) near a small water flow contains 41 cupules, six mortars, two grinding slicks and a few petroglyph elements. Three of the cupules (pits) are connected by grooves. One unusual cupule has five small pecked pits just inside its lip.

15. 26WA308 Indian Church. About 25 cupules are on the floor of a natural tunnel that goes through a tufa mass (Connick and Connick 1992:78). Pyramid Lake is nearby.

16. 26WA2012 Thomas Creek. A number of rocks along Thomas Creek have pecked curvilinear design motifs. Site 26WA2012 was originally recorded as having a bearpaw petroglyph. However, upon inspection, no bearpaw was discernable, but the rock does contain about one dozen small cupules. Boulder L in the vicinity contains two cupules on the top of the rock. They are spaced 15 cm apart and measure 7.5 cm in diameter and 1.5 cm deep. The site elevation is 1622 m. Other cupule boulders are reported in the vicinity.

17. 26WA3329 Winnemucca Lake Site. Deep pecked cupules occur here which are called cups by Connick and Connick (1992:78). Winnemucca Lake was near this site during historic times. Now, an alkaline spring is located 1000 m from the petroglyphs.

18. Granite Creek Site. This site is located at an elevation of 1428 m. A few small pecked cupules occur along the upper edges of two boulders at this locality (Figure 5).

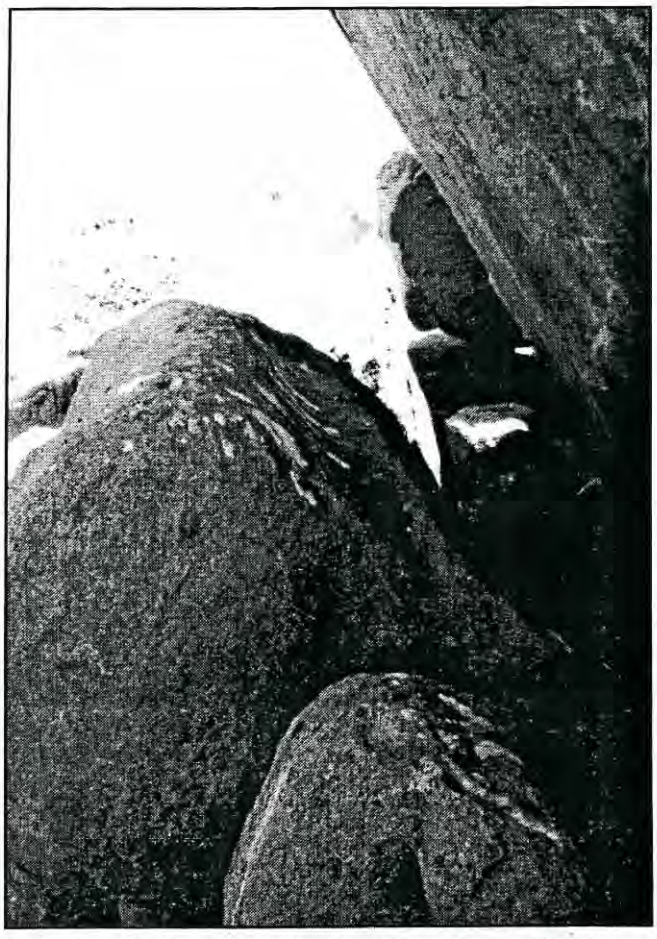

Figure 5. Cupules on upper edge of boulder at Granite Creek Petroglyph Site, Washoe County. Photo by D. Valentine.

19. Mately Ranch Medicine Stone. A large boulder contains 78 small cupules surrounding two probable mortar holes. Many of the holes were stained various colors (Mulcahy 1963). This stone, once located near the Truckee River, is now on the grounds of the Nevada Historical Society in Reno.

20. Miller Cabin Cupules. The Miller Cabin site consists of at least 13 granite boulders with several dozen cupules. The cupules are 5-7 cm in diameter and about 2 cm deep. One boulder has over 40 cupules and another boulder also contains pecked grooves and a short trough. A small unnamed creek flows past the site which lies at an elevation of 1768 m.

21. Near Site 26WA630. About 30 cupules are on the side of a tufa dome (Connick and Connick 1992:78).

22. Poeville Rock. This is a large isolated boulder with a flat surface containing eight probable mortars and 24 small cupules. No other artifacts were found in the vicinity. Spring water is a short distance away.

White Pine County

23. 26WP134 Raised Spring. Aikens (1978:11) recorded two stones at this site with small pits. He did not classify them in the pit-and-groove style because they were much smaller than those reported for western Nevada.

24. 26WP235 Mill Creek. Cupules are at this site at an elevation of 2438 m. Rusco (1970:5) noted a pit and groove panel here. She described pits (cupules) 2.5-3.75 cm in diameter and about 2.5 cm deep.

25. 26WP854 Ohio Spring Site. Numerous deep and shallow cupules are found at this high altitude (2829m) site (McLane 1989:17). Despite the site's name, water is several hundred meters from the cupules.

26. 26WP1945 Windy Canyon. This high altitude (2664 m) site contains pits and grooves and individual pecked cupules on the flat upper surface of a dark brown quartzite rock. Though not immediately located at water, a flowing creek is about 250 m away.

27. Cleve Creek at North Fork. Recorded as a pit-and-groove site, a photograph shows cupules at the locality (James 1981:62, 64).

Discussion

The above descriptions, in every sense, should be considered quite preliminary, and are, to be sure, presented primarily to alert researchers to the fact that cupule art exists more abundantly in Nevada than prior works would imply. In a general way the data derive mostly from northern Nevada. All of the recently recorded sites reflect the results of observations made by the authors during the course of surveys dictated by other circumstances. Thus the newly identified sites were not found in specific searches for cupule petroglyphs, but were revealed as ancillary discoveries in the context of more broadly oriented projects. Thus, it would be misleading to consider northern Nevada as a formal study area for the information contained in this paper.

Realistically, the information derives from northern Nevada only because that is where the authors have undertaken field assignments in recent years. That most previously known cupule sites which we have cited above also occur in northern Nevada is likewise coincidental, stemming from the emphasis that antecedent researchers, particularly those based at University of California, Berkeley, placed on that area. We are aware that cupule art is found throughout the state as the valuable contribution of Stoney (1992) explicitly demonstrates. This paper is offered simply as one more addition to the body of cupule rock art knowledge from the state of Nevada.

In this spirit, we refrain from the presentation of interpretation regarding function, ethnographic affiliation, or mid-level theoretical comparison of our sites to areas which have received more attentive study. For the curious reader, however, we suggest several starting points for such inquiries: Baumhoff (1980), Hedges (1990), Nissen and Ritter (1986), and Parkman (1986).

Acknowledgments. We wish to express our appreciation for the contributions of the following people: Tanya Thompson and Sandra Uchitel for their assistance with graphics and Ruth Danner and David Valentine for providing photographs. It should be explicitly noted that the data herein was compiled in Spring 1993 and represents our view of the topic as of that date. We have not incorporated materials which have come to our attention since that time.

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An Archaeological Study of an Historic Wagon Road in Southeast Nevada

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Abstract

Portions of historic roads crisscross the landscape of southern Nevada. A number of these retain original refuse discarded during their period of use. The model presented, based on study of a segment of the Pioche to Salt Lake Wagon Road, establishes a method to predict the location of the road and an inventory process that delineates patterning. From these data it is possible to determine certain behavioral characteristics of those that traveled the road.

Introduction

The foundations became visible as we turned off the dusty county road. The buildings, outlined by mounds of scattered rock, were smaller than we had anticipated. Close by, cottonwoods and willows announced a small spring - the water appearing somewhat brackish in the mid-September sun. The open area to the south, where we parked the truck, was where the stages must have stopped to discharge passengers and change horses. Scattered about were glass shards of various colors in association with rusting cans and odd shaped pieces of hammered metal. There was no doubt. This was the Desert Springs stage and wagon stop.

It was here that the wild west lived, when in January of 1876, Idaho Bill and his gang of outlaws took over the stage station, holding the station agent and his wife hostage. The previous fall Idaho Bill, while still in view of the station, had robbed a stage carrying the U.S. mail. The station manager had been an eyewitness and the outlaw was later arrested in Pioche, Nevada and jailed in Beaver, Utah. Released, when bond was posted by his side-kick, Al Winn, the two rode to Desert Springs where they met up with several members of the gang. At gunpoint the station manager was forced to sign a document that he would not testify at Idaho Bill's pending trial. This went so well that Idaho Bill than made him sign an IOU for several thousand dollars.

Celebrating their success, Bill and his gang opened the bar and furnished free drinks, not only to members of the outlaw band, but to all travelers that came along the road. They were not only persuaded to join in the celebration but had to give up their firearms as well. These were used, as reported by the Pioche Daily Record (12 January 1876:3) ". . . to target practice on the window glasses and ... riddling the house generally, in fact making it a perfect pondemonium (sic)." The liquor supply depleted, Bill and the boys left for parts unknown.

The Desert Springs station was the terminus of our research project (Mathews 1992), 36 miles of frontier wagon road that spanned the high desert and mountain ranges from Pioche, Nevada to the Desert Springs stage stop at the edge of the Escalante Desert in southwest Utah. We had walked every foot of this road and came to know its history and physical attributes on a personal basis.

This project came about when Dawna Ferris, archaeologist for the Bureau of Land Management, Caliente Resource Area, located a portion of a wagon road east of the town of Pioche. Suspecting the road originated in Pioche but not having time to gather further information, Dawna asked if we would be interested in volunteering to work on the project. It sounded interesting. We agreed to spend some time and see what it was all about.

After several days locating the road and examining many artifacts and features we became hooked. We were familiar with archaeological research related to wagon roads such as way-stations, trading posts and military posts, but we were not familiar with studies that dealt with linear posited refuse along travel routes. Early-on we decided the focus of the project would be to determine cultural and behavioral traits of the people that had used the road.

Before becoming too involved in the fieldwork

we felt archival research was necessary to give us background on wagon roads in general and the Pioche road in particular. The Lincoln County Court House in Pioche held most of the original local newspapers beginning in the early 1870's. From this source and other historic documents we were able to piece together the early history of the town of Pioche, Lincoln County and their dependence on the Pioche to Salt Lake road in the late nineteenth and early twentieth centuries.

Local History

The genesis of the town of Pioche began in early 1870 and quickly became a mining boom town. It immediately attracted not only developers but a supporting cast of merchants, miners, saloon keepers, prostitutes and hangers-on. Elliott (1971:110) describes the 1870 population of 1,141 "... mostly men and nearly half of them foreign born ... the camp soon came to be known as one of the rowdiest and most lawless in Nevada."

Pioche was laid out, as were many western mining towns, in a canyon on the side of the mountain from which the ore was mined. There was a large variety of stores, restaurants and general supply houses in addition to freight and stage business.

Prior to completion of the Transcontinental railway in 1870 supplies for this part of the frontier were shipped around the horn to ports in San Francisco and Sacramento, then overland to the many mining towns in California and Nevada. This long haul transportation adding greatly to the cost of supplies. Completion of the railroad through Salt Lake City shortened the freight haul to Pioche over the Salt Lake road. It also created opportunities to travel to and from the eastern United States without the tedious and often dangerous ocean travel.

Early-on daily stage coaches were leaving Pioche for Salt Lake City via Rose Valley, Desert Springs, Connor Springs, San Francisco, Riverside and Antelope, merging with the Mormon Road at Corn Creek, Utah. Two stages a day traveled north to Hamilton and stages on both roads carried U.S. Mail and Wells Fargo Express. In addition, the "pony mail", one horse, one rider, carried letter mail between Pioche and Hamilton and Pioche and Salt Lake City. Freight wagons were constantly on the Salt Lake road carrying machinery for the mines and supplies for the merchants. The variety of goods available in local stores denied the isolation but not the prosperity. An advertisement in the Daily Record of 9 January 1873 lists the following merchandise:

> . . . splendid stock of merchandise, tailoring goods, also large stock of watches, diamonds, and silverware . . . pure and patent medicines, paints, oils, turpentine and lamp chimneys . . perfumery, solitare (sic.) and cluster diamond rings, gold chains, sleeve buttons, ear rings, solid silver card cases, charms, lockets, bracelets, fancy goods, hosiery, shoes, sheetings [sic], bleached and brown of every description, towels, demask [sic] table cloths, periodicals and stationary [sic], muffles and furs, bales of white and colored blankets . . . stove pipe fashionable hats, cigars, tobacco, wines, liquors, hair oil, cologne, boots, all fresh from eastern manufacturers . . . foreign fruits, confectionarys [sic], and general produce . . . fresh oysters and all kinds of fresh fish, cranberries, chestnuts, a choice of green and dried fruit, deviled ham, turkey, tongue, lobster, chicken and pigs feet, mackeral [sic], clear lake cheeze [sic], and fresh California hatter.

Mining, an extractive economy, relied on transportation of ore to the outside to be converted into useful products. This did not generate income for mining towns such as Pioche and they were dependent on speculative outside money to keep the mines in operation. As in all mining boom towns the high grade ores were finally depleted, encouraging investors and their money to leave town and move to other expected bonanzas. Expensive equipment was needed to extract ores from the deeper and narrowing silver veins.

By late fall 1873 the economy began to slip away and merchants eliminated the more exotic items from their inventories. Some mining activity still occurred in the mines around Pioche as tailings

were reworked and water levels in deeper shafts were pumped. This mining activity was only temporary and eventually the mines would close.

As the County Seat, Pioche was spared the total evacuation that befell other mining communities. In general, a quiet time had settled over the county and the inherent isolation became a dominant factor in the community. The census of 1880 recorded a total of 2,637 people in Lincoln County, 745 of which resided in Pioche, a considerable decline from the 6,000 reported for the town in the peak year of 1872 (Thompson and West 1881;487). News items in the Weekly Record now consisted of such mundane occurrences as: when the mail did or did not arrive, who was going and coming on the stage, condition of the roads, social gatherings and shootings, both accidental and otherwise.

By 1890 the population of the town had dwindled to 242. Some modest mining activity was taking place in other parts of Lincoln County, the ore being freighted to the railhead at Milford, Utah via the Salt Lake road from Pioche. By 1910 most mining activity in the area had ceased.

Transportation History

The movement of people and supplies was one of the great achievements in developing the West. Nowhere was this accomplished under a greater environmental challenge than in southeastern Nevada. The Salt Lake road was the principle supply route to Pioche and surrounding area well into the 20th century.

Railroads helped shorten the long haul from Salt Lake City and by 1873 a railhead had been established at Provo, Utah, some 50 miles south of Salt Lake City. Here, Passengers began the sixty hour journey to Pioche. Competing stage lines publicized new or overhauled Concord stages, pulled by fresh four or six horse teams. All advertised that the schedule would be "on time". Such a possibility depended more on the elements than the skill of the drivers.

Winter conditions of mud and snow created a particularly difficult roadway and disrupted schedules were common. Often the Salt Lake stage had to be replaced by a sleigh when snow blanketed the high desert and drifts blocked passage through the mountain canyons. The celebrated Concord stage was used extensively in Nevada and was the pride of the Gilmer and Salisbury stage lines. The Concord stage, a product of the firm of Abbot Downing and Company, Concord, New Hampshire, was well suited to the rigors of the Salt Lake road where extreme heat and cold, rough mountain terrain and deep sandy deserts took their toll of lesser constructed vehicles.

Stage travel, while uncomfortable, was not particularly dangerous and did not discourage travelers from Pioche taking extensive journeys by stage and rail to San Francisco, Sacramento and New York. For the five year period 1872 - 1877 the Daily Record reported only five stage mishaps. No fatalities resulted but there were bruised passengers and several broken bones. The last reported accident occurred in 1910 when a wheel ran over a passengers foot while the disembarked passengers were holding the stage upright as it was being driven over steep ground in attempting to avoid several freight wagons that had blocked the roadway (Pioche Weekly Record, 21 May 1910:3).

Little information is available regarding the character and background of stage drivers and teamsters. Winther (1964:64-65) indicates that most western stage drivers possessed distinct personality traits which varied according to the personal experience of the individual. Hoffman (1980:44) states that handling animals took considerable skill and for that reason western society of the day ranked them just below steamer captains and above teamsters.

In Lincoln County there is no evidence that the stage driver and his work were considered more romantic or rewarding than many other occupations. Their work was hard with many hours spent in the sun and cold. Comforts and provisions could be as uncertain as the road. Drivers were representative of the people in the area. One can surmise that owners, Gilmer and Salisbury, would employ the most reliable people available at the prevailing wage. The transportation business was competitive and drivers were responsible for the welfare of the passengers,

the company equipment and the U.S. Mail, which was generally lucrative and helped keep the stage lines in business.

The teamsters were a different story. Their visibility was more pronounced than the jehus (yea-hoos) or stage drivers. This was possibly due to their greater numbers but more likely because they could not be ignored, as noted by the editor of the Delamar Lode (5 August 1896:3):

> Citizens in the upper end of town are annoyed constantly by seeing and hearing the abuse perpetrated on animals hauling freight to the mines and mill above them. There is hardly an hour in the day in which the sound of blows and shouts and curses of the savage, half-civilized brutes who drive most of the teams is not heard and it is not only disgusting to see and hear but is unnecessary, cruel and barberious [sic] to the dumb animals who are thus tortured.

Muleskinner and bullwhacker were the frontier terms used for drivers of wagons pulled by mule teams or oxen. Winther (1964:34) describes the teamsters as "... belonging by and large to a class of illiterates ... not the soberest of men who brawled long and hard before extended trips ... and known at times to have raided the liquor in the freight." Teamsters hauling silver bullion north to Salt Lake City had reputations of being less than honest. As reported in the local newspaper, they would load their wagons lightly at the mines and increase the load weight with the sands of the Escalante Desert before entering the rail head at Milford, where they were paid on the weight of the load (Pioche Weekly Record 25 November 1893:3).

While horses were exclusively used to pull the stages, horses, mules and oxen pulled the freight wagons. It was generally agreed, according to Winther (1964:34-35) that oxen were the most gentle and easy to feed because they could thrive on bunch grass and feed need not be carried aboard the wagons. This was less true in southern Nevada where grass was scarce. Mules needed less grain than horses and were more sure footed, would not panic in a tight situation, so were less prone to injury. Mules also had a distinct advantage in the hot climate of southern Nevada in that they could survive on less water than horses.

Size of teams varied with the job to be done. An 18 mule team hauled in 12 tons of freight including a "monster fly wheel" from Lodi, all in 12 days. In addition to mining equipment, freighters also carried the steam engine for the Bullionville-Pioche narrow gauge railroad and the new engine to run the presses of the Daily Record" (Pioche Daily Record 12 January 1874:3).

The freight wagon, a well constructed vehicle, evolved through trial and error and was a product of those who needed a functional, yet simply constructed vehicle. While durable, it could be repaired on the road and was as light in weight as the materials available would allow. While the wagon lacked springs, it flexed enough to survive fairly well on the poor roads in uneven terrain. The wagon box provided little structural support other than to hold cargo and distribute weight. Riding on the axle assembly it provided the flexibility and bore the forces applied to the wagon by the team.

The wagon box rode on hardwood (later, metal) bolsters fastened to the axle with the front axle turning on a pair of steel plates sandwiched between sections of bolster on the axle and wagon bed. A kingpin down through the center held the assembly together. The reach, resembling the tongue, tied the axles together allowing for the transfer of horizontal force through it rather than the bed. Power from the teams was transferred directly to the axle by chains. The wagon tongue served as a device simply to turn the wagon (Clawson 1985:127).

Size of wagons depended on the size of the load. Clawson (1885:127) states that a lead wagon would typically weigh 5,200 pounds and could carry a normal load of ten to twelve tons, up to a maximum of fifteen tons. This wagon measured some twenty feet in length, had a bed of less than six feet wide and side boards could be as high as seven or eight feet. A variety of this type of wagon could be seen on Pioche streets - from an 18 mule team hauling twelve tons of freight to small wagons carrying 5000 pounds or less (Pioche Daily Record, 12 January

1875:3). It was not unusual for heavily loaded freight wagons to have accidents resulting in tipped over wagons or the freight breaking loose from the wagon boxes.

Rate of travel for freight wagons and stages was relative to the terrain, road conditions and the number of stops along the way. Winther (1964:66) reports travel time for the Central Overland Stage at 9.29 miles per hour for the Missouri River to Sacramento run. The stage run from Milford, Utah to Pioche, a distance of 110 miles was reported to take 22 hours, an average rate of travel of five miles per hour (Pioche Weekly Record, 13 May 1893:3). Freight teams during the winter months required sixteen days to travel this same route of flat, sandy, desert and mountainous terrain (Pioche Weekly Record, 17 March 1893:3).

As railroad construction progressed south through Utah, wagon routes shortened but the rail did not replace wagons or stages as the primary mode of transportation and stage and freight lines prospered. Contributing factors were more passengers making rail connections at Milford even though the cost of stage fare was twenty dollars, the same cost as for a ton of bullion (Pioche Weekly Record, 21 April 1882:3).

By the spring of 1901 the Utah Pacific completed the rail line as far south as the town of Caliente, Nevada. In 1905 the first run was made from Salt Lake City to Los Angeles. In 1907 the Pioche to Caliente narrow gauge railroad was completed and immediately began to haul ore from the mines in Pioche to the railhead in Caliente. However, this line was not a common carrier and passengers continued to use the stage to Modena.

Even though railroads were in place stage coaches continued to be a valuable part of the transportation system. In 1910 the Pioche Transportation Company expressed hope that postal authorities would obtain permission for the stage to haul mail from Caliente to Pioche because the railroad through Condor Canyon was in constant disrepair due to flooding, delaying the delivery of mail. Appeals to Nevada Congressmen were necessary to restore mail service to the stage on a permanent basis (Pioche Weekly Record, 11 February 1911:2).

It was not until the arrival of the automobile that a drastic change took place in Lincoln County transportation. On November 6, 1915, the first gas station opened in Pioche (Pioche Weekly Record, (6 November 1915:3). Automobiles had been in use since 1909 but use was limited due to lack of roads. At this same time perishables were still brought to Pioche by wagon and team (Pioche Weekly Record, 5 November 1915:3). In January 1917, Lincoln County passed a $50,000 bond issue for road repair and authorized the purchase of an auto truck for use by the road inspector (Pioche Weekly Record, 5 January 1917:2)

By November the Pioche to Modena road was under construction. Officially known as the Pioche-Modena Highway, the route followed the general location of the Salt Lake wagon road.

Theory of Artifact Distribution

It is remarkable that features and relics of this early transportation system still can be found. We have walked several miles of the Oregon Trail in Oregon and the Butterfield Road in New Mexico and did not observe historic refuse on either road. Remoteness of the region, low population density, and absence of land development all contribute to the unique situation in southeast Nevada.

The overall plan for the project was to locate the road from Pioche to a point of termination that would be representative of one to two days travel. The Desert Springs stage stop, 36 miles east of Pioche, seemed appropriate. In the survey process all information was recorded that related to the physical aspects of the road, including discarded refuse, map location, vegetation, soils, topographic features and any salient information that might have influenced or have been concurrent with the road.

The archaeological focus of this research is on development of a base line model containing two components: 1) the physical location of the road in relation to the physiography and 2) an interpretive analysis of the cultural material including but not limited to, kind, location, amount, patterning, and

chronology. Cultural and behavioral traits were the focus for the analysis of both components.

Archaeology rests on the tenet that human behavior is patterned. Documented studies by Scott (1989) and South (1977) demonstrate that discard patterns of material goods reflect details of behavior. Artifacts located along a linear feature exhibit such patterning. The nature of the spatial distribution of the archeological material demands the archaeologist devise parameters to provide a systematic means of pattern recognition.

We recognized patterns by adapting South's Brunswick Pattern of Refuse Disposal (1977:47-80) to fit the disposal practices observed along the wagon road. The basic concept of South's theory is based on occupants of Brunswick Town, North Carolina, disposing of their refuse in a predictable manner in relation to their dwelling. Small items would be dropped through the floor, other refuse would be tossed out doors and windows. Remaining refuse would be carried out into the yard and street. Location of these artifacts indicated to South, not only location of the houses and streets, but also the location of doors and windows. Modification of this theory for use on a historic road not only locates the artifact in relation to the road but also serves as a means to interpret the relationship between the site (road), context, and function of the artifact.

A criticism of the use of surface artifacts is their susceptibility to transformational processes. Lewarch and O'Brien (1981:319) discuss the advantages and disadvantages of recognizing patterned behavior in prehistoric surface assemblages. They argue that while surface artifacts are susceptible to erosion forces, their distribution constitutes an appropriate source of archeological data, independent of the sub-surface remains. While the conclusion of Lewarch and O'Brien pertains to prehistoric lithic material, it should also apply to historic artifacts, particularly those of glass and metal.

Application of the Brunswick theory begins by dividing each side of the road into three parallel zones, termed, "drop", "toss" and "throw". The "drop" zone covers the road bed from wheel track to wheel track. All material goods found in this zone was recorded as having been dropped or fallen from a vehicle or domestic animal. The second zone is from the edge of the roadbed outward for a distance of 20 feet. Artifacts in this zone were considered as having been "tossed" from a vehicle or horseback. Beyond this zone is the "throw" zone. While it is not likely that many items were actually "thrown" into this zone from the road, it does allow for an explanation of artifacts found in this area by their association with other artifacts and the relationship with the road through distance.

Artifacts in the throw zone could either be isolates deposited by a single roadside activity or they could be the result of a "journey stop" which would include a number of artifacts representing several activities. "Journey stop", then, is a designation that indicated travelers paused and through some activity disposed of refuse. In most instances the artifacts indicate either rest, repair, or both.

Field Procedures

The field survey consisted of four pedestrian transects, two on each side of the road. The road was discernable through wheel tracks, changes in vegetation, gullies, or refuse. One archeologist walked in a wheel track, observing the area between both wheel tracks plus some 12 to 15 feet into the toss zone. The second archeologist walked 25 feet out from the road, on the same side, visually covering 12 to 15 feet toward the road and an additional 12 to 15 out, toward the throw zone. This process was then repeated on the opposite side of the road on the return trip. Heavy brush, gullies, and steep slopes often caused variance in this procedure. Accomplishment for an average day would be from one half to one and one half linear miles, depending whether or not we allowed ourselves to become distracted by sites not within the project area. All artifacts were identified by zone, located on a map, measured and their attributes recorded.

Description of Road Survey Sectors

As the field work progressed it become apparent that topography, vegetation, type of soils, and water flow had an effect on where the road was located as well as an influence on the recoverability of artifacts.

It seemed logical to separate the road into sectors based on this criteria in order to isolate changes in artifact recovery when they occurred. These Eight sectors were identified and are labeled "A" through "H". A synopsis of each sector follows.

Sector A. Initial efforts to relocate the Salt Lake road began some four miles from Pioche at a known relocation site. Working back from this site we relocated the road to within one-half mile of the main street, near the Raymond and Ely Extension Mine. Sometime in the past the road extended to the main street but this portion has been obliterated by the expanding improvements of the community.

The road near the town is difficult to locate due to a dense growth of shrubs and grass which obscure the wheel tracks. By careful inspection we located refuse along two parallel roads a quarter mile apart. They eventually join together one half mile east of Highway 93 and continue east, down the slope toward Patterson Wash. Once out of the dense Pinion-Juniper woodland the road is easily found and travels east, down the slope of the terrace.

On level terrain shrubs and grasses are filling in the rutted wagon tracks. In contrast, steeper slopes have turned the wagon ruts into gullies as deep as two feet and six to eight feet wide. The bottoms of these gullies contain iron wagon parts along with horse, mule and oxen shoes. This led us to believe the gullies were the original road bed. We used this criterion throughout the remainder of the survey.

The lower slope, above Patterson Wash is relatively flat and the road exhibits as many as four multiple road tracks, a characteristic found throughout the length of the road on similar topography. Our conclusion was these were "passing lanes", much as passing lanes on contemporary highways. At other locations some of the tracks were badly eroded giving the appearance that new lanes were developed when ruts became too deep to be manageable.

One mile east of Highway 93 the wagon road crosses a narrow gauge railroad. The crossing of the two facilities appear to be insignificant other than the error it caused in Myrick's (1963) location of the Bullionville railroad. Myrick's map (1963: 721) indicates the railroad heads east at the junction with the jeep road. In reality the jeep road is the Salt Lake road and Myrick erred in the location of the Bullionville railroad. The railroad, instead of turning due east, as shown on the map, heads northeast for approximately one and one-half miles then turns east along Patterson Wash. At the edge of the wash is a large historic site. The area is littered with trash and evidence of wooden structures. In addition there are excavations and large piles of brick. The relation of this site to the railroad, if any, is unknown.

Sector B. The names Hamlin Flat and Patterson Wash accurately describe the topographic features of Sector B. Hamlin Flat is about one and three quarters miles wide. Through the center of this alluvial fan courses Patterson Wash, an ephemeral , sandy, gravelly, watercourse about one-half mile wide. It was only after several days of fighting brush that we located the road designated by a quarter mile of occasional rock alignments. Only two cans were located in Sector B, other material probably was carried away by flood waters or buried in the alluvium.

Sector C. The road travels east up the slope of Patterson Wash to the top of an alluvial terrace. Here, we located a junction joining the Salt Lake road and, after a four mile survey, a road we determined to be the Dry Valley road, the latter connecting the farming area of Dry Valley with the Town of Pioche. The Dry Valley road survey yielded a paucity of artifacts as compared to similar terrain of the Salt Lake road leading us to conclude that local traffic behaved somewhat differently from the long distance freighters. Local wagons transported hay or produce rather than the heavy loads of cargo destined for the mines. Local wagons were in better repair and as a result lost fewer wagon parts. If locals carried food and drink it was not in disposable cans or bottles. Horses were better cared for and shoes replaced before they wore out and were lost on the road. Our conclusion is that there is a distinct difference in the amount of discarded refuse between a road used for local transportation and one used as a main line freight route.

Item	#	Item	#	Item	#
hole in cap can	273	ox shoes	4	purple whole bottles	1
green glass scatters	154	zinc jar lids	4	clear glass,whole	1
smashed cans	136	washers	4	purple dish scatter	1
brown glass scatters	131	blue glass scatters	3	spoon	1
can lids	107	miscellaneous cans	3	bucket	1
pieces baling wire	80	crown caps	3	hairpin	1
aqua glass scatters	59	mule shoes	3	biscuit cutter	1
purple glass scatters	42	jar glass scatters	3	fry pan	1
horse shoes	38	porcelain scatters	3	cooking pan	1
unidentified metal	24	windshield glass	3	pie tin	1
pails	22	oil can	3	wagon brake exten.	1
tobacco cans	21	window glass scatters	3	piece leather harness	1
hole in top can	19	whole green bottles	2	tumbler	1
pieces box iron	13	aqua whole bottles	2	cup handle	1
flat hinged cans	11	pink glass scatters	2	clevis	1
metal can fragments	11	harness buckles	2	wooden handle	1
pieces miscel. wire	11	metal cup	2	single tree clip	1
lids axle grease cans	11	metal button	2	wagon pin	1
square nails	11	piece pole spring	2	toy gun	1
fish cans	10	metal pot handle	2	porcelain doll head	1
pieces chain	10	whiffle tree hook	2	stake iron bracket	1
ceramic scatters	9	log cabin can	2	metal canteen	1
bolts	8	box rod handle nut	2	box rod nut and washer	1
meat cans	8	leaf springs	2	glass button	1
wire nails	8	metal rods	2	frag. king plate	1
sanitary cans	7			tele.insulator	1
black glass scatters	7			tele.insulator holder	1
amber glass scatters	7			piece wagon box rod	1
clear glass scatters	7			tele.insulator frag.	1
brown whole bottles	6			double tree staple	1
metal stripe	6			wagon wheel rim	1
pieces box wood	5			piece of tongue plate	1
coffee pot screens	5			reach pin	1
				length telephone wire	1
				piece of bolster metal	1
				barrel stave	1
				whiffle tree spring	1
				barrel stave	1
				shovel	1

Table 1. Artifact Counts on the Pioche to Desert Springs Wagon Road.

Observations on Sector C conclude that alternate routes were developed on steep slopes as well as on level areas similar to those we had seen in sector A. These steep slope roads were straight up and down the incline rather than contouring to reduce the grade. The reason for this was to keep the wagon or stage on an even keel that would not tip over due to the high center of gravity. The degree of slope could not exceed the ability of teams to negotiate it.

Sector D. Sector D, a broad, flat flood plain, has a dense stand of big sage, rabbit brush and black sage with deep, sandy loam soils. The road follows a small wash that now contains a series of gullies three

to four feet deep and six to eight feet wide with steep, vertical, sides. As many as three and sometimes four gullies run parallel to one another, indicating the number of once active roads. Surprisingly, the 172 artifacts recorded in two and one-half miles compared favorably with areas not impacted by gullies or water movement.

A journey stop, located at the mouth of the canyon in the west part of the sector, contained cans, baling wire, and a shovel, indicating that in this spot, someone stopped, ate, and fed livestock.

A significant observation in Sector D was the several alternatives available for road location. Instead of following up the drainage from Sector D into the narrowing canyon of Sector E, there was a option to follow down the Dry Valley road for a mile, then up a drainage to the next terrace. This route would be above the canyons and avoid the difficult cross drainages that the canyon route would eventually have to negotiate. This overland route would advance to the same location where the Salt Lake road descends into Rose Valley and with less effort. That this did not occur is an indication of an obvious desire to keep to drainage bottoms rather than ridge or mesa tops. Our observation is that the canyon bottom route allows a straight line-of-sight from Rose Valley to Pioche. This seems to have been a priority. Other alternative routes may contain less hazards and be less difficult but they did not maintain line-of-sight.

Sector E. Sector E begins at the mouth of a narrow canyon characterized by big sage, rabbitbrush and deep alluvial soils. Similar to the other sectors, it also has multiple roads and artifacts. Several miles beyond the mouth it leaves the canyon, ascending a moderate slope on the east side. Four roads are visible on the slope. At the top of the canyon the road continues east, forking several times into multiple roads which take different routes through and around cross drainages. Topography in this part of the sector is the most rugged encountered. Dropping in and out of drainages caused increased strain on wagons and animals as evidenced by the number of recovered animal shoes (16) and wagon parts (29).

Rose Valley is one half mile wide at its widest. It is mostly farm land settled in the 1850's. The Salt Lake road drops off the rim through a narrow, steep canyon and winds its way toward the bottom, 500 feet below. Near the bottom the wagon road is obscured by the modern county road.

Hauling loaded wagons and stages out of Rose Valley was quite a chore. At the top the teams rested, teamsters made necessary repairs to the wagons and harness and replaced lost shoes. A concentration of discarded material indicated a journey stop of some proportion. Twenty two transects at three meter intervals produced 65 artifacts in the throw zone. Included were cans, bottles, animal shoes, tack and wagon parts. One interesting item was a harness keeper with the number 1862. This could be a date or inventory number. If a date, it was probably a Civil War item which came west after the war.

Maintenance of wagon wheels is indicated by a lid from a can of Frazer Axle Grease. Six additional lids were recorded in Sector E. An interesting note is that we did not find a can to fit the Frazer tops. Baling wire, both full rounds and pieces were recorded. Pieces of baling wire were used to repair and fasten all manner of items including chain, metal hooks, broken spokes and pieces of unidentified objects, all attesting to its importance as a resource for repairs. The full rounds were from bales of hay.

Sector F. Sector F includes that portion of the road that crosses Rose Valley. No survey was done on this private land. Rose Valley was the first available water for wagons after leaving Pioche and the last available water for travelers headed toward the boom town. Names and dates inscribed on the tufa cliffs indicate travelers rested here before continuing their journey. The oldest date observed was 1873.

Leaving Rose Valley, the road enters Immigrant Wash, a heavily eroded, brushy canyon, and a major drainage flowing west from the summit of the White Rock Mountains. No artifacts or evidence of a wagon road is visible until the junction with Serviceberry Canyon. This junction is the end of Sector F and the beginning of Sector G. Beyond this

point the road and refuse (see following section) are similar to those of other sectors.

Sector G. The wagon road is fairly intact for the first mile above the entry of Serviceberry Canyon. Thereafter it becomes intermittent as it winds along the narrowing canyon bottom for another mile and a half to Little Summit. At Little Summit the road abruptly exits the canyon and winds around a small knoll to the summit proper. The exit route clearly demonstrates how wagons maneuvered steep slopes by keeping the "bow" of the wagon up or down the slope, not allowing the weight to shift to either side which would tip the vehicle over. This portion of the road is now a large gully, four feet deep and six to eight feet wide. Three other roads parallel the original. A journey stop at Little Summit is indicated by a refuse area measuring 150 feet by 200 feet and containing a variety of historic and contemporary refuse.

Sector H. Sector H cuts across the main summit of the White Rock Range. This sector is characterized by rugged topography, narrow canyons and an abundance of exposed rock. These characteristics have an influence on road location as well as artifact recovery.

From Little Summit the wagon road drops abruptly into Deer Lodge Canyon. Where the canyon is narrow, the county road prevails; as the canyon widens remnants of the original wagon road can be observed. While the county road climbs out of the narrow, rocky corridor, the wagon road had no choice but to continue up the

Artifact Type	Discard Zone				
	Drop	Toss	Throw	Journey Stop	Total
Transportation Group					
Animal Shoe Nails	3	0	0	1	4
Tack	2	0	0	3	5
Shoes	40	3	1	1	45
Axle Grease Can Lid	2	7	0	2	11
Square Nails	8	1	0	2	11
Wire Nails	6	2	0	0	8
Wagon Parts	54	17	0	5	76
Wire Bale (Full)	14	6	3	5	28
Wire Bale (Part)	36	11	0	5	52
Other Wire	5	2	0	4	11
Other Transportation	28	12	0	8	48
Subtotal	198	61	4	36	299
%	67	20	1	12	100
Domestic Group					
Bottles	67	333	6	27	433
Cans	110	356	9	106	581
Kitchen Ware	2	12	5	0	19
Personal	13	6	0	0	19
Other	19	8	2	1	30
Subtotal	211	715	22	134	1082
%	19	67	2	12	100
Total	409	776	26	170	1381
% in Zone	30	56	2	12	100

Table 2. Counts of Domestic & Transportation Related Artifacts

narrow drainage. Here, wagon tracts are deeply worn into the hard ignimbrite rock. In some locations the deep ruts may have aided vehicles from sliding off into a more perilous circumstance. Stage coach passengers must have experienced some apprehension along this part of the journey. Out of the canyon, the road continues up slope to the top of Big Summit. Wagon parts and animal shoes indicate the long, straight gully up the slope to the summit proper was the original route.

At the top of Big Summit, the divide before descent down Prohibition Wash, is a large area of both past and contemporary human activity. Scattered refuse and a prominent gully indicate the location of the road. Off to one side is a 16 foot narrow gauge rail that may have been destined for the Bullionville railroad.

Near the Utah border the wash broadens and the road is lost among the pastures and cultivated fields. North from the mouth of the wash scattered refuse again indicates the location of a road, however the integrity has been compromised so that recordation of artifacts was not possible.

Artifact Analysis

Table 1 presents the complete assemblage recorded along the Salt Lake road. Glass scatters indicate the remains of whole bottles, that is, 59 aqua glass scatters indicate 59 aqua bottles were recorded. Individual shards found along the road were not recorded unless they could be related to the original bottle.

Several approaches are used to synthesize the refuse material for pattern analysis. One approach is the functional grouping of items in relation to their location on the landscape by provenience. Table 2 presents the complete assemblage by provenience zone, classified by two principle groups: *transportation* and *domestic*.

An analysis of Table 2 shows animal shoes, wagon parts and baling wire make up 67 percent of the transportation assemblage. Seventy-two (72) percent of these artifacts were located in the drop zone, indicating this distribution was a result of wear and breakage. This supports the theory that road location can be determined by the location of wagon parts and animal shoes in areas where the road trace is not otherwise distinguishable. On the other hand, while cans and bottles make up 94 percent of the domestic group, only 17 percent were found in the drop zone while 68 percent were located in the toss zone. This indicates a conscious effort was made to toss the majority of this type refuse away from the road bed.

The designation of Journey Stop appears to be a valid designation for interpreting the clustering of refuse items at this distance from the road and also for describing an activity related to the traveler. The journey stop loci has a variety of refuse material, usually cans, bottles, wagon parts and baling wire.

A second approach to analyze refuse material by patterning was to examine changes in ratios between artifact types that could be the result of particular behavioral traits. Raw numbers of artifacts by sector cannot be compared because quantities are a product of the length of the sector and length is an arbitrary constraint based on topographic reflected considerations. If there was no variability activities in various road sections proportions of artifact types should remain fairly constant. Variability in proportions of artifacts between road segments were examined to determine the cause.

For instance, Chart 2 illustrates the number of cans and bottles recorded in sectors A through H. Note that sectors B/C and E/F are combined due to the scarcity of artifacts in Sectors B and F if examined alone.

Chart 1 illustrates two items of significance: 1) the large number of bottles in Sector A, and 2) the fairly constant proportions of cans and bottles in the other sectors. The ratio of cans to bottles for the total length of the road is 3:2. The dramatic change in the can/bottle ratio (2.5) in sector A indicates a behavioral change. Since 85 percent of the recorded bottles held liquor, we can observe a dramatic increase in liquor bottles that were discarded between the town of Pioche and Patterson Wash. Travelers looking forward to the long journey on the Salt Lake road must have left town well fortified to meet the challenge of the journey. By the time

Patterson Wash came into view a good many bottles had been emptied and discarded along the road.

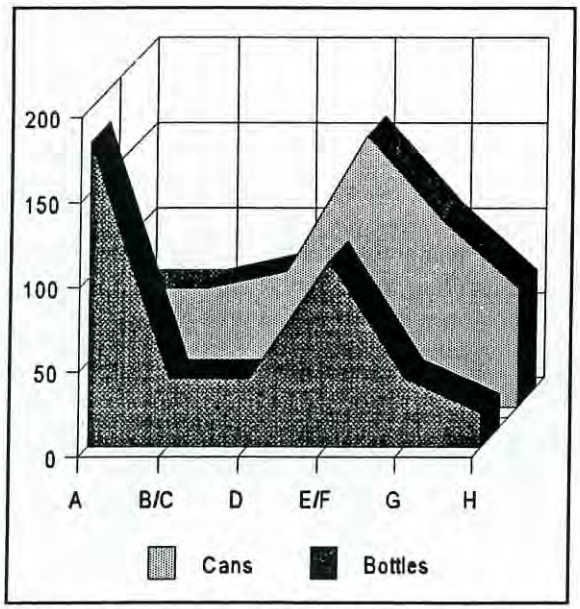

Chart 1. Numbers of Bottles and Cans by Road Section for the Pioche to Salt Lake Wagon Road.

Chart 2 illustrates the number of wagon parts and animal shoes distributed among Sectors. These items are distributed through a process of breakage and wear. The ratio of wagon parts to animal shoes for all sectors is 7:4. While there appears to be some fluctuation in ratios between the two types of artifacts, no dramatic changes are apparent, indicating the discard of wagon parts and animal shoes is relatively constant.

The remainder of the artifacts shown in Table 2 show no great degree of variability in proportions. The distribution of artifacts along the road may be interpreted to show where specific activities or actions occurred and may be useful comparative information for other historic roads.

While the presence of specific artifacts may be interpreted as defining specific cultural activities or processes, the absence of particular artifacts may also be significant. Absence of activity specific refuse does not necessarily mean that a particular activity was not carried out. It may also indicate that while the activity did occur, refuse from that activity was not deposited. This applies to passenger carrying stage coaches. While the historic record indicated 45 years of stage travel over the Salt Lake road there is no archeological evidence to indicate use of the road by these vehicles. Inspection of several stagecoaches by the authors confirms the high quality of workmanship and lack of metal in construction. These traits together with proper maintenance probably explain why parts from Concord stages were not recovered along the road.

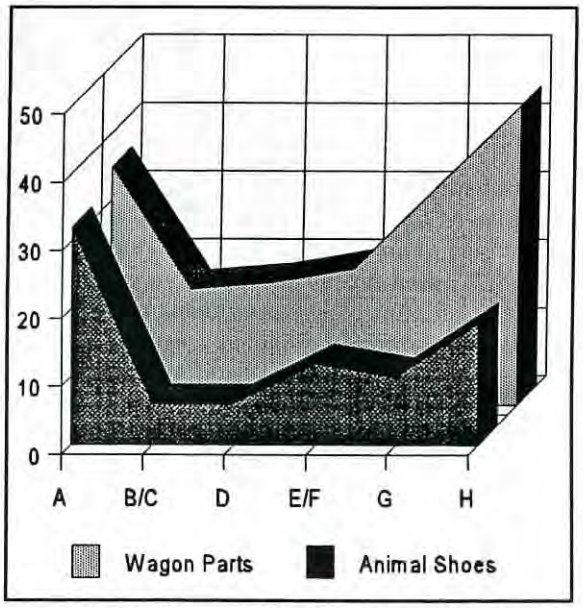

Chart 2. Numbers of Wagon Parts and Animal Shoes by Road Section for the Pioche to Salt Lake Wagon Road.

On the other hand, specific artifacts may be considered "time markers" and useful in determining the chronology of the road when historic documentation is lacking. The conundrum that exists is that historic artifacts have three dates; the beginning and ending date of manufacture and the date of deposition. Dates of manufacture of some items may cover many decades due to overlapping techniques in manufacture. Other items may have a short period of production and reliable manufacture dates are more certain. It is probable that food and

drink items in bottles and cans shipped to the West did not become obsolete sitting on the shelf but were used immediately because of need.

Summary

Archaeological study of the Pioche to Salt Lake road gives an insight on the people that traveled the road. The road location was determined largely by the location of dependable waters. The first freighters, pioneering the route for the future, drove the drainage bottoms and wherever possible used line-of-sight between both geographic and cultural features. Freighters learned how to negotiate steep slopes, make changes in the route when necessary and in general survive the long and sometimes dangerous journey through the desert and over the mountains.

Discarded refuse indicates freighters ate on the move, discarding food and drink containers in a predictable manner, much like contemporary society. Equipment failures meant stopping for repairs - a time also to rest and perhaps do needed maintenance on the freight wagon and team. If one were hauling canned goods it would not be unusual to partake of the contents of canned fruits and vegetables as well as canned meat and fish. Alcoholic beverage was a staple for the teamsters as well as an important commodity in the local economy. All manner of goods came from trade centers in the eastern United States and Europe.

The assemblage indicates a male dominated travel route. Other than two buttons and one hairpin, refuse that might be related to women's activities also includes items used for house keeping and preparation of food. However, travel by stage was popular and accounts of town women taking stage trips to Salt Lake was a common occurrence as reported in Pioche news papers.

Transportation of people and goods by wagon and team did not readily succumb to new technology of the industrial age. The railroads shortened routes and time of travel but it was not until the advent of the automobile that horse drawn wagons became obsolete - and then automobile roads often followed many of the same routes established by the freight wagons and stage coaches.

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Artifact Notes

The following illustrations were useful in reconstructing the history of the area served by the Salt Lake road. In addition to the formal drawings, many sketches were made of artifacts that were unfamiliar or appeared unusual to the archaeologists. These sketches were later used to determine identification through archival research.

Figure 1. Max Oberfelder whiskey bottle.

Figure 1. This is a reconstructed shoo-fly whiskey bottle originally sold in Eureka, Nevada. Most whiskey was shipped to the western frontier in kegs and casks and bottled by bartenders in the towns or sutlers at the military forts. Entrepreneurs like Max Oberfelder advertised on the bottles which received considerable distribution throughout the area. Oberfelder and Harrison were partners in a general merchandise store in Eureka wholesaling and retailing liquor. In 1878, at the peak of the mining boom, there were 100 saloons in Eureka. In that year Oberfelder dissolved the partnership with Harrison and established his own retailing business. When the bubble burst Oberfelder was out of business. The Oberfelder flask dates between 1878 and 1881 (Halabird and Haddock 1981).

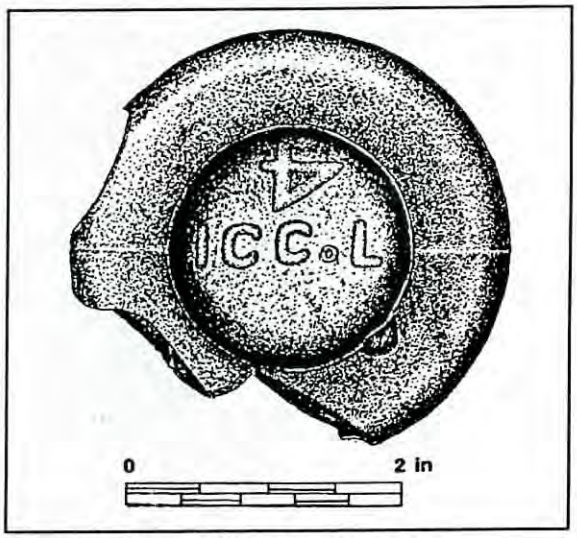

Figure 2. Illinois Glass Co. Bottle base.

Figure 2. This is a bottle base manufactured by the Illinois Glass Company of Alton, Illinois. This company was in business from 1873 until 1929. I. G. Company was one of the largest bottling firms in the country. In 1905 they made a million bottles, all by hand. The inverted 4 could be a furnace number which would date the bottle circa 1880. The company was to become progressive in manufacturing and chose a somewhat homely slogan: " Glass with class that doeth surpass" (Toulouse 1971:265-267).

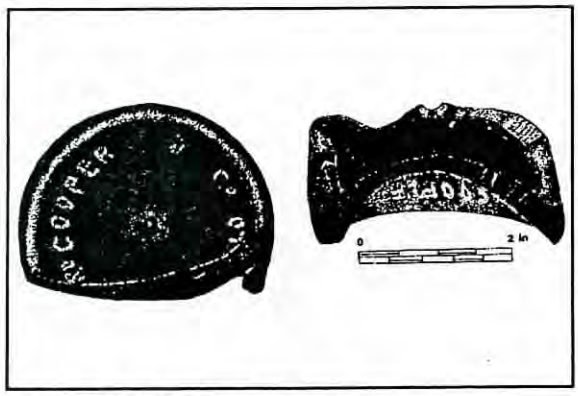

Figure 3. R. Cooper bump-up.

Figure 3. This is a R. Cooper black glass bump-up bottle base with a pontile mark in the center. Richard Cooper and Company of Portebello, Scotland were distillers and exporters from 1868 to 1928 (Toulouse 1971). Black glass (actually a deep, olive green) was used before it was fashionable for customers to want to see the contents of the bottle. Pontile marks are circular scars of glass where the pontile was broken away from the base of the finished bottle. Rock (1981) states the majority of pontile bottles were made prior to 1870.

Figure 4. Cutter Quart Whiskey Bottle.

Figure 4. This is an 1880's bottle (Wilson 1981:132) produced in a mold except for the lip and collar which was set on the bottle with a lipping tool. This Cutter quart whiskey bottle is heavily embossed

with what is perhaps the original cork still inside the bottle.

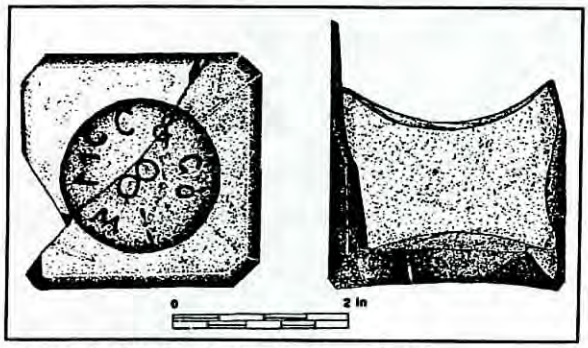

Figure 5. McCully & Co. panel bottle.

Figure 5. This is a reconstructed base and partial bottom of a McC & Co. panel bottle. One of the early glass makers was the William McCully Company of Pittsburgh, Pennsylvania. Over the years the company had seven makers marks, all a variation of the family name. Those with "Co" were manufactured between 1841 and 1886 (Toulouse 1971:351).

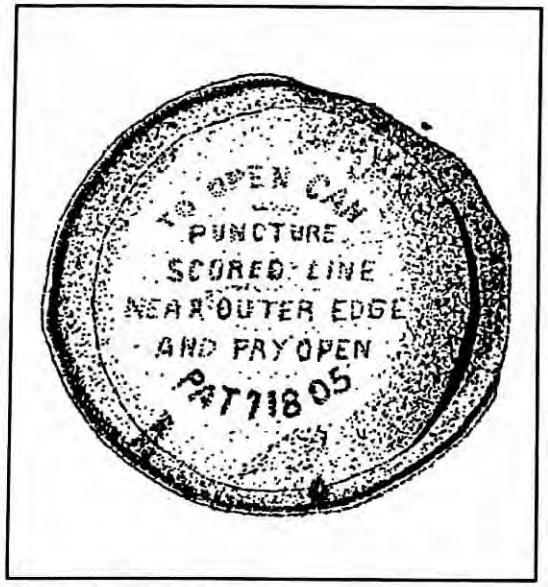

Figure 6. Pry open can.

Figure 6. This can has a patent date of 1905 along with explicit directions on opening. The opposite end was opened with a device indicating the user may have been illiterate or perhaps this new technology was a failure.

Figure 7. Axle grease can lid.

Figure 7. Lid from a can of Frazer axle grease. Dates of Frazier cans are obscure but Hafen (1975) mentions its use in the 1860's. The Frazer Company was later purchased by Sears Roebuck and Company but that date is unknown. The Sears catalogue of 1897 depicts a much deeper and more elaborately embossed friction lid.

Figure 8. A very worn, smallish mule shoe and large, draft horse shoe. The mule shoe was torn from the hoof as evidenced from the erupted nail holes. The shoe shows heavy wear on the toe and the outer edge of the right branch where the fuller has been completely worn away. The horse shoe shows slight wear but the shoe broke in half at the toe, probably because of a defect in the metal, perhaps caused by a gas bubble. Once the shoe was broken it pulled from the hoof and since the nails are still intact it probably broke off the left side of the wall of the hoof, possibly laming the animal. This shoe has heavy toe and heel caulks, characteristic of a shoe used during wet, muddy weather.

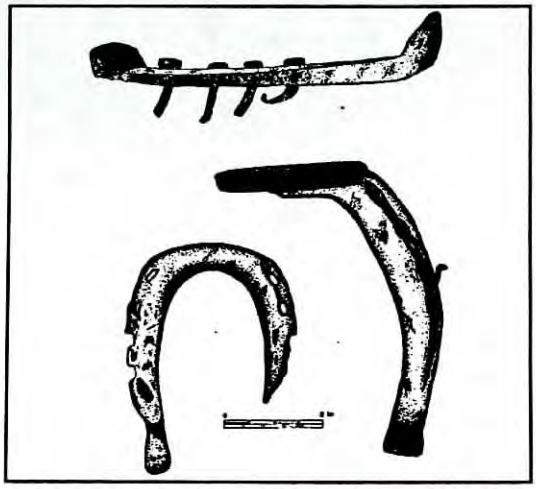

Figure 8. Mule shoe (top) & Draft horse shoe.

Timber-R-R!! Archeological Investigations at a Late 19th Century Sawmill in Lincoln County, Nevada

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Abstract

Historical archeology methods were applied to the study of a late 19th century sawmill, located in the Clover Mountains of Lincoln County. Data from archival sources, family histories, and archeological field investigations were synthesized to more completely reconstruct the history of this enterprise and to identify its role in the development of the region. Newspaper articles, mortgage deeds, and informants' accounts provided information relating to the principal owners of the sawmill, during the period from 1870 until 1910. Archeological inventories at various locations in the Clover Mountains corroborated much of the archival and anecdotal evidence concerning the final operation and location of the sawmill.

Introduction

From the late 1860s until the first decade of the 20th century, small local sawmills provided milled lumber for the mining camps, railroads, and growing settlements of Lincoln County, Nevada. These ventures employed crews of "fallers", who skillfully plied their cross-cut saws to fell the ponderosa (*Pinus ponderosa*) and pinyon pine (*Pinus monophylla*) that forested the mountain ranges of southeastern Nevada.

Typically, two fallers worked together to carefully cut down a tree, assuring that it would fall so as not to split or damage the trunk. In order to position the tree, an undercut or felling notch was made on the side to which the tree would fall. The cross-cut saw was placed on the opposite side of the trunk from the felling notch, and the two men began sawing the felling cut (Figure 1). Metal wedges were inserted into the deepening cut, to keep the saw from binding and to assure that the tree would fall in the desired location. Oil was periodically sprinkled on the saw to reduce friction and cut through the heavy pitch that exuded from the pines (Vaughn and Ritter 1992:39). The tree would ultimately snap and the fallers would quickly withdraw their saw, giving the warning of "TIMBER-R-R!" to all in the vicinity.

When a sufficient number of trees had been felled, teamsters would harness teams to drag the logs to the mill. In Lincoln County, horses or mules were the most commonly used draft animals, because of their speed and versatility in the woods (Edwards 1980:123). The drawback to their use was that horses and mules tended to be excitable in hazardous situations, causing injury to themselves or the teamster. While working with the logs, the animals would often pull off their shoes; valuable time was lost as the blacksmith or a farrier forged, shaped, and nailed on a replacement. In very rugged terrain, teams of oxen were often preferred for dragging felled timber, because they were sure-footed and would remain calm even under the most dangerous circumstances (Ibid).

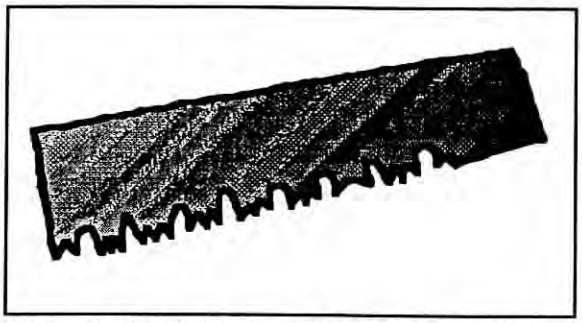

Figure 1. Detail of cross cut sawblade used for felling timber.

Sawmills in Lincoln County were generally open-air facilities with no structures constructed to shelter the equipment (Ferris 1989, 1993). Power for the sawblade was provided by a steam engine,

sometimes called a "steam donkey", that was designed to be moved from one location to another.

A comparison of three engines used at small sawmills in Lincoln County has demonstrated that they were somewhat similar in both size and attributes (Ibid). All were made from cast iron, produced by foundries in the eastern United States during or just after the Civil War. Each engine consisted of the following basic components: a horizontal steam chamber and fire box, measuring between 12 and 14 feet long; two unequal-sized flywheels, the larger of which had a diameter of 6 or more feet; pistons and drive shafts; pressure release valves; and a vertical smokestack that could exceed 20 feet in height (Figure 2). The cylindrical steam chamber was commonly supported on a cast iron stand, while the rectangular fire box was designed to be bolted to a wooden platform or other temporary foundation. Metal rail or wooden skids covered by iron runners could be attached to the base of the steam engine in order to facilitate its transport. Each of these "portable" engines was estimated to weigh between 6 and 10 tons.

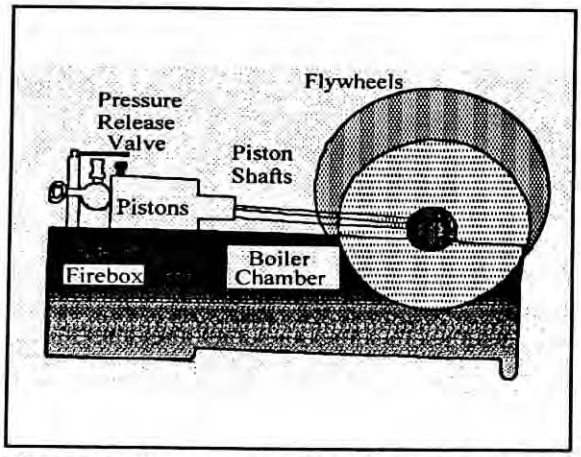

Figure 2. Schematic of a portable steam engine, similar to those used to power Lincoln County sawmills.

During operation of the sawmill, workers fed firewood and water to the engine, generating steam pressure to drive the pistons and, in turn, the flywheels. A drive belt, installed over the larger flywheel, turned the circular sawblade. Mounted on a separate unit behind the engine, the steel sawblade commonly measured between 36 and 60 inches in diameter. A cast iron conveyor track system, called a carriage track, was also powered by the steam engine. Logs on the carriage track were initially pulled past the blade to remove the bark and square or "dog" them for finishing. Successive passes through the blade planed the rough cut logs into mining timbers, railroad ties, and building materials. A skilled mechanic, known as a "donkey doctor", was employed whenever repairs to the steam engine were necessary (Vaughn and Ritter 1992:39). After milling, the finished lumber was then freighted by wagon many miles over rugged terrain to the mining camps and settlements of Lincoln County. Whenever the nearby timber stands were depleted, the sawmill equipment, including the multi-ton steam engine, was moved by teams to a new location and the mill reestablished.

Research combined archival, anecdotal, and archeological data to reconstruct the history of one late 19th century Lincoln County sawmill, locally known as the Clover Valley sawmill. This reconstruction includes a discussion of the geographic, geologic, and environmental setting of the study area, as well as the results of archival research and archeological investigations in the Clover Mountains.

Environmental Setting

The Clover Mountains are a rugged, heavily forested range, located approximately 10 miles southeast of Caliente, Nevada (Figure 3). The range is bounded on the west by Meadow Valley Wash, on the east by the Beaver Dam Wash in Utah, on the north by Clover Creek, and on the south by the Tule Desert (Tschanz and Pampeyan 1970:102). The central mass of the range is characterized by several peaks, including Sawmill and Ella, which exceed 7500 feet in elevation.

Geologic processes create the general conditions that account for the presence of abundant timber in the Clover Mountains. Nevada is part of a physiographic province known as the Great Basin, which has formed as the region was pulled apart or extended from east to west. The Great Basin broke along north-south faults; ranges were uplifted and intervening valleys subsided, producing the

dominant north-trending landforms of the province. In this portion of eastern Nevada, however, the dominant north-south landforms are missing. Instead, a broad east-trending upland is present, bisected by the stream of perennial Meadow Valley Wash, through Rainbow Canyon. This upland formed as a result of two factors: eruptions from the Caliente caldera complex during the Tertiary (from 13 to 23 million years ago) and subsequent uplift of the volcanic materials. Explosive eruptions of ash-flow tuff and lava from the Caliente caldera complex created the highly resistant rocks of the Clover Mountains (Rowley and others 1995).

Figure 3. Location of the Clover Mountains in Lincoln County, with county boundaries as delineated in 1880.

When eruptions in the Caliente caldera complex ended, approximately 13 million years ago, uplift began along east-trending faults which bordered the northern and southern edges of the complex. Uplift was partly due to late intrusions of molten magma beneath the calderas; in addition to faults, such intrusions form as expressions of the east-west extension in the Great Basin (personal communication P. Rowley 1996). Episodes of uplift created the central mass of the Clover Mountains.

Weathering of the materials erupted from the Caliente caldera complex has produced the gravelly, porous soils of the Clover Mountains. The rhyolitic/welded tuff caps of the mountain peaks have resisted erosion, maintaining their high elevations. These peaks capture seasonal precipitation, creating a favorable moisture regime for woodlands. As a consequence of the above-noted environmental factors, the Clover Mountains support dense stands of pinyon and ponderosa pine, as well as Utah juniper (*Juniperus osteosperma*) and occasional white fir (*Abies concolor*).

The study area for this research occurs in the northeastern Clover Mountains (Figure 4), on public lands administered by the Bureau of Land Management. The following sections describe the history of the Clover Valley sawmill and its role in the development of Lincoln County. The results of archeological field investigations at the last location of the sawmill are also discussed.

Figure 4. Location of the study area in the Clover Mountains, Lincoln County, Nevada (USGS 1:250,000 scale topographic map with 5,000' contour accentuated).

Historical Background

Archival materials relating to the early years of the Clover Valley sawmill are unavailable. An account in the *Pioche Daily Record*, dating from November 15 of 1873 (3:2), suggests that the steam engine may have first been owned by a James Culbertson. During the mid-1860s, Culbertson was reported to have set up one or more sawmills in the central Clover Mountains and hired crews to cut timber (Ibid). Milled lumber was in demand at that time for the mines and mills of the Pahranagat mining district, located approximately 100 miles to the west of Culbertson's sawmill. It cannot be conclusively known whether this initial operation included the equipment which later became part of the Clover Valley sawmill.

By 1869, the market had shifted to the new Meadow Valley silver mining district, situated in the vicinity of Pioche, Nevada (refer to Figure 3). Pioche soon became the most important mining center in southern Nevada (Figure 5). One of the district's pioneers was Stephen Sherwood, who recorded his claims in the Meadow Valley District on March 18, 1864 (Angel 1881:60). Sherwood had initially come to Lincoln County with General Connor's Volunteers from Salt Lake City, Utah, in order to quell reported troubles with the local Paiutes *(Pioche Daily Record* 11 December 1873:1). He and several other Volunteers remained in the region to explore for ore-bearing deposits.

In the autumn of 1865, Stephen Sherwood traveled east to his home state of Illinois, in order to solicit capital for the development of his claims. He returned in the spring of 1866, accompanied by his two brothers, William H. and Otis P. Sherwood, as well as other family members interested in the promise of mining riches in eastern Nevada. In 1873, Stephen Sherwood lost a lengthy battle for control of his claims in the Meadow Valley District. His opponents were W.H. Raymond and J. Ely, both wealthy entrepreneurs who held substantial interests in the Pahranagat District. Raymond and Ely successfully argued in court that Sherwood had not completed sufficient development work to validate

Figure 5. Pioche, Nevada, circa 1873 (Photo courtesy of the Elbert Edwards Collection, Nevada State Historical Society, Reno, Nevada).

his claims and were awarded control of the most valuable properties within the Meadow Valley District (*Pioche Daily Record* 12 April 1873:1).

Sherwood's brothers, William and "O.P.", decided to capitalize on the growing demand for lumber in the booming silver district rather than risk their financial futures in mining. During March and April of 1870, the Sherwood brothers purchased several timber tracts in Lincoln County and the adjacent ranges of southern Utah. On July 8, 1870, they paid James Culbertson $5,800 for his sawmill interests, which included 640 acres of timber land in the Clover Mountains, approximately 12 miles south of Caliente, Nevada (*Lincoln County Book of Deeds "D":17*).

Between 1870 and 1873, Sherwood and Brother, as the partnership was known, acquired a total of 1,200 acres of timber tracts, as well as steam engines and equipment for sawmills in the Clover Mountains, the Wilson Creek Range, the Pine Grove Mining District of Beaver County, Utah, and the Hamblin Valley of Utah. Their lumber business was soon in full swing, employing dozens of fallers to cut timber. The partnership purchased weekly advertisements in the Pioche newspaper to offer mining timbers and milled lumber for immediate delivery.

During this period, Lymon L. Woods of Clover Valley and other local teamsters worked for the Sherwood and Brother, freighting lumber into Pioche (Edwards 1980:8). On November 21, 1872, the editor of the *Pioche Daily Record* (3:3) reported that Main Street in Pioche was so clogged with the mule teams of lumber freighters "that pedestrians were compelled to wind their way around the teams" (See Figure 6).

A month later the local newspaper editor interviewed George W. Crouch, who was operating a sawmill for Sherwood and Brother in Utah. Crouch stated that the "immense lumber business" operated by the partnership was paying out between $40,000 and $50,000 monthly for the freight of lumber, "from which some idea can be formed of the extensive character of their business" (*Pioche Daily Record* 18 December 1872 3:2). The *Pioche Daily Record* reported on May 23, 1873 (4:3) that O.P. Sherwood, "the king lumber and sawmill man of southern Nevada" had recently visited his sawmills, located approximately 35 miles distance from Pioche. The newspaper also noted that "his timber tracks are alive with choppers" (Ibid).

The partnership enlarged its retail lumberyard at the north end of Pioche's Main Street during November of 1873. All types of milled lumber, including mining timbers and building materials made from yellow (ponderosa) and pinyon pine were available for immediate purchase at the yard. Sherwood and Brother also invested heavily in other Pioche real estate, holding mortgages on numerous buildings, including the Pioche Theater, other businesses, and building lots within the town limits (*Pioche Daily Record* 21 November 1873 3:2).

Their financial empire began to crumble during the following year. Late in 1873, local newspaper articles hinted that Pioche's boom was slowing, with dull times reported "in consequence of the great depression and stringency in the money market" nationwide (*Pioche Daily Record* 23 November 1873, 1:1). The Sherwood brothers appeared in Lincoln County District Court on several occasions, suing to recover back due mortgage payments on their real estate holdings. Although the society page editor for the local paper observed that Mrs. William H. Sherwood and her sister-in-law Mrs. O.P. Sherwood were seen at a February 8th Masquerade Ball in "costumes which were very rich and elegant", the partnership was obviously overextended in its investments (*Pioche Daily Record* 10 February 1874 3:3).

On March 13, 1874, Sherwood and Brother assigned their holdings to John Rice as Trustee, stating that they were "indebted to divers persons in considerable sums of money which they are at present unable to pay in full" (*Lincoln County Miscellaneous Records Book C-1:149-178*). In the event that the partnership could not fulfill its obligations, including a mortgage to Wells Fargo and Company for $30,000 at 2.5 percent per month, the properties shown on the assignment deed were to be sold to pay the more than 20 creditors with claims against Sherwood and Brother. The attached properties included the steam engines from the Clover Valley, Wilson Creek, and Utah sawmills.

Other salable goods itemized in the assignment were 100,000 (board) feet of sawed logs at the Clover Valley sawmill, 55 yoke of oxen, 28 head of horses and mules, and 20 different types of wagons.

succeed in the lumber business. In the spring of 1882, the *Pioche Weekly Record* (24 June 1882 3:3) reported that local teamsters were hauling lumber from the Clover Valley sawmill to the new silver district near Bristol, approximately 25 miles north of

Figure 6. Freighters and wagons in Pioche, Nevada, circa 1875 (Photo courtesy of the Elbert Edwards Collection, Nevada State Historical Society, Reno, Nevada).

Subsequent transactions in 1876 and 1878 document the liquidation of all assets held by Sherwood and Brother. On December 9, 1876, John Rice as Trustee sold the properties assigned by the Sherwoods to Wells Fargo for $20,000. The notes to Wells Fargo had remained unpaid since the spring of 1874 (*Lincoln County Book of Deeds, Book O: 45-50*). On January 8, 1876, real estate in Pioche was conveyed to satisfy a debt of $1,281 incurred by "the late firm of Sherwood and Brother (*Lincoln County Book of Deeds, Book O: 353*). William H. and O.P. Sherwood disappeared from the archival record within a decade after the demise of their once-successful business venture.

The Clover Valley sawmill equipment changed ownership several times during the decade of the 1880s, as other local entrepreneurs attempted to

Pioche. Operation of the sawmill was dependent on lumber contracts from the mines. When the silver market collapsed in the late 1880s, the milling of lumber also came to a halt.

In January of 1889, the *Pioche Weekly Record* (12 January 1889 3:2) reported that a Charles Lytle had leased the Clover Mountains sawmill and was milling lumber for the local market. A revival of mining activity at the Raymond and Ely silver properties near Pioche had stimulated the demand for mining timbers and building materials. The newspaper observed that the availability of lumber at reasonable prices might "stop the general razing of frame shanties in town whenever a little lumber is needed for general repairs" (Ibid).

Early in 1890, Lincoln County residents were

excited by the prospect of a new railroad in the region. The Nevada Pacific Railway, a subsidiary of the Union Pacific, proposed to construct a rail line from Salt Lake City to Pioche, with the possibility of an extension of that line to California. The company began acquiring lands in Lincoln County for the right-of-way and offered contracts for construction materials to local suppliers (Hafen and others 1979:20).

In March of 1890, Charles Lytle went into partnership with Lymon L. Woods and Woods' son-in-law George Edwards to operate the Clover Valley sawmill. During the boom years of Pioche, Woods had freighted lumber for Sherwood and Brother and was familiar with the Clover Valley sawmill operation. His son-in-law George Edwards was also an experienced freighter and a blacksmith, capable of making repairs to the sawmill equipment or forging replacement animal shoes (Edwards 1980:46). The new partnership secured a contract from the Union Pacific for 750,000 feet of heavy timbers to be used in the construction of the new railroad (*Pioche Weekly Record* 1 March 1890 3:2). Later that year, Woods and Edwards purchased the sawmill equipment from Lytle and worked feverishly cutting timber in the Clover Mountains to fulfill additional railroad contracts.

In 1892, funding shortages halted construction on the Union Pacific line. Woods and Edwards were compelled to solicit other local orders to keep the Clover Valley sawmill running. Their milled lumber was used to build many of the homes in Panaca and the one-room school (See Figure 7) at Barclay, Nevada (Edwards 1980:18). George Edwards also made coffins, carefully selecting good quality lumber for the task and finishing the boards at the sawmill. From 1892 until 1909, the sawmill provided mining timbers and building materials for the new Ferguson gold mining district and its principal camp of DeLamar. When construction resumed on the railroad in 1902, Woods and Edwards again received lucrative contracts from the Union Pacific for bridge timbers and railroad ties. The Clover Valley sawmill also prepared building materials for the new

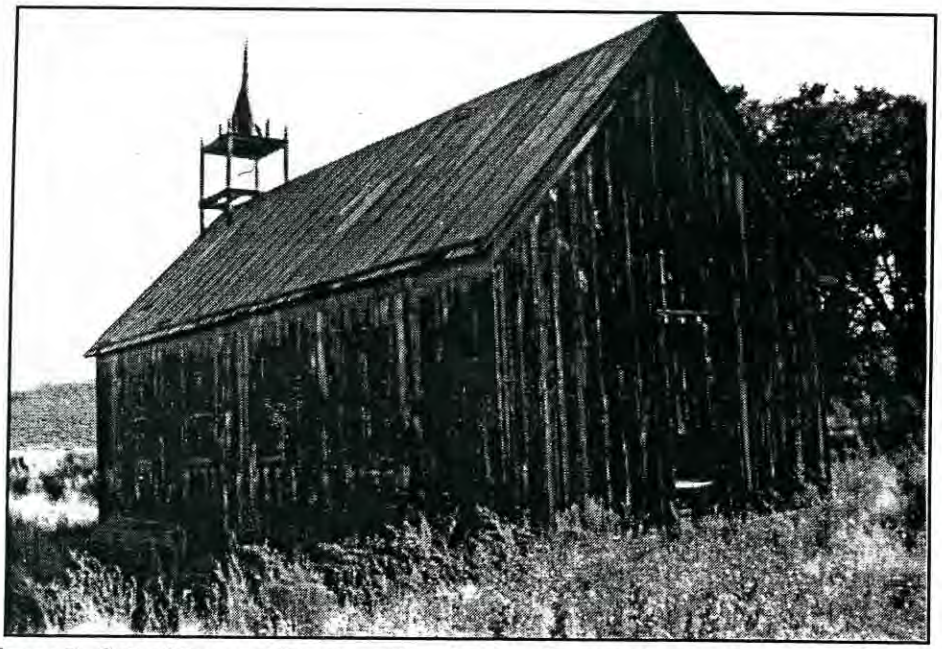

Figure 7. School house at Barclay, Nevada, showing exterior wood milled by Woods-Edwards at Clover Valley sawmill (Photo by D. Ferris, 1991).

railroad town called Aguas Calientes, today known simply as Caliente.

After 1910, the sawmill was dismantled and the steam engine hauled by teams to a new timber stand on public lands. Lymon Woods and George Edwards delayed transporting the remainder of the sawmill equipment, including the sawblade and carriage track, to the new location until the demand for lumber increased. The newly-completed Union Pacific railroad had begun suppling Lincoln County residents with many products, including lumber, from outside the region. The Clover Valley steam engine was never fired up again to mill lumber for the mines or settlements of the region.

George Edwards reportedly continued to hope for an opportunity to revive the sawmill business. In 1931, at age 71, he harnessed his team to a wagon and returned to the sawmill site. Here he collected much of the iron hardware from the mill carriage track, returning with these materials to his home in Panaca, Nevada. There he began construction on a new frame for the mill. At age 77, death claimed George Edwards before he could complete his task (Hafen and others 1979:20).

The Clover Valley sawmill site and its relocated steam engine remained generally unknown for 75 years. In 1986, descendants of the Woods-Edwards partnership guided staff from the Bureau of Land Management to the location of the steam engine. They expressed interest in donating the steam engine to an interpretive exhibit that would highlight the history of the sawmill. After completing required consultations with the Nevada State Historic Preservation Officer and the Advisory Council on Historic Preservation, the Bureau of Land Management coordinated the transfer of the steam engine to an interpretive site in Panaca, where it remains on permanent display.

Archeological Investigations

Archeological reconnaissance surveys were used to identify the final Clover Valley sawmill location and to substantiate the anecdotal accounts concerning the relocation of the steam engine. Field inventories were completed in Pine Canyon, in the vicinity of the relocated engine (Figures 8 and 9).

The steam engine (site number 26LN3511) and equipment associated with its transport were the only artifacts observed in Pine Canyon. The cast iron engine had a total length of 12.5 feet, with a cylindrical steam chamber measuring 8.5 feet long by 38 inches in diameter. The firebox measured 4.2 feet high by 4 feet wide and bore the mark of the Pottstown (Pennsylvania) Ironworks that had forged the engine. The forge mark also indicated this to be model "C.H. No. 1".

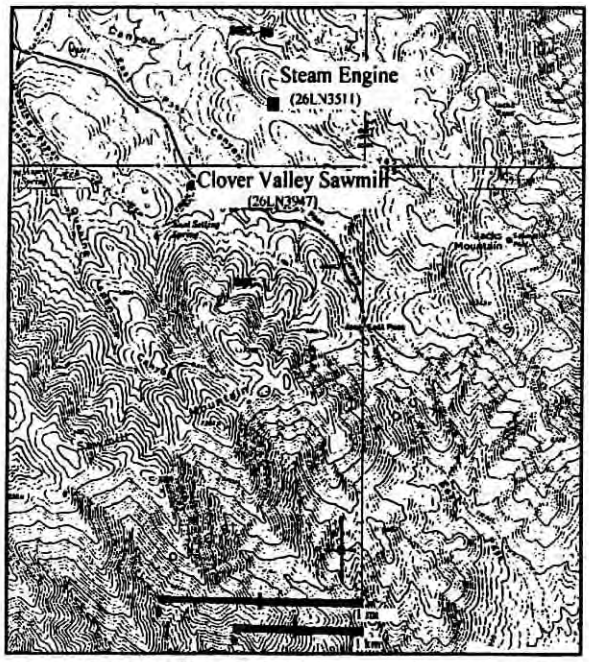

Figure 8. Location of the Clover Valley sawmill and steam engine in the Clover Mountains. USGS topographic maps, Bunker Peak and Jacks Mountain Quadrangles, 1973. 1:24,000 scale.

The engine's two flywheels had diameters of 6 feet and 4 feet, respectively, with cast iron spokes radiating from wooden hubs. The smokestack, dismantled into two sections each measuring 10 feet long by 14 inches in diameter, was recorded adjacent to the engine. Wooden skids with attached iron runners (used to move the steam engine) were also identified at this location. An iron wrench and several short sections of water pipe that had not been reattached to the engine's steam chamber were also present. The total weight of the steam engine and its associated equipment was 6 tons (personal

communication D. Shipman 1992). No other types of artifacts or features (for example sawdust piles, waste lumber piles) were identified at this site.

Reconnaissance survey conducted on the heavily wooded slopes surrounding the steam engine location did not identify other sites or features, such as skid roads or other activity loci. The absence of such data conforms to the archival information that indicated that the sawmill was never set up or operated in Pine Canyon (Edwards 1980; Hafen and others 1979).

north slopes of Sawmill Mountain, approximately two miles west of Pine Canyon, in the area of two springs, Quaking Aspen and East Setting Spring.

East Setting Spring proved to be the last location of the Clover Valley sawmill site (refer to Figure 8). The site contained a waste pile of sawdust and lumber, measuring 35 feet wide by 50 feet long. Sawdust had accumulated to depth of 6 inches above the surface at the west end of the waste pile, indicating the area where the steam engine and sawblade apparatus had been located. An estimated

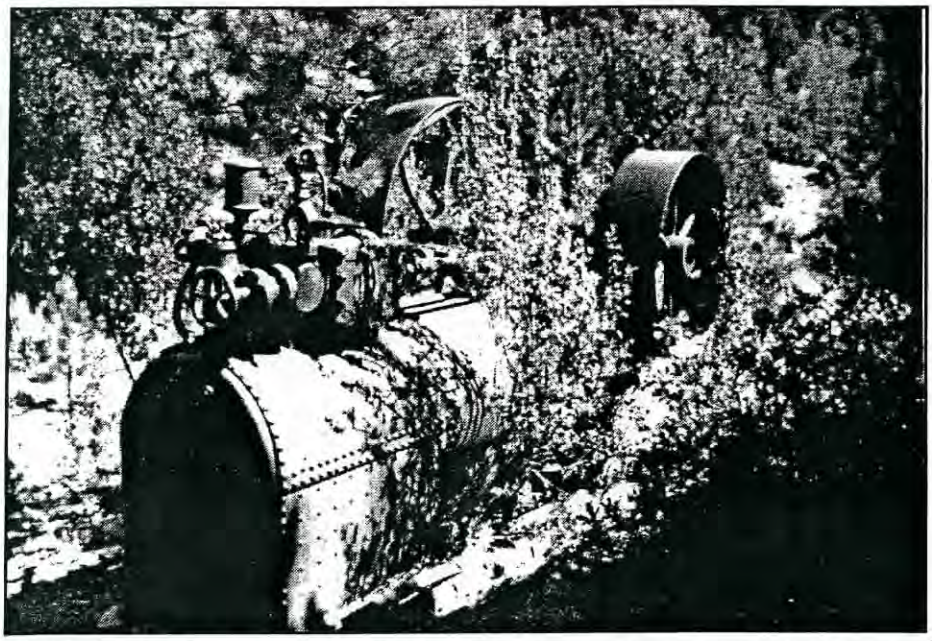

Figure 9. Clover Valley steam engine in Pine Canyon, Clover Mountains (Photo by D. Ferris, 1991).

The final location of the Clover Mountains sawmill site (site number 26LN 3947) was identified using complimentary lines of evidence. Anecdotal accounts indicated that the steam engine had been moved just a short distance from the sawmill site, in order to position the equipment closer to uncut timber stands. Since the steam engine required large quantities of water in order to generate steam, it was hypothesized that the sawmill site would have been situated in close proximity to a natural water source. Reconnaissance survey efforts were focused on the

300 slabs of waste lumber, ranging in size from a few inches to several feet long, had been produced by the milling of timber. Milled lumber at the site also included fragments of a wooden box and two milled timbers, measuring approximately 6 feet long by 1 foot wide.

The sawmill site also evidenced five areas of artifact concentrations, accessed by a wagon road (Figure 10). The five artifact concentrations contained three general classes of artifacts: steam

engine parts, domestic items, and animal shoes. Steam engine parts included cast iron water pipe sections of various diameters, tools, and assorted hooks and pins. A total of 20 pieces of carriage track were recorded, ranging in size from 4 inches to 2 feet long and approximately 4 inches wide. Five of the carriage track sections were embossed with the manufacturer's name (S. Van Syokel) and a patent date of October 9, 1855.

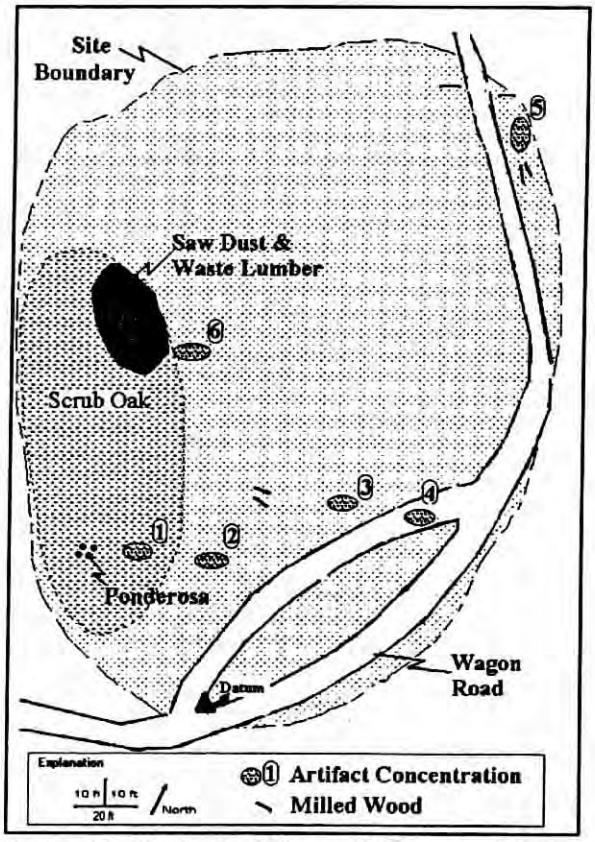

Figure 10. Site Map of Clover Valley sawmill (26LN3947) near East Setting Spring, showing artifact concentrations and features.

Domestic artifacts observed comprised a very small number (N=10) of dark green and aquamarine glass bottle (alcohol) sherds and several tin can fragments, including one hole-in-top can that had been knife-opened. These suggest a general period of use during the late 19th-early 20th century. Six small barrel hoops were also present on site. The limited number and types of domestic artifacts present indicate that the workers did not establish short-term habitation sites at the sawmill; the location(s) of worker camps has yet to be identified.

Animal shoes at the sawmill site included one partial shoe and two complete corrective shoes, hand forged and shaped to modify the locomotion of the animal. The partial shoe had a heel caulk to improve traction and could have been shaped for either a horse or mule. The first corrective shoe was a right hind horse shoe that included a "trailer" or additional length on the heel of the shoe (Figure 11). Trailers are often added to the outside heels of shoes intended for horses with "cow-hocked" conformations. The additional length helps to provide lateral support to the hoof as it lands, thereby lessening the potential for injury (Butler 1991:334). The second corrective shoe, commonly known as a "weighted shoe", was also custom made, in all probability for a horse. Additional weight had been forged along the branch (side) of the shoe to improve the balance and gait of the animal. The heels of this shoe appeared to be slightly abbreviated, a pattern commonly observed in the shoeing of logging horses. The shortened heels of the shoe minimized the risk of the horse pulling off the shoe while hauling timber (Butler 1991:507)

An area within a one mile radius of the sawmill was intensively inventoried to locate other sites or features associated with the sawmill. Several short skid roads were observed; these joined a central wagon road that accessed the sawmill site. Many stumps evidenced the characteristic felling notch and hinge produced by the use of cross-cut saws. The adjacent timber stands of ponderosa and pinyon pine were aged at less than 100 years old and would have been too small to harvest at the turn of the century (pers. communication, Marc Pierce 1991). Based on the current distribution of even-aged stands in the vicinity of East Setting Spring, it was apparent that the sawmill had exhausted timber supplies in close proximity to its last location. Relocation of the sawmill would have been necessary to gain access to mature timber stands.

Discussion

Artifacts recorded at the Clover Valley sawmill site appear to corroborate the archival information

concerning the Lytle/Woods-Edwards operation of the mill from 1890 until approximately 1910. The very limited number of temporally diagnostic artifacts, including the bottle sherds and hole-in-top can, substantiate a general period of use during the late 19th-early 20th century. The Woods-Edwards family histories report the use of horses, as well as mule and oxen, for hauling felled logs to the mill (Edwards 1980:123).

of the century. Other archeological evidence (or the absence thereof) is consistent the Woods-Edwards family histories. The 20 short sections of carriage track recorded on site would have been insufficient to construct a conveyor system capable of moving mature timber past the sawblade. The absence of additional carriage track segments potentially corroborates the account of George Edward's retrieval of the track material.

Figure 11. Corrective shoe from Clover Valley sawmill site (26LN3947). Photo by D. Ferris, 1991).

Horse and/or mule shoes were recorded at the sawmill site, with two of the shoes having been deliberately crafted to improve the performance of the draft animals. It could be speculated that the corrective shoes were made by George Edwards, an experienced blacksmith. No ox shoes were recorded, perhaps indicating that these slower moving draft animals were reserved for steeper terrain away from the mill site.

Milled timbers of a size suitable for railroad ties or mine timbers were also present on site, corroborating the accounts of lucrative contracts secured by the Woods-Edwards partnership at the turn

The limited number of domestic artifacts present at the sawmill site indicates that temporary camps were established away from the sawmill during the Woods-Edwards operation of the mill. The location(s) of these short-term habitation sites remain, as yet, unidentified.

The archeological evidence at the Clover Valley sawmill site does not provide conclusive information pertaining to the earlier periods of operation, particularly during the Sherwood and Brother ownership in the 1870s. The waste pile near the East Setting Spring location does not contain sufficient sawdust or milled lumber to reflect the 50

year period of use described by the archival sources. Additional field investigations are needed to identify other locations where the Clover Valley sawmill was operated. Temporary camps for the work crews, as well as skid and wagon roads, could be expected to occur within the vicinity of these earlier sawmill locations.

Conclusions

Information from archival sources, family histories, and anecdotal accounts were integrated with archeological data derived from field investigations in order to more completely reconstruct the history of a small sawmill in the Clover Mountains of Lincoln County, Nevada. These complimentary lines of evidence have provided greater insights into the late 19th-early 20th century operation of the sawmill by Lymon Woods and George Edwards. Lumber milled at the Clover Valley sawmill helped to build the first interstate rail line through the region and provided building materials for the principal settlements of Lincoln County, including Pioche, DeLamar, and Caliente. Additional archival research and expanded archeological field inventories are still needed to identify the locations of the sawmill and associated sites prior to 1890.

Acknowledgments. Martha Lauritzen of Pioche compiled information from the *Pioche Record*; her research filled many gaps in the archival database. Maribah Cowley and her mother Marie Hurst of Panaca, descendant of the Wood-Edwards partnership, shared copies of their family histories and other information. My thanks to each of them!

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Continuing Archaeological Investigations of New Fort St. Joseph Overton, Nevada.

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Abstract

This paper presents a synopsis of the 1995 excavations at New Fort St. Joseph. The excavations of St. Joseph have been for the most part, salvaging the remaining archaeological information before Nevada Department of Transportation (NDOT) expands an existing road. The University of Nevada, Las Vegas (Department of Anthropology) has been engaged in the salvage operation for the past ten years under the direction of Dr. Claude Warren. The general research questions are related to understanding material correlates of the Mormon cognition which accompanied the Mormon expansion into southeastern Nevada.

Project Background

In January of 1994, Dr. Cluade Warren (Department of Anthropology-University of Nevada, Las Vegas) conducted an historic field methods class at the location of Fort New St. Joseph in Overton, Nevada. This class was in part, to salvage data from Fort New St. Joseph prior to its impending destruction due to a road expansion planned by Clark County, Nevada. Dr. Warren has worked in this area for the last ten years to help preserve the cultural heritage that remains at New Fort St. Joseph. Several masters theses on the historic communities at Overton, Nevada have resulted (Kimball, 1988; McCarty, 1981).

Location and Site description

The site of Fort New St. Joseph is located in the upper Muddy River Basin, twelve miles north of the historic town of St. Thomas. The historic town site of St. Thomas is where the Virgin and Muddy rivers converged and dump into the Colorado River which is presently under Lake Mead, .

New Fort St. Joseph is positioned above the valley floor with extensive sand dunes separating it from the fields fed by the Muddy River. New Fort St. Joseph is just north of the 1865 location of Mill Point (Carlson, 1974:208). The area of investigation, Area V, is less sandy then the rest of the site. This may be the result of artificial separation from the other loci due to three roads that intersect and potentially block a large amount of sand from blowing across and accumulating.

Research Orientation

The northeastern portion of the site was systematically excavated during the 1995 field season. This area was chosen because of the high volume of subsurface artifacts recovered during the 1994 field season. Initial indications from the quantity and location of artifacts are that this area may be a refuse or dump loci. Extensive foundations uncovered at the site have generated high expectations of further evidence of structural remains to the northeast.

History of Muddy River Basin occupation

During the mid to late nineteenth century the Moapa Valley was a focal point for the Mormon expansion in southern Nevada. The Muddy River runs through Moapa Valley, converges with the Virgin River, and finally spills into the Colorado River some 450 miles southwest of Salt Lake City, Utah. This region experienced two influxes of the Mormon expansion. These influxes were centered on the idea of the development of nuclear families within a larger religious context (Carlson, 1974; Kimball, 1988; White, 1990). According to Mark Leone (1979:4), Mormon communities were the first European Americans to attempt farming in this desert environment. These conditions were completely foreign to those early settlers, who:

> ...had to fit their experience to farming a semiarid area, which meant that they must learn how to control the river water, [and] putting it onto the land and draining it off as needed. They must also learn to experiment

> with crops that could be successfully grown under the new conditions. The whole complex process of settling into the region was an experiment, risk-running venture, initially providing very little control over the environment. (Leone, 1979:4-5)

These settlements were located approximately where the Colorado River and the Virgin River converge and continue northward more than forty miles along the Muddy River (Kimball, 1988; Grattan, 1982). The goal of the Mormon Church was to establish an agricultural experiment in the Muddy River Basin to test their ideology of "economic independence and self-sufficiency", and produce an agricultural surplus that could be sold in the markets of St. George, Utah (White, 1990:17). This self-sufficiency was to be obtained from within each community. These settlements were also to serve as a "supportive basis" for traveling between St. George and St. Thomas (Kimball, 1987:220).

St. Thomas was one of the first missions in the Muddy River region, named after the first missionary to visit the area in January of 1865. This mission, St. Thomas, was established near the point where the Muddy and Virgin Rivers converge (Grattan-Aiello, 1986:32; Fleming, 1967:24-30). The president of the Southern Utah Mission, Erastus Snow, first visited the Muddy three months after St. Thomas was established (1865). At the time of Snow's visit, he chose two areas to be settled, "...one of which became St. Joseph, the present site of Logandale" and the other on a sand bench overlooking the fertile valley. In June of 1865, St. Joseph was abandoned and New St. Joseph was built, believing the new location was more suitable for habitation (Olson, 1984:34; Grattan-Aiello, 1986:32).

The local American Indian population felt threatened by the arrival of the new European American settlers in the region and by their consumption of local resources through the farming and ranching ventures. The Mormons practiced a form of subsistence which consumed much of the natural resources in the valley. This consumption of resources forced the native population into stealing cattle for food (Kimball, 1987:110). In early 1868, problems with the natives forced settlers into building a fort-like configuration at the site of New St. Joseph. The nature of the design is what gave it the name of "New Fort St. Joseph" (White, 1990:31-34). This new construction allowed for all building entrances to face inward for defensive purposes. At the peak occupation of New Fort St. Joseph, there were 167 residents reported (Kimball, 1987:223).

Several similar communities were establish in this area over a five year period. Two of the communities established at roughly the same time as New Fort St. Joseph were Sandy Town and West Point. All of these settlements were located along a sandy bench overlooking the Muddy Basin (Olson, 1984:27). As a result of this growth, the need for a dependable water supply became more pressing. One of the most challenging tasks of the Mormon Missionaries was to build canals which would transport water to their settlements for domestic and agricultural uses. The canals, however, constantly needed to be maintained because of their loose sandy foundations. These unstable foundations led to movement and eventual cracking of the canals lining, which allowed for a great amount of water to be lost. By the time the flow in the canals reached the New Fort St. Joseph, little to no water was present (Grattan-Aiello, 1986:41-42).

Due to the problem with water and threats by the natives, the leaders of the Church of Latter Day Saints ordered the settlers to abandon New Fort St. Joseph and return to Utah or St. Thomas. However, five families disobeyed the churches directives to leave and stayed in the area (White, 1990:31-34).

Significance

Fort New St. Joseph has been determined to be eligible for the National Register of Historical Places by the Nevada State Historic Preservation Office (SHPO). This site shows the expansion of Mormon settlements and has evidence of Mormon cognition. James Deetz (1977:23) stated that cognition is;

> Such aspects of a past people as the way in which they perceived their environment, the world view that underlying the organization of their physical universe, and the way ideology shaped their lives.

The Mormon cognition was designed to create unity, equality, and cooperation among the pioneering settlers (Peterson, 1973:45). This kind of ideology motivated settlers who traveled to the Muddy River Region, to start a new life. New Fort St. Joseph contains intact archaeological deposits which may contribute to the understanding of the Mormon expansion and of the cognition which accompanied it.

Archaeological Excavations

Excavations were conducted in areas with evidence of exposed wall foundations on the surface with methods similar to those used by Jonathon C. Horn (1992). The units were 5' x 5' [tenths of feet], oriented along true north, and were excavated from surface to floor or to the bottom of the wall foundations. This style of excavation was appropriate because little stratification was present due to the recency of the site (1865-1867). The soil was sifted through 1/8 inch mesh screens and the artifacts bagged by excavation unit and feature. Both photographs and site sketches were completed in the field.

Laboratory Methods

Under the direction of Susan Rose (Department of Anthropology, University of Nevada, Las Vegas), artifacts were dry-brushed, re-bagged, and cataloged by students attending the field class. The following semester, fall 1994, students in the historic laboratory methods class analyzed the artifacts. The purpose of the research conducted by the laboratory class was to determine if the Mormon cognition was followed by the occupants or disregarded for finer possessions. This was done by analyzing the ceramic assemblage to determine which pieces fit the typical style of Mormon pottery and which did not (deLespinasse and others, 1995).

Investigations of the Northeastern Half of Fort New St. Joseph in 1995

Eight excavation units were set up along the northeastern boundary, oriented toward true north. Units 305E 90S, 305E 85S, and 305E 80S all have melted adobe rubble and burnt structural remains. The upper levels showed significant surface burn, probably from sporadic wild fires. Few artifacts were recovered from Area V during the 1995 field season. The type of artifacts recovered are identical in material and quality as those recovered from the 1994 season.

No features were identified in any of the units excavated. Future excavations are planned for the northern section of the site adjacent to the dirt road that connects both Airport Road and Cooper Street. These foundations may give insight to what function that the building served.

Artifacts

Stoneware, and earthenware where among the artifacts recovered during the 1995 field season. A total of ninety-two sherds of stoneware were recovered. Of the ninety-two stoneware sherds, many of them had painted and embossed floral designs. Fourteen sherds had makers marks, with three of the sherds coming from a Temple Plate (from unit 305E 80S). Among the sherds of earthenware, thirteen of them are redware, seventeen grayware, and seven sherds of buffware. There was no evidence of trade marks on any of the earthenware. A more detailed analysis of the ceramics found at New Fort St. Joseph is given by P. deLespinasse, Sims and Mundt (1995).

Several hundred sherds of glass were also recovered during this field season, however, approximately 90% of it was deemed to be of modern origin and discarded. No analysis has been performed on the remaining glass to determine types.

Structures

The dominant features at New Fort St. Joseph are the foundations of structures. Analysis of the built environment is another avenue of investigation by archaeologists. Structures are,

> Artifacts originally created to define space for human activities or to be used as components of space defining artifacts.
>
> [They are also] ... originally created as a separate, distinct, and generally interchangeable structural or decorative part of a building [and]

> function as part of larger structure rather than independent units. (Horn, 1992: 25)

Due to the harsh environment, suitable shelter was one of the most important needs to the settlers (White, 1990:39). The only structural features that remain are those of the foundations. Continuing excavation of these foundations will contribute to the understanding of the social organization of this Mormon community.

Conclusion

The quantity of artifacts has significantly dropped from the previous field season of 1994. The area that was under investigation in 1995 may have been impacted from the maintenance of Cooper Street. Burned soil is present in units (305E 80S, 305E 85S, 305E 90S, and 305E 95S) may be the result of disturbance caused by the road maintenance or surface burn. Further investigation of Area Five may provide information concerning the function of the structure and perhaps, the extent of the cultural deposits.

Acknowledgments. The authors would like to thank Dr. Claude Warren (University of Nevada, Las Vegas) for his help and guidance locating materials pertaining to New Fort St. Joseph . We would like to extend gratitude towards Robert M. Leavitt for the use of his library. Of course a special thanks to the students from both the field (spring-1994) and laboratory (fall-1994) classes for their participation and hard work. Without their effort and dedication this project would not have been possible.

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Archaeology from Thin Air

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Abstract

Early air mail flights were restricted to day light hours due to the primitive nature of early airplanes and navigation equipment. The United States Postal Service realized that the only way to make airmail work was to fly planes around the clock. Borrowing technology from the Bureau of Light Houses, the Postal Service, and later the Department of Commerce, began constructing series of lighted beacons, known as airways, to guide pilots flying in the dark and inclement weather. The first transcontinental airway ran from San Francisco to New York City through northern Nevada in areas administered by the US Bureau of Land Management, Winnemucca District. Changes in technology resulted in the abandonment of lighted airways, but information about these early navigation features is preserved in the archaeological record.

Rediscovery of Airways

In 1993 the hazardous materials coordinator for the US Bureau of Land Management, Winnemucca District Office, discovered an underground storage tank at a mining mill site in the Sonoma-Gerlach Resource Area (SGRA) in northwestern Nevada. Conversations with the mill operator indicated that the storage tank was associated with an abandoned landing field. A check of the Master Title Plats showed that the site was withdrawn in 1928 as an air navigation site, and that there were several other sites in the immediate vicinity.

It was determined that the air navigation sites were associated with the Department of Commerce as part of an airway. Airways were constructed to aid in the night flying of planes delivering mail and other cargo. Field investigations at air navigation sites identified several type of features associated with airways. The purpose of this paper is to describe the types of historic sites encountered along the airway identified in northcentral Nevada.

Historic Background

After the Wright brother's public demonstration of the viability of heavier than air craft in 1908 (Holmes 1981), not much thought was given in the United States to the potential economic development of the airplane. Many individuals thought the airplane was a toy for the adventurous, and money earned by pilots was from selling rides, demonstration flights given at county fairs, or early air races. These endeavors did little to demonstrate the potential of the airplane as a serious tool for the delivery of goods and services.

For several years airplanes were not flown in Nevada, since it was believed that the thin air over the high deserts was not capable of providing sufficient lift. It was not until 1910, after some improvements in airplane design, that the first airplane was flown in a demonstration flight near Carson City (Earl 1979).

In spite of the general attitude towards the airplane as a machine for the thrill seeker, far sighted individuals in the United States Postal Service realized its potential. In 1911, the first airmail demonstration flights were given between Long Island and Mineola, New York. Many pieces of mail were successfully delivered. Prying funding out of a stingy Congress proved to be a different matter, and it wasn't until 1916 that money was appropriated for airmail contracts. Businesses were unwilling to sink money into buying aircraft for what was perceived as a risky venture, and the contracts were never let (Holmes 1981; Leary 1985; Komons 1989).

With United States involvement in the First World War, many Americans were exposed to the varied uses of aircraft. This added fuel to the Postal Service's arguments that airplanes were a viable mail delivery alternative. Involvement in the War also trained many pilots, and resulted in a glut of surplus aircraft after the end of the War. In 1918 Congress

gave the Postal Service $100,000 to establish their own airmail route. This first route was established between New York City and Washington, D.C., with a stop in Philadelphia. The army provided the pilots and planes for the first three months of operation. The route was not a financial success, but mail was delivered in a timely manner and it was thought to be an operational success. The postal service began planning for a transcontinental route between New York and San Francisco (Holmes 1981; Leary 1985; Komons 1989).

The first leg of this route, between Cleveland and Chicago, was established in 1919. Later that year, it was expanded to New York. The route reached Nevada in 1920 with stops in Elko and Reno. By the end of the year it had reached Sacramento, California (Holmes 1981; Leary 1985; Komons 1989).

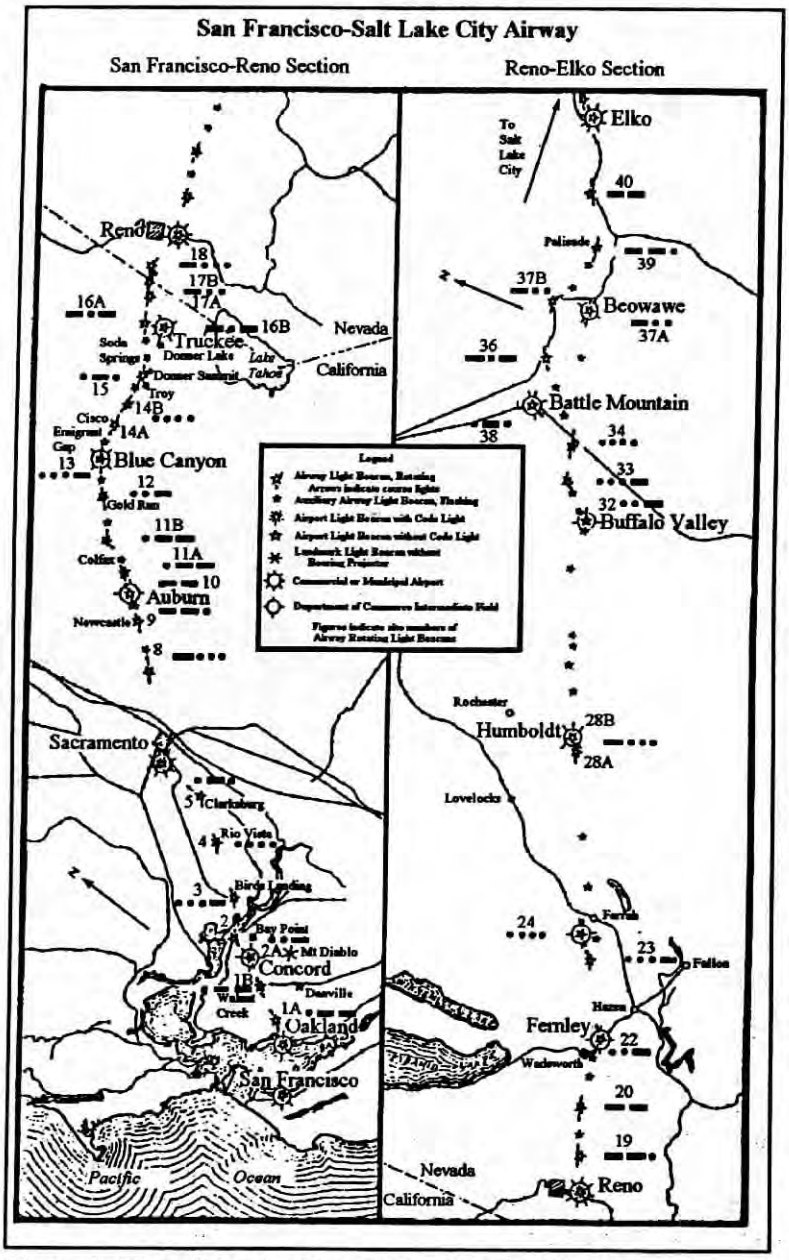

Figure 1. Map of the San Francisco-Salt Lake City Airway covering the Parran-Beowawe segment (USDC, AB 1932).

Early planes did not have much in the way of navigational gear. They were equipped with compasses, which often never stopped spinning, and altimeters, which were more useful as barometers than indicators of elevation. Radios were uncommon. There were no navigational charts, instead the post office provided Postal Service road maps. These maps did not show communities without post offices or potential hazards such as mountain peaks or church spires. The pilots were reduced to navigating by visible landmarks, which meant flying only in daylight during good weather. Because of this, air mail routes followed railroads (Holmes 1981; Leary 1985; Komons 1989).

Mail planes would fly until dark, land, and unload the mail on the first train heading in the same direction. A few sacks would be unloaded off a train the next morning, and flown on until dark. This leapfrogging of a minor amount of mail was more of a novelty than an actual benefit.

The Postal Service quickly deduced that continuous movement of airmail was needed. To do so, flights needed to operate 24 hours a day, and would need ground based assistance to do so safely (Holmes 1981; Leary 1985; Komons 1989).

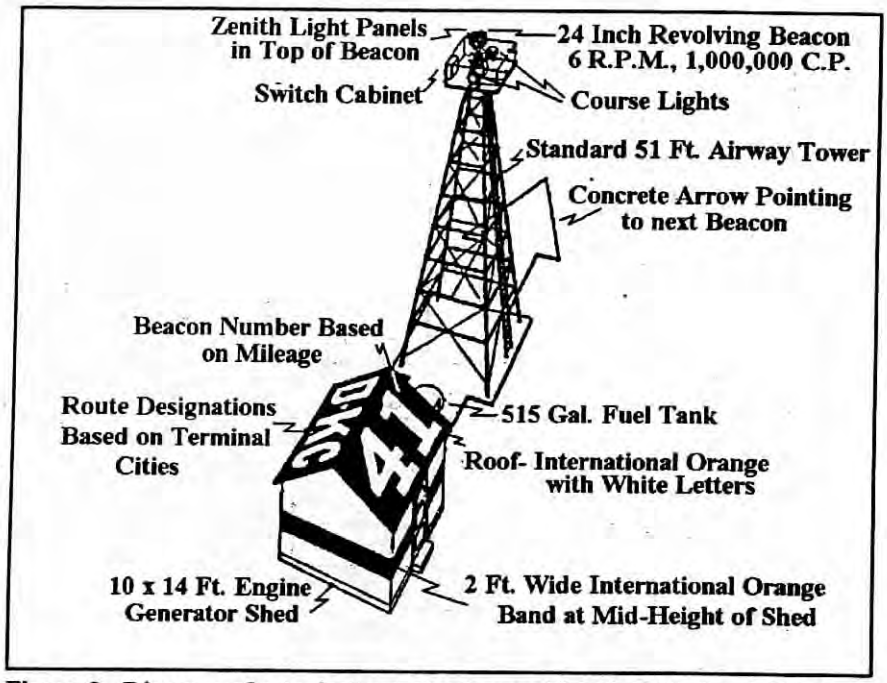

Figure 2. Diagram of a typical rotating beacon light installation (USDC, AB 1932: Figure 13).

The army had some experience with night flying. During World War I they had marked runways with bonfires for night landings. Using this idea, the army then established an airway with lighted beacons, flashing markers and flood lighted runways that allowed for night flying. The Postal Service experimented with this military technology, and decided it was suitable for their needs (Holmes 1981; Leary 1985; Komons 1989).

In 1924 the first section of the transcontinental air mail route between Chicago, Illinois and Cheyenne, Wyoming was lighted. Later in the year, lighting was expanded to Cleveland, Ohio and Rock Springs, Wyoming. In 1925 the section between Cleveland and New York City was lighted. The year 1925 also saw the passage of the air mail act, which required the Postal Service to contract flights instead of using their own planes and pilots (Holmes 1981; Leary 1985; Komons 1989).

In 1926 the Air Commerce Act was passed. This act gave the Secretary of Commerce the responsibility for fostering air commerce by issuing and enforcing air traffic rules, licensing and certification of pilots and planes, and establishing airways. The Department of Commerce took over airway construction and maintenance from the Postal Service. Initially, airways were maintained and constructed under the Airways Division of the Bureau of Lighthouses, since people from this division were familiar with beacon technology. The division was later changed to the Department of Commerce, Aeronautic Branch and later the Bureau of Air Commerce.

In 1938 the Civil Aeronautics Authority was created. In 1940, the Civil Aeronautics Board (CAB) and the Civil Aeronautics Administration (CAA) were created from the Civil Aeronautics Authority. The CAA had the responsibility for

creation and maintenance of airways and airports, while the CAB created rules and regulations. The Federal Aviation Agency was created in 1958 as an independent agency, and took over the duties of both the CAA and CAB. In 1967 the Department of Transportation was created and the Federal Aviation Agency was reorganized within the Department of Transportation as the Federal Aviation Administration (United States Department of Transportation, Federal Aviation Administration 1991).

The Department of Commerce began expanding the airway system and lighting all of the routes. They also determined that following the railroad, and hence the Humboldt River through northern Nevada, added an extra 120 miles to the transcontinental route. A cut off between Beowawe and Parran was established and lighted during the winter of 1928-1929 (Komons 1989).

Archaeological Investigations

The Beowawe-Parran cutoff route was the focus of the field work for this paper. Twenty-three (23) sites along the Beowawe-Parran route were identified in the SGRA from master title plats and old United States Geological Survey maps. Thirteen of these sites were visited.

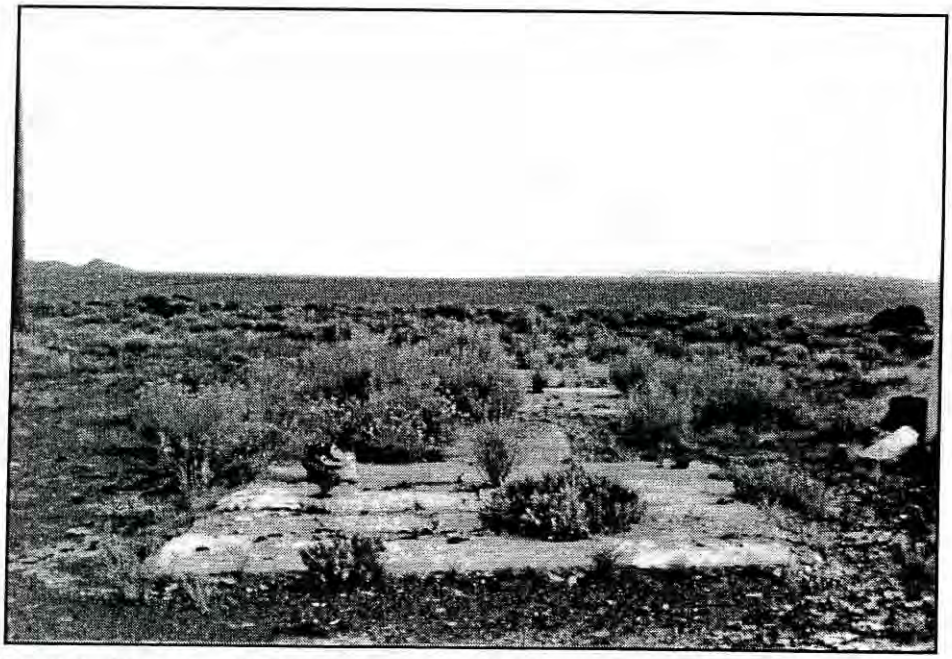

Figure 3. Overview of concrete arrow foundation.

Ideal Department of Commerce standards required placement of an electrified rotating beacon every 10 to 15 miles. At first, the beacon was a 24 inch, rotating two lamp searchlight using 110 volt, 1,000 watt lamps that generated 1,000,000 candlepower (Young et al. 1931). Later, this was upgraded to a 36 inch, rotating, 110 volt, 1,000 watt incandescent lamp generating 1¼ million candlepower (United States Department of Commerce, Aeronautics Branch [USDC, AB] 1932).

One lamp was clear, while one was green if there was a landing field, or red if there was no landing field. Rotation was such to show six clear flashes per minute. Colored lamps were aimed in such a manner to flash a code identifying the beacon. Lamps were aimed 2½ degrees above the horizon.

These rotating lamps were placed on steel skeletal towers, 20 to 87 feet high, with a standard height of 51 feet. Also on the towers were two course lights, consisting of red or green 500 watt searchlight projectors. Towers were placed in the center of a concrete directional arrow pointing towards the next beacon. A power house/storage shed was built at the end of the arrow, with the beacon designation painted on top (USDC, AB 1932; Young et al. 1931). At first, towers were painted alternating chrome yellow and black. This was later changed to international orange and black (USDC, AB 1932) and more recently to red and white.

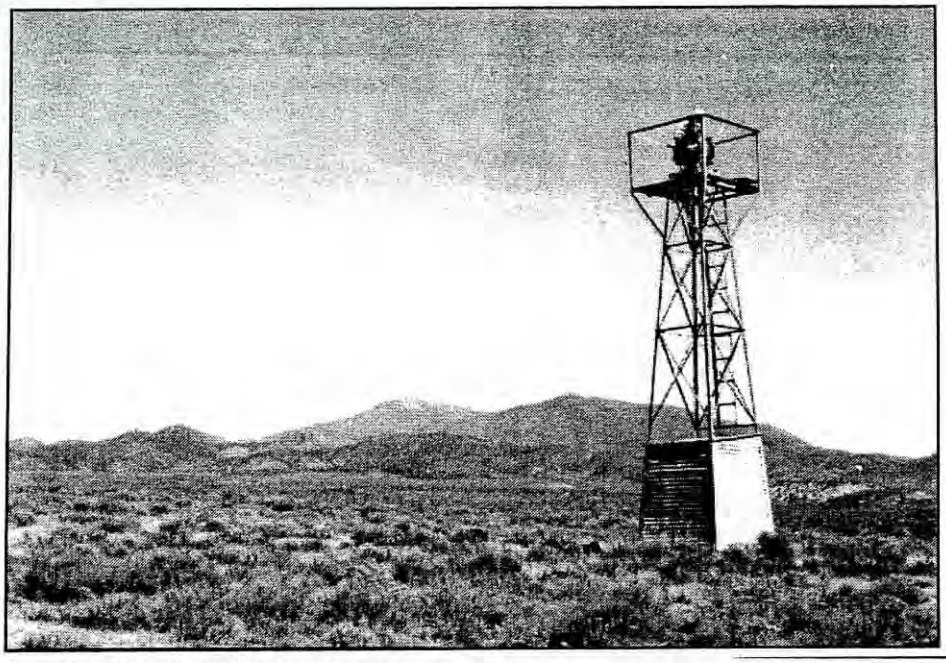

Figure 4. Standing blinker beacon.

In Nevada, these beacons were placed at points of easy access where commercial electrical power was available. These types of beacons were identified at three locations. All of the towers have been decommissioned and dismantled. Only the concrete arrow foundations, or fragments of them, remain. Artifacts commonly found at these sites include: burned out 1,000 and 500 watt bulbs, beacon glass, and paint brushes and cans. Two of these sites are located at, or near, landing fields.

In more inaccessible areas, or as a supplement to rotating beacons in mountainous terrain, Acetylene Flashing Beacons were used. Acetylene Flashing Beacons, or Blinkers, had two fixed clear lamps, 20 to 22 inches in diameter, that flashed 20 times per minute (Young et al. 1931). The lamps were placed on 20 to 22 feet high skeletal steel towers. The towers were placed on wooden beam foundations with anchor bolts. The bottom of the tower was enclosed with sheet metal to form a shed for housing acetylene tanks. The acetylene tanks required refilling every six months. Painting schemes are the same as those for the larger electric beacons.

Much of the Parran-Beowawe cut off is remote and mountainous, so it is no surprise that nine of the locations visited were blinker sites. All of the blinker sites have been decommissioned, and most of the blinker towers have been removed. At least one of the towers was reused to construct a wind mill on

a nearby ranch, but most appear to have been salvaged for scrap iron - a process that claimed a tower as late as 1991.

Two blinker towers are still standing in remote areas in the study area. Much of the acetylene delivery system has been removed from the towers, and in one case the lamp glass has been shot out, but both towers are in good shape. Where the towers have been removed, a leveled area is often found. Occasionally wooden beam foundations, or their remains, are present. Very few artifacts are found at these sites - anchor bolts; nuts, bolts, angle iron and sheet metal from the tower and shed; and lamp cover glass.

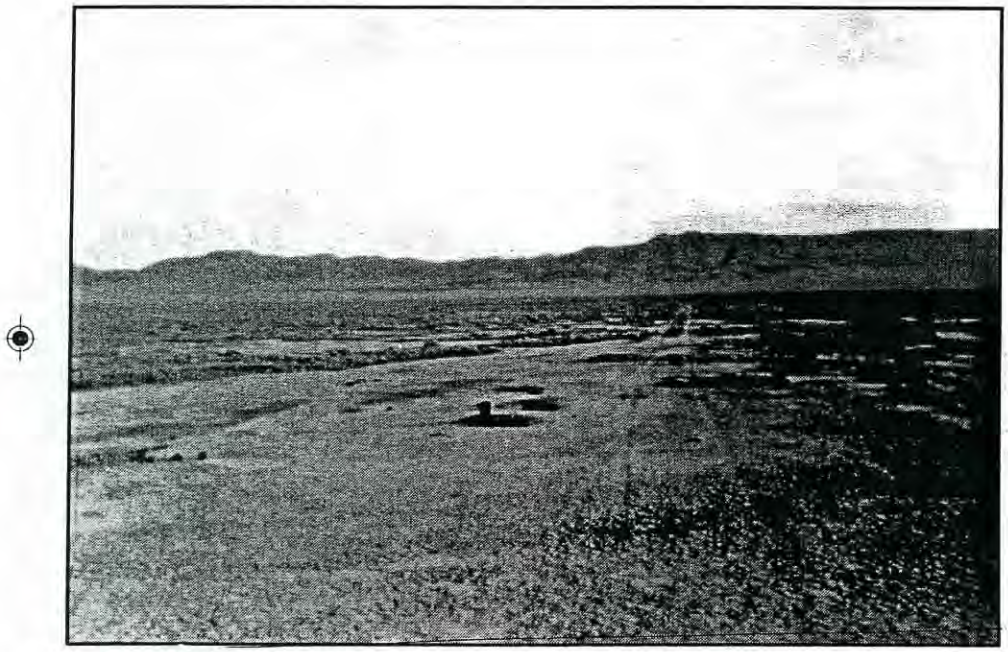

Figure 5. Typical site where a blinker beacon has been removed.

Due to the unreliability of the early planes, auxiliary landing fields were constructed every 30 to 50 miles along an airway. T, L or X shaped landing strips were built. The strips were 2,500 ft. to 3,000 ft. long. Intersections of the strips were marked with 50 ft. diameter white circles with 20 ft. colored panels running out into the runway. Strip boundaries were marked with 60 ft. orange markers at the corners and every 600 ft. along the boundary. Boundaries were also illuminated with globe lights every 300 ft. around the field perimeter, or in remote areas with acetylene blinkers at field corners and centers of the sides (Jackson 1970; Young et al. 1931).

Two auxiliary landing fields are in the SGRA. Both of these fields were abandoned by 1950, as were most fields in the United States. The landing fields are difficult to spot from the ground, but the general outline shows up on air photos. One landing field is shaped like a large coffin, approximately 4,400 feet long by 1,900 feet at the widest point. The second landing field is an equilateral triangle with rounded corners, roughly 3,100 feet on a side. No indication of the runway configuration remains at these sites. Both locations have can dumps and other evidence of camp sites and/or temporary quarters. The trash dates back to 1928-1929, when the Parran-Beowawe cutoff was constructed, on up into the 1940s. Both sites also have wells and fuel

storage tanks.

Even though lighted beacons were useful for night flying, they were not especially useful in rain, snow or fog. The Department of Commerce was charged with developing directional radio facilities

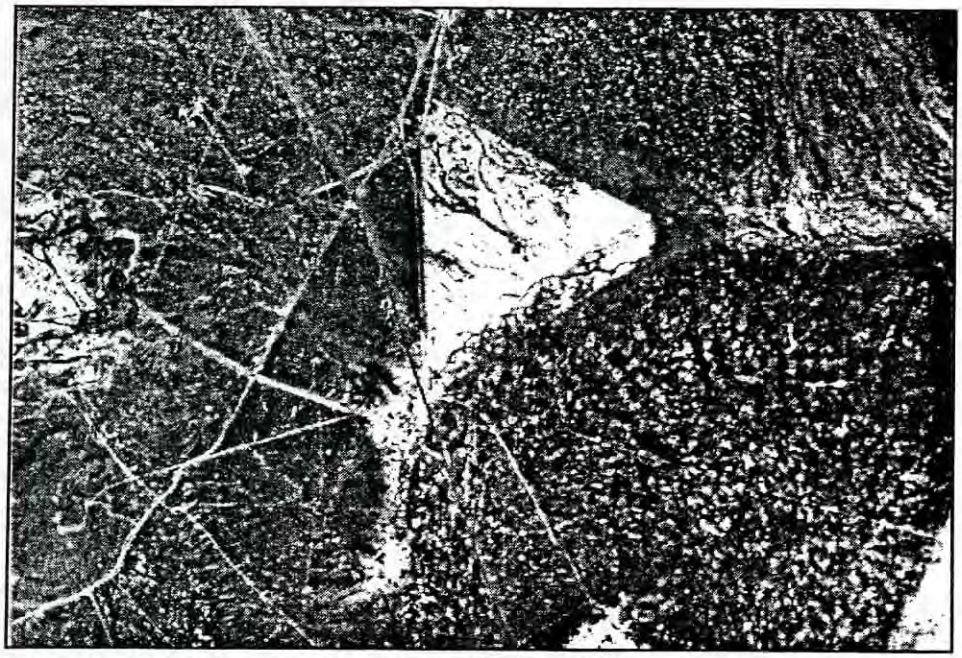

Figure 6. Aerial view of an intermediate landing field.

to guide aircraft in poor weather (Komons 1989).

The United States Signal Corps had developed the Four Course Range or Radio Range in 1923 based on the German Telefunken radio compass. A radio range...

> ...consists of a tone-modulating transmitter working alternately into two crossed vertical loop antennas displaced by 90 degrees. The radio frequency field pattern radiated from each loop is a figure-8 pattern. The intersection of the two figure 8 patterns produces four zones of equal field intensities of courses approximately 3 degrees wide. The letter A (· -) is transmitted by one loop, and the reciprocal letter N (- ·) is transmitted by the other loop. These letters are interlocked so that a continuous dash is received when along the radial of equal field intensities. On either side of the course, the N or A signal will predominate over the background signal, indicating to the plot which side of the course he is on [Jackson 1970].

The Department of Commerce began installing radio ranges on the New York to Cleveland Route in 1928, and had installed radio ranges on all the major airways over the next five years (Komons 1978). In 1935, a fifth tower was installed on radio ranges to broadcast weather information (Jackson 1970). In the late 1930's, the ranges began to use Very High Frequency (VHF) radio signals and were known as VARs. VARs, because of the overlapping figure 8 patterns, allowed pilots to navigate from a fixed point while not on an airway (Jackson 1970, Stuart 1943).

One radio range was identified on the Winnemucca District. This facility, known as the

Lovelock Radio Range, was decommissioned by 1966 (Master Title Plat file Nev-051771). The site consists of a square cleared and levelled area, 293 feet on a side. The corners of the site are marked by tower anchor bolts. A two room concrete foundation is near the center. A light scatter of electronic debris and beacon glass covers the site. A bulldozed wooden beam foundation indicates that a blinker beacon operated at this location before construction of the radio range.

A supplement to the radio range is the homing beacon, also known as a homer, nondirectional beacon or H facility. A homer is an antennae emitting a continuous carrier, low to medium frequency radio wave in an omnidirectional pattern. The first was commissioned in 1924. In 1965 there were 439 homers in use on the nation's airways, but a program for decommission was already in place.

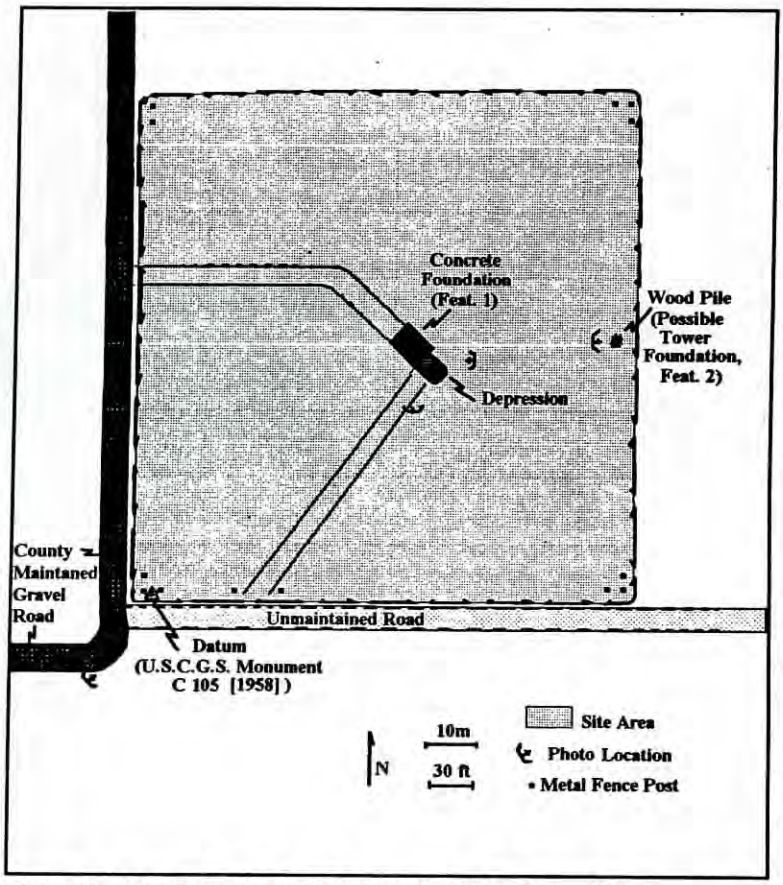

Figure 7. Sketch map of the Lovelock Radio Range Site.

One homing beacon site was identified near McKinney Pass. Remains include a concrete foundation with tower anchor bolts, a second foundation with raised mounts and two trash dumps. One of the dumps contains air and oil filters, anti-freeze cans, and motor gaskets. This indicates that electrical power for the facility was provided by a diesel generator. A depression near one of the foundations may be the site of an underground fuel storage tank. This power source also made it possible to change the nearby Pleasant Valley beacon over from a blinker beacon to a rotating beacon, however no concrete arrow foundation was constructed for the upgrade.

Starting in 1947, new technology began to replace the VARs. A device known as the VHF Omnidirectional Radio Range (VOR) was developed, and radar stations began to play an ever increasing role in air navigation (Jackson 1970). These facilities are placed far apart and pilots are no longer restricted to narrow, lighted airways to be able to navigate from one point to the other. While VORs are located in the Winnemucca District, none are on the older Parran-Beowawe airway segment.

Conclusion

From 1924 up into the 1940's, lighted airways played a very important role in aviation in the United States. They made it possible to transport airmail, and later freight and passengers, in a safe and timely manner through the dark of night and in adverse weather conditions.

Continuously improving and expanding technologies decreased the reliance on airways. As

the importance of the lighted beacon and early radio beacons began to wane, the Department of Commerce and successor agencies began a program of decommissioning beacons.

The maximum number of lighted beacons (2,274) in operation was in 1941. After that year the number kept in operation began to decline (Jackson 1970:Table 1). While rotating beacons are still used to mark airports, the last airway beacon was decommissioned in 1973 (Cheskaty 1973). By 1950 all of the intermediate fields in the lower 48 States were abandoned. All of the VARs and Homing Beacons were out of operation by the end of the 1960s.

Global Positioning System technology, where a location on, or above, the earth's surface is triangulated from orbiting space satellites, is becoming ever more widespread. Ground based navigational systems are in danger of becoming obsolete, leaving a network of foundations and debris for present and future archaeologists to ponder over - archaeology from thin air.

Acknowledgments. I would like to thank Robert Lawson and FAA historian Edmund Preston for providing reference materials and other assistance. BLM archaeologist Peggy McGuckian provided encouragement and greatly appreciated field assistance.

Editor's Note. The author informed me as this was going to press that the remaining lamp on the airway blinker beacon at Jerzey Wash had been removed by someone who had taken great effort to get a vehicle to the location.

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Nevada Archaeological Association
1996 Officers

The Board of Directors of the Nevada Archaeological Association is elected at the annual meeting by the general membership, except for the State Historic Preservation Officer Representative and the *Nevada Archaeologist* editors who are *ex officio* members of the Board in accordance with the NAA by-laws. The Board elects officers from the membership of the Board. The President and the Board appoint the Executive Secretary, Newsletter Editor, Committee Chairs and Editors who need not be elected members of the Board.

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Member & Newsletter Editor	William White Henderson, Nevada

The NAA Board generally meets quarterly including immediately prior to and following the Annual Meeting. The dates of the Annual Meeting and all other Board meetings are set by the Board. All NAA members are encouraged to attend meetings of the Board and the Annual Meeting.

Nevada Archaeological Association
Chapters & Affiliates

Local organizations in Nevada with goals and ethical standards compatible with those of the Nevada Archaeological Association may become affiliates (independent charter) or Chapters (charter approved by the Nevada Archaeological Association) by application to the Board and approval by the membership at the Annual Meeting. The following organizations are currently associated with the NAA:

Am-Arcs of Nevada
[Western Nevada affiliate]
June Rivers, President

Archaeo-Nevada
[Southern Nevada affiliate]
Robin McMullen, President

Churchill County Chapter
Paulie Alles, President

Elko County Chapter
Penny Urriola, President

Lincoln County Chapter

White Pine Historical & Archaeological Society
(Chapter)
Tina Reuwsaat, President