# NEVADA Archaeologist

Volume 3, Number 1, 1981

The Pebble Mound Mystery...Ancient or Modern Alteration of the Desert Pavement in Western Churchill County?

Nevada Archaeological Association

## Nevada Archaeological Association

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

### Membership

The Nevada Archaeological Association is an incorporated, non-profit organization registered in the State of Nevada, and has no paid employees. Membership is open to any person interested in archaeology and its allied sciences, and in the conservation of archaeological resources. Requests for membership and dues should be sent to the corresponding secretary whose address is listed below. Make all checks and money orders payable to the Nevada Archaeological Association. Membership cards will be issued on payment of dues, and active members receive subscription to the *Nevada Archaeologist.* Subscription is by membership only, but individual or back issues may be purchased separately.

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The editorial board of the *Nevada Archaeologist* is comprised of the Board of Directors of the Nevada Archaeological Association. The Board appoints the editor of the *Nevada Archaeologist* for a term of three years.



### Back Issues

Back issues of the *Nevada Archaeologist* may be ordered through the office of the President of the Association: address all inquiries to Amy J. Dansie, Nevada State Museum, Carson City, Nevada 89710. Checks or money orders should be made out to the Nevada Archaeological Association. Volume 1 (one issue), and Volume 2, Numbers 1 and 2, are available at $3.00 each issue.

### Future Issues

Manuscripts on hand include an article by Sharon Edaburn on how to record a railroad grade as an archaeological and historical site, and one by Jean Stevens on her discovery of a stone fence, posssibly an antelope trap, near the White River Narrows in Lincoln County. These two articles are slated for the next issue of the *Nevada Archaeologist,* and additional articles of up to 24 pages in length, double spaced and including bibliography, are solicited. Manuscripts, in general, should follow the style guide of the January, 1979 issue of *American Antiquity.* Manuscripts should be typed and double spaced throughout, and illustrations must be camera-ready with a caption typed on a separate sheet, also double spaced. More important than the form you use is what you have to say, so put those words on paper and send them in regardless of the "ideal" format expressed above.

Also slated for a future issue is a tribute to Peter Ting, Sr., the first President of the Nevada Am-Arcs who passed away last year.

# NEVADA Archaeologist

VOLUME 3, Number 1 1981

## The Phoenix Issue

*Webster's Seventh New Collegiate Dictionary* (1971:635) defines "phoenix" as"...a legendary bird represented by ancient Egyptians as living five or six centuries, being consumed in fire by its own act, and rising in youthful freshness from its own ashes." The *Nevada Archaeologist*, having had a brief life span of two years (1972-1974), under the able guidance of Jean Myles, Member of the Incorporating Board of Directors of the Nevada Archaeological Association, and the first editor(and publisher) of the *Nevada Archaeologist*, now rises from its own ashes with this issue. The present Board of Directors and Officers of the Association would like to take this opportunity to thank Mrs. Myles for her efforst on behalf of the Association and for the sheer hard work she accomplished in putting together the first two volumes of this journal. Thanks, Jean.

Like the phoenix, this journal may rise again, but only your contributions will make it fly. Please, -make it fly.

The Nevada Archaeological Association

The Nevada Archaeological Association was organized in 1972 to provide a bond of communication between professionals in the field of archaeology and its allied sciences, members of various amateur organizations, and the people of Nevada towards the furtherance of public education and involvement in reponsible preservation of Nevada's finite archaeological and historical resources.

The need for recording these cultural resources of the past for the enlightenment of future generations grows more pressing with each day of development and progress. The goals of the Nevada Archaeological Association are: to provide a focal point for general information and study of nonrenewable cultural resources; to provide a central point for recording artifact collections from Nevada and the Great Basin and the verbal knowledge of provenience and associations accompanying these collections; to correlate this knowledge with that information already professionally recorded for the mutual benefit of the amateurs and professionals with research interests; to provide assistance with education towards responsible public participation in archaeology; to assist in the preservation of sites by the establishment and maintenance of a registry of available, capable, and technically skilled amateurs in Nevada who would be able to work with professionals in accordance with the Code of Ethics and Standards of Research Performance as advocated by the Society of Professional Archaeologists, particularly in the immediacy of salvage archaeology; and to provide a bond of communication between professionals, amateurs, and the general public by publishing a journal, *Nevada Archaeologist*.

To these ends the Nevada Archaeological Association was incorporated in 1972, in the State of Nevada, with its organizational and editorial offices as listed on the inside cover, and with designated conference and meeting center located in Tonopah, Nevada. Membership is open to all those interested in the archaeology, ethnology, and history of the human inhabitants and their natural habitats in Nevada, the Great Basin, and adjacent environs.

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# AMATEUR ARCHAEOLOGISTS SPEAK...

BY

NORMA AND HERB SPLATT

*Editor's preface:* At the risk of intruding on a frank and succinct statement about their participation in Nevada archaeology, the editor would like to point out that the Splatt's statement was meant to be an oral presentation. Norma Splatt read the paper at the Spring meeting of the Nevada Archaeological Association held in Tonopah, Nevada March 13-15, 1981. If contributors can be found, we believe this kind of dialogue is essential for the health of Nevada archaeology, and ought to be continued in future issues. As much space as necessary will be reserved for your comments, so please type your contribution now, and send it to the editor.

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As a speaker, I really have no business being up here, but your president is a hard lady to say no to. Most of the times when I say "I", I really mean "we" because my husband Herb is really more into archaeology and more knowledgeable than I about the subject. He's also more chicken than I or he'd be up here, and, believe me, we are amateurs.

I was raised and educated in Minnesota where the climatology and environment are as opposite as they can be from that of the Great Basin. All during my education there I never heard of the word archaeology, and it was never offered as a course. The closest I came to "Indian culture" was knowing our family doctor was digging up burial mounds around one of our 10,000 lakes.

When I first came to Nevada, I think the only archaeologist was a fine geologist by the name of Peg Wheat. Early in the 1960's I took two archaeological courses at the University of Nevada, Reno. I don't remember the instructor mentioning the federal antiquities law, certainly it was not stressed. I'm convinced that that law, like a lot of other antiques, was hidden in the attic of some bureaucratic agency. I had also heard that when the CCC (Civilian Conservation Corps.) were here in the 1930's it was common recreation activity for the boys to pile into trucks and head for the Lovelock flats. There they would line up abreast and cross the flats picking up the "goodies". I would have thought the federal government would have upheld its own law.

My husband and I truly love the State of Nevada and use any excuse available to get out into its open spaces. Now this is strictly my own off-the-record opinion, but some years ago the politicians and developers ruined the urban areas of the state and now they're going after the jugular vein of the rural areas, especially if the MX thing gets built here.

Because we love the outdoors, we have taken or used lots of reasons for getting out - fishing, hunting, rockhounding, and, yes, arrowhead hunting! Lots of blatant arrowhead hunting! We were fascinated by the man-made gems we found on the desert floor. Besides, other people were doing it. And, make no mistake about it, we found lots of artifacts. So a bad habit, as we later learned that was what it was, was formed. Now, as I see it, there are two ways to break a bad habit. First, we need to know why a habit is bad. And then we need to substitute alternatives for that bad habit.

And this is when you people of NAA entered the picture. Under your auspices, in the spring of 1976, I think, Amy Dansie taught us (one night a week) some of the fundamentals of archaeology. There were about eight of us in the class. For one thing, we learned why arrowhead hunting is a no-no. And before I forget, I want to say that Herb and I never dug a pit on our own, or violated a cave or rockshelter in any way. But from Amy we learned terms such as "bulb of percussion," "altered flakes," "worked flakes," "striking platforms," "cores," etc. We also learned what a provenience slip was and how to write one. And we learned to write up records of camp sites and to catalog collections. And we went on three field trips, - one to the dump grounds near Carson City to surface collect and write up the site; another to the Reynold's site (Dansie 1976) at new Washoe City where we dug pits, found a couple of buried fire hearths, and made the acquaintance of a profile.And finally we worked at the historic site near Sand Mountain, reported by Don Hardesty (1979). Now all of this introduced us to many of the various aspects of archaeology, but only experience could make us even a little bit proficient. Whenever she could, Amy gave us work in the Anthropology Department at the State Museum where she could keep a close watch on us. And we will always be grateful to her for all she has done for us.

Stage two can very well be called the Mary Rusco phase. Under her guidance we've spent at least eleven days in the field at the Rye Patch Reservoir Archaeological Project. And I must say that all of her crews have been super kind to us "old duffers". When we worked with Mary, we arose when the crew did, went to work when they did, and returned when they did. Mary was very good about placing us at different sites in the area for different field experiences. We helped lay out grids on Sand Island and then systematically surface collected artifacts. My husband helped dig pits. There was no way I'd find myself in the bottom of one that was ½ meter or more in depth. And if you take a good look at me, you'd know why. And we screened and screened and screened! One of the more interesting aspects was a half day at the paleontological site. Now the finding of a camel tooth in a screen full of broken bones may not mean much to you professionals, but to me it was a gem.

This past August we made a trip with Mary and her crew to the Tosawihi quarry located between Battle Mountain and Midas. Herb and I had been hoping to make this trip for a couple of years, but something had always interfered, mostly weather, and once, the opening of duck season. But we did take off from Imlay and by the time we reached Winnemucca, we were involved in a full scale sand storm. Those of you who have visited northern Nevada know what kind of first class roads we traveled on. But what beautiful country! Having been raised not too far from a granit quarry, I had a fixed image of what to expect of the Tosawihi quarry, but I was not prepared for what I saw.

The area we worked was approximately 120 by 150 meters. We all lined up along the crest of a hill about 10 meters apart and as we walked down the hill, we staked no fewer than 46 quarry holes, most of which measured 2-3 meters in diameter. A few were larger. Dave Johnson, one of the supervisors, with the aid of his student crew, laid out 30 meter grids. Then we, who were strictly labor, would go to the intersection of the grid, toss a coin, and then collect at random. This procedure involved counting the flakes and lithics and weighing the flakes from the selected quadrant. This was a completely new experience for us. I prayed the coin would indicate the least dense area. I also have a little prayer that the rockhounds never find this spot, for the natural rock found there is beautiful! One of the quarry pits had already been cleaned out by either other archaeologists or rockhounds.

Now for the "nitty gritty," or the follow through, as educators would call it. I joined the Docent Council at the Nevada State Museum in the fall of 1974 and Herb followed in the fall of 1977, both as volunteers and both interested in the Antropology Department's program in archaeology. Now our idea of volunteer work is this. We do the menial, simple work that releases the professionals to do the complicated technical work for which they were trained. And that is why I was happy(?) to wash heaps of flakes, to move drawers of artifacts, and occasionally to xerox records and reports. But it is very nice now to be able to do things that have a little more depth to them:

1.) Herb has written up many camp site records that have met with the approval of Amy and Evy Seelinger, who maintains the site records file. As a matter of fact, Herb gave Amy five camp site records which we had located on Hinkey Summit and the copies which she gave to the Forest Rangers were the first they had in the area.

2.) Marilyn Hollingsworth, Doris Folson, Herb and I did the complete cataloging of the Rye Patch Early Man site (No.370), and transcribed it in graphic form for the computer.

3.) We, mostly Herb, measured, weighed, and cataloged for the computer a couple of collections Andy Jensen and Margaret Miller made and brought to our home.

Finally, the education we have received from you has given us a new kind of freedom in arrowhead hunting. Now we can go to a camp site armed with a meter tape, a camera, a notebook, and a Munsell Reader and examine the lithic scatter and artifacts or fragments thereof and write up that camp site and still have the same satisfaction as we did when we collected the arrowheads.

We know, for instance, that there are many camp sites in the Indian Lakes area (Stillwater) that are becoming more fragile by the day. When we first visited this area in Churchill County, we were lucky if we saw one other vehicle during a weekend. Now the lakes are ringed with campers, trailers, boaters, etc. There is a lot of pressure on Stillwater from fishermen, hunters, and grazing cattle. Perhaps the reason is the higher fees and bad water found at Lake Lahontan State Park. At any rate, Herb is writing up the sites, but we're not going to live long enough to get all of them; there are that many.

We feel confident that education is the most effective weapon that can be used to save archaeological sites. For us, it has made us feel useful and that is, perhaps, the most important feeling retired people can have.

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1979 The Pony Express in Central Nevada: Archaeological and Documentary Perspectives. *Bureau of Land Management Cultural Resource Series* Number 1. Reno.

# A Brief History of the Discovery and Exploration of Pebble Mounds, Boulder Cairns, and Other Rock Features at the Sadmat Site, Churchill County, Nevada

BY

Donald R. Tuohy

The purpose of this paper is to present a brief history of the discovery of the Sadmat site with its "Early Man" artifacts, pebble mound complex, boulder cairns, and other stone features located in western Churchill County, Nevada. At the same time as providing a short history of the Sadmat site for the ensuing study of pebble mounds by Amy Dansie, this study also serves to underscore the importance of both the site and the locality, and to express the author's continuing research interest in them. The term Sadmat "site" refers to only one site, 26Ch163, the westward most in a group of sites located in western Churchill County near Hazen, Nevada. The term Sadmat "locality" refers to an area twenty to thirty miles long and three to four miles wide located between Hazen and Parran and encompassing all of the sites in the area that have pebble mound complexes (Map 1).

The sadmat site itself was discovered February, 1965 by two former neighbors who resided in Fallon, Nevada, Mrs. Yvonne Saddler and Mrs. Etta Mae Mateucci. They and their husbands had been driving along a pole line road near Hazen Butte in western Churchill County when they decided to make a rest stop. While walking between the pole line road and the railroad tracks, they noticed and picked up a collection of prehistoric artifacts. Finding the whole area, about two square miles, to be productive of artifacts they returned on successive weekends to gather additional specimens. There were so many that the ladies made canvas bags with shoulder straps to hold and to carry artifacts from the site on weekend forays. When catalogued at the Nevada State Museum several years later, the collection contained over 3,000 specimens.

Realizing the importance of their collection, the ladies first took the artifacts to Mrs. Clara Beatty at the Nevada Historical Society Museum in Reno who suggested they contact Margaret "Peg" Wheat, also a Fallon resident. Mrs. Wheat, at that time, was affiliated with the Nevada State Museum as Research Associate in Ethnology, and had been a member of several archaeological expeditions led by Dr. Richard Shutler, Jr. Mrs. Wheat had a portion of the Saddler and Mateucci collections at the George Whittel estate at Lake Tahoe when I first saw them in 1965. I was struck at the time by the similarities between the artifact classes and types and those reported from several Early Man sites in Nevada and in California such as some of the surface artifacts from Tule Springs reported by Susia (1964), San Dieguito materials reported by Malcom Rogers (1939), and the Lake Mohave artifacts reported by Amsden in Campbell and Campbell et al (1937).

Both Dr. Wilbur A. "Buck" Davis, who held a joint appointment in the Anthropology Departments at the State Museum and at the University of Nevada, Reno and I became aware of the Sadmat artifact collections roughly at the same time, and immediately asked to be shown the site. Mr. and Mrs. Saddler, Mrs. Mateucci, Mrs. Wheat and I all visited the site together in June, 1965. At the time, I presumed Dr. Davis had made out a site record form, and he must have presumed the same for me, as it was several years later when I discovered that neither one of us had recorded the site properly. Subsequently, it was recorded, but not mapped, and was given the Smithsonian designator 26Ch163, and the name "Sadmat" from the first three letters of each finder's surname.

Dr. Wilbur Davis (1966:149) was the first professional archaeologist to mention the site in the published literature when he noted that early appearing artifact types had been recovered from 3,955 foot beach terraces of Lake Lahontan at Falcon Hill (Tuohy 1970) and from..."the vicinity of Hazen."

Since the collections were retained by the finders at separate households in Fallon, Nevada it was difficult to do any kind of analysis and recording of the artifacts. Nevertheless, with the help and cooperation of Mr. Mateucci, Dr. Claude Warren, Anthony Ranere, and I were able to do a study of the artifact types contained in the Mateucci half of the collection in 1966. Dr. Warren was asked to participate in the study because of his intimate knowledge of San Dieguito materials found in San Diego County, California (Warren and True 1961), and becuase of the presumed resemblance between Sadmat and San

**Map 1.** A portion of western Nevada showing Pleistocene lakes, and archaeological localities where "Early Man" materials have been recovered. The letters and numerals refer to several such sites; locality "D" with the attached arrow indicates the Sadmat locality. The map was adapted from Snyder, Hardman, and Zdenek (1965).

*a*

*b*

**Figure 1.** Four views of the Sadmat site (26Ch163). *a,* Steve Teiber standing on normal or undisturbed desert pavement at the Sadmat site; *b,* Row of pebble mounds located at the west end of the Sadmat site; *c,* The same row of pebble mounds with Hazen Butte in the background; *d,* Arrow in left center indicates the location of the excavated pebble mound at Sadmat.

*c*

*d*

Dieguito assemblages. His interpretations of the Sadmat site and Mateucci collection of artifacts were published in 1968 (Warren and Ranere 1968:6-18). My notes on this study are appended to this report, (Appendix I).

In the same volume (Irwin-Williams 1968) as the Warren and Ranere (1968:6-18) paper was published, I summarized sketchy information of some early lithic sites in western Nevada in which mention was made of the Sadmat site and some of its artifact types (Tuohy 1968:27-38). While mention was made of ..."San Dieguito - like rock cairns and rock alignments having circular and rectangular configurations" at Sadmat, the article (Tuohy 1968:27) did not specifically mention the pebble mound complex also found there. A second paper, published the following year (Tuohy 1969:133-144), briefly mentions the Sadmat site and illustrates artifacts from it, but again, the pebble mound complex was not discussed in detail.

Quite early in the history of Sadmat investigations Dr. W. Davis, Dr. Warren and I realized how important it would be to obtain aerial photographs of all the rock alignments at Sadmat. At one time, I had actually put ground markers down at both ends of the Sadmat site for use by a photographic reconnaissance unit of the Nevada Air National Guard. They had to postpone the flight because of emergency maneuvers, however, and I never did call them again to renew the appointment for the overflight and photography.

Meanwhile the years passed by, and because of the early notoriety the site had received, a number of Nevada amateur archaeologists decided to visit it. I remember one such visit in March, 1968 accompanied by the late Peter Ting, Sr. and Stephen V. Tieber (Figure 1 a,b,c). They were particularly interested in the row of pebble mounds located near the west end of the site, and they called my attention to it. I had noted the row previously, but because of the mounds' modern appearance I assumed that: 1), either the ladies had raked up the pebble mounds in the course of their collecting activities, or 2), the pebble mounds were related to construction activities on the nearby railroad grades, either in 1868 or in 1904 (dates from Dansie 1981).

To satisfy my own curiosity about them, I excavated a test excavation pit in one of them in 1968 (Figure 1d). The pit sliced one of the mounds in half, and my notes state that the pebbles were about the size as might be caught by the tines of modern rake, while adjacent gravels were smaller in all dimensions, and of a size which would pass through the tines. Also, I had noted at the time that the bulk of the pebbles comprising the mound were not pitted or worn from wind erosion (Davis 1967:345-343), as one might expect had the mounds been in existence for six to ten decades or more. In addition, many pebbles in the mound were noted in which the iron stains formerly on the bottom side of the desert pavement were turned face up, and vegetation growing in the mounds appeared to be much younger than larger, nearby plants. Also, there were no waste flakes from stoneworking present in the mound. In all, the pebble mound excavation appeared to confirm my belief in their temporal recency, and I dismissed them from my mind, not even reporting the test excavation.

Seven years later, in April, 1975 when contract archaeology had come into full flower, Amy Dansie and I did a field reconnaissance of a 6½ mile square area of the Carson Desert area for a proposed site of an electrical power plant. This survey located one site (26Ch190) with a large number of pebble mounds. Both the mounds and the pebbles themselves seemed considerably more robust than those recorded at the Sadmat site (Rusco and Tuohy 1975:15-18). Unquestionably, we were dealing with the same phenomenon in the desert pavement at approximately the same elevation, ca. 4,000 feet, in the Lahontan Basin. But, as yet, we had no idea as to the areal extent, or the total number of pebble mounds at either site.

The next discovery came as a result of the Bureau of Land Management's decision to inventory federal lands for cultural resources before disposing of them. John Roney (1978:6) reported a series of 39 pebble mounds located on a barrier bar above the 4,040 foot contour on the eastern slopes of the Hot Springs Range near Parran, about 20 miles from Sadmat. Found near the pebble mounds were 32 artifacts from lithic scatters near the pebble mounds. The artifacts included Haskett or Cougar Mountain Points, Lake Mohave and variant points, obsidian silicate, and other stone knives and bipoints, gravers, scraper/gravers, scraper planes, and large and small scrapers and other tools identical to types recovered at the Sadmat site (Roney 1977). In short, this site (26Ch510) was estimated to have been occupied between 11,100 and 9,000 years ago on the basis of the artifact types present there (Roney 1978:9). By implication, the pebble mounds at the site were presumed to be of the same age as the artifacts.

One year after Roney (1978) had reported the pebble mounds at the embayment on Hot Springs Mountain, the late Peter Ting, Sr., the amateur archaeologist who had visited and collected artifacts from the Sadmat site, reported to me the presence of pebble mounds in desert pavement on the east side of the Black Rock Desert at an elevation of 3,940 feet. I had asked him to be on the alert for such phenomena because *two separate localities* in northern Nevada with pebble mound complexes would certainly buttress arguments favoring a prehistoric age for them. He reported to me the presence of 302 such mounds covering an area about 300 feet long by 40 feet wide "...placed in linear or fairly straight rows." Unlike the previously reported sites, no artifacts were associated with these pebble mounds. I subsequently reported this site (Figure 2c,d) to the Bureau of Land Management, and it was named the Peter Ting, Sr. site, but, as yet, it has not been given a Smithsonian site designator.

Elsewhere in the Desert West, particularly in the Colorado Desert, Death Valley, and portions of San Bernardino, Riverside, San Diego, and Imperial Counties in California, linear alignments of rock cairns, exact duplicates of the Sadmat and Black Rock Desert localities' pebble mound complexes, have been found and recorded. A short paper published by Wlodarski and McIntyre (1979:137-142) summarizes available data from some of these sites. The earlier substantive contributions to knowledge of pebble mound complexes in these California Desert areas were made by Rogers (1939:11;1966:55), Wallace et al (1958), Hunt (1960:115) Hanenszel (1978) and Begole (1973;1974;1976) among others.

Renewed interest in Nevada sites particularly in the Sad-

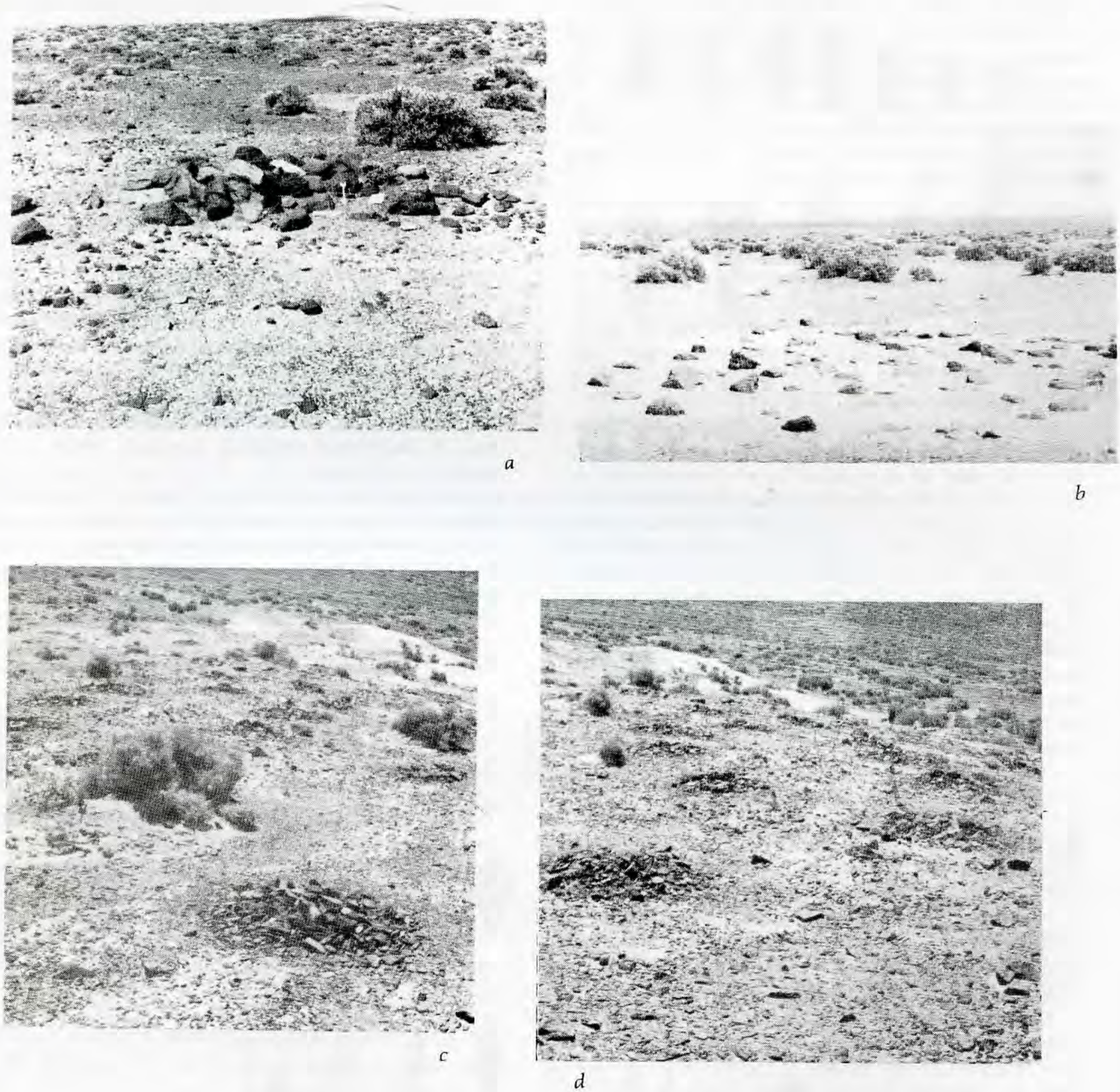



**Figure 2.** One view of a boulder cairn and a circular or radial grouping of rocks at the Sadmat site, and two views of the Peter Ting, Sr. site located on the Black Rock Desert. *a,* A boulder cairn at the Sadmat site; *b,* A circular or radial arrangement of stones at the Sadmat site; *c,d,* Two views of the Peter Ting, Sr. site (photo courtesy of Peter Ting, Sr.).

mat locality dates from 1980 when Sharon Edaburn, Director of the Churchill County Museum and her pilot friend, Charles Gomes, flew over western Churchill County and rediscovered and photographed the pebble mound complexes from the air. Her aerial photographs combined with ground examinations of the pebble mounds and mapping projects sponsored by the Bureau of Land Management have resulted in new insights into the archaeological phenomena represented by the mounds. Some of these insights were presented at the May, 1981 meeting of the Nevada Archaeological Association (Edaburn, Dansie, Davis, and Roney 1981). The ensuing paper by Amy Dansie explores in detail the many possible functions proposed for sites with pebble mound complexes.

With reference to my own views on the pebble mounds at the Sadmat locality, I am of the opinion that some of the pebble mounds eventually will be shown to be of historic age, and related to the gathering of gravel for use in railroad grade or highway construction, or repair work. The plain fact of the matter is, however, that all of the evidence is not yet in, and one should keep an open mind concerning both the function of, and the age of pebble mounds in western Nevada.

**With reference to the Sadmat *site* alone, I should like to make it clear that not only are pebble mounds present there, but many of them appear to be mere remnants of mounds, the pebbles having been scooped up by unknown parties for unknown uses. Also, pebble mounds are not an exclusive type of rock formation of cultural origin at the Sadmat site. There are roughly a dozen boulder cairns of the type illustrated in Figure 2a located at the Sadmat site. There are also an unknown number of other slightly displaced linear, circular, and rectangular rock alignments, one of which is illustrated as Figure 2b, present at the Sadmat site. These features also have not been mapped as yet, but comprise a continuing research concern and interest of mine.**

The latter statement is expressed here in print because of the overlapping jurisdictions and research interests of recent archaeological field investigators working at the Sadmat locality. For example, in the vicinity of the Sadmat site, land ownership is in the "Railroad checkerboard," and there are parcels of Public Domain lands, Bureau of Reclamation withdrawals, and private lands present there. Until recently, there were few section markers, and it was difficult to tie archaeological features to any kind of datum point established by an engineering survey.

Then too, the last of the archaeological collections from both the Sadmat site and the locality have only recently been deposited at the Nevada State Museum. The Peter Ting, Sr. collection of artifacts from the Sadmat locality was accessioned in October, 1980. The Mateucci half of the Sadmat site collection was accessioned in August, 1973. The latter artifacts were the gift of Mrs. Etta Mae Chase (nee, Mateucci). The Saddler half of the Sadmat site collection, of course, was accessioned two years before that in 1971. It was donated to the Nevada State Museum in the memory of Yvonne Saddler's husband, Harry Saddler, now deceased.

Now that the data base for the Sadmat site has stabilized, I am looking forward to future research at the Sadmat locality both in the field and in the laboratory. Studies of the existing artifact collections should enable qualitatively and quantitatively precise studies of the artifacts to emerge. Whether or not the Sadmat site should be included in a "western pluvial lakes tradition" as Bedwell (1973:170-171) has indicated, in the "Hascomat complex" as Warren and Ranere (1968:11) have defined it, or in a Stemmed Point Tradition as Bryan (1979:244) has suggested, needs further review and thought. Certainly, the prehistoric people who lived at the Sadmat site undoubtedly made the boulder cairns and the linear and circular rock alignments, and it is not inconceivable that they were responsible for constructing at least some of the pebble mounds, as well. Amy Dansie's paper, to follow, explores some of these possibilities.

*Addendum*

Since the above paragraphs were written Allan L. Bryan (1980:77-107) has produced a broadly conceived synthesis which postulates a "Stemmed Point Tradition" for the Intermountain West. Summarizing his conclusions briefly, I quote Bryan (1980:102) who postulates a tradition"...which began in the Great Basin at the end of the Pleistocene as a technological adaptation to the hunting of herbivores, including mountain sheep, bison, camelids, and horses /and/"...it developed at least as early as the Fluted Point Tradition." Surely, Bryan's study (1980) is focused on the larger picture of what happened in western North America on an Early Man time level (13,000 to 7,000 BP). There is no doubt that Bryan's synthesis looks at forests and not trees, but as a regional archaeologist, I think we need to examine the trees (i.e. the Early Man sites, their features, and the artifacts from them) much more closely than we have to date (without becoming myopic), before conclusive evidence supporting half-a-continent-wide tradition can be mustered. On the other hand, perhaps Bryan's "Stemmed Point Tradition" has its merits as an appellation. It certainly seems superior to any of the hyphenated versions suggested so far, including my own postulated "Lake Mohave-Pinto" Tradition (Tuohy 1974:100).

## Appendix I

Notes on the Typology and Technology of Sadmat Site Artifacts

Artifacts from the Mateucçi half of the Sadmat collection comprise the sample of specimens illustrated in Figures 3 through 7. Claude Warren (Warren and Ranere 1968:9) had previously noted that there were 75 Haskett and "Haskett-like" points, 15 Lake Mohave points, 25 bipointed leaf-shaped specimens, 40 round-based leaf specimens, and several each or less of more recent types (illustrated in Figure 4c). He also noted that the collection included lanceolate, leafshaped and circular knives and leafshaped bifaces with coarser flaking than noted for the projectile points. Scrapers included 72 of the concave type (Figure 5), elongated, keeled and domed scrapers, oval side scrapers, keeled end scrapers, pointed scrapers and retouched blades (Figures 5 through 7). Steep and thumbnail scrapers were present, but not numerous. Gravers and drills (Figure 5) were quite numerous with 185 gravers counted in the Mateucci collection. There were also nine simple crescents (Figure 4d), and a few large, percussion flaked scrapers or choppers as well as cores of various forms (Figure 6). All of the classes of tools in the collection are illustrated except the elongate, flat side scrapers which in plain view look very much like the rectangular scrapers illustrated in Figure 6.

The collateral flaking technology present on the stemmed and lanceolate points from Sadmat was noted by Warren and Ranere (1968:11). They state that the flaking scars were produced by a pressure technique that produces broad, shallow flakes that feather out near the midline in a collateral fashion. Edges are often retouched. This technology was also noted on Haskett and Birch Creek points in Idaho as well as on points from Cougar Mountain Cave in Oregon (Layton 1972:13-19, Figs. 1-7; Cowles 1959), according to Warren and Ranere (1968:11), and they suggest the name "Hascomat complex" for the stemmed points having such collateral flaking scars. A complete study of all specimens from the Sadmat site together with the metrical data may help to resolve questions on the technology of Sadmat artifacts.


*a*

**Figure 3.** Projectile points of several types from the Sadmat site. *a,* Lake Mohave points and variants are the first five in the top row; the sixth point fragment in the top row and the bottom two rows were classified as Haskett points; *b,* Six Lake Mohave points and variants; *c,* The top two rows were classified as Bipointed points; they have some overlap with the Lake Mohave style; the bottom row was called Oval-leaf type; *d,* Lake Mohave points and Stemmed Points of several types.


*d*

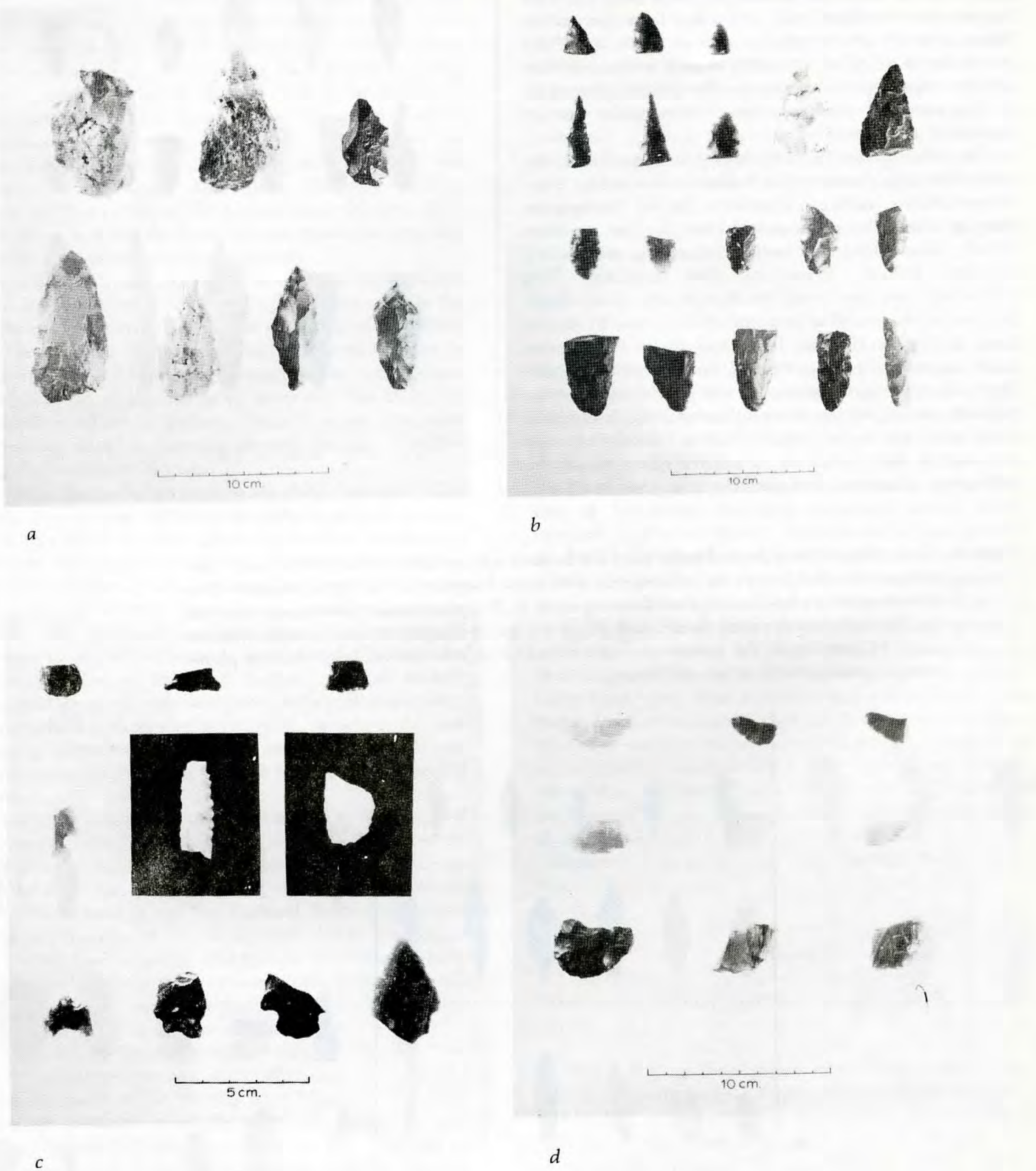
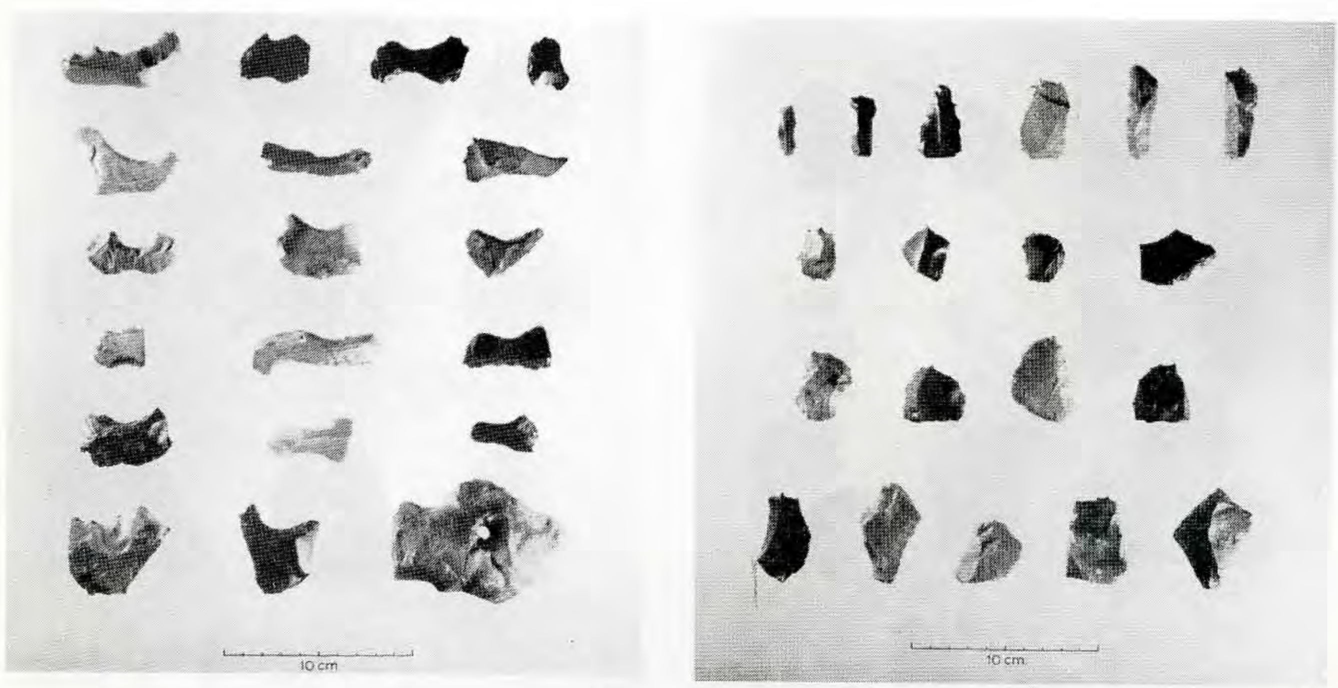



**Figure 4.** Bifaces, biface fragments, point fragments, and crescents from the Sadmat site. *a*, Top row contains roughouts; the bottom row contains incompletely reduced bifaces; *b*, Top two rows are pointed biface fragments; the lower two rows are biface fragments with rounded tips; *c*, Projectile point fragments of the Triangular, Rose Spring, Pinto, Humboldt, other series of Great Basin points; *d*, nine crescents.


*a* *b*

**Figure 5.** Drills, gravers, pointed scrapers, reamers, scraper-gravers, prismatic blades, concave scrapers and scraper-gravers, and gravers on blades and flakes from the Sadmat site. *a*, Drills of various types, top three rows; blunt nose gravers are in bottom row; *b*, top two rows, scrapers and reamers; bottom row prismatic blades; *c*, concave scraper-gravers and concave scrapers; *d*, gravers on blades and flakes.




*c* *d*

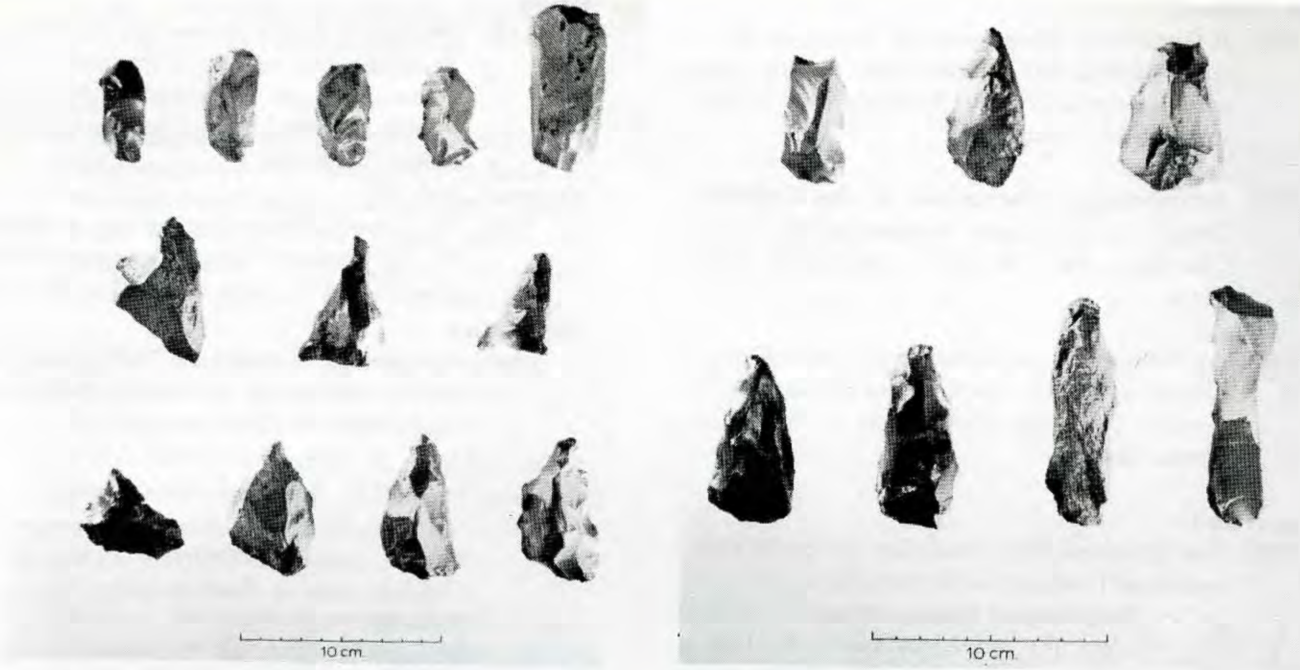

*a*


*b*

**Figure 6.** Cores, scrapers, knives, and flake scrapers from the Sadmat site. *a,* Tongue-shaped cores, top row; lower two rows are bifacial cores; *b,* Platform cores, top row; Irregular cores, second and third rows; *c,* Ovate scrapers, top row and first one in second row; Ovate knives, second row, the last two and the bottom row; *d,* Discoidal scrapers, the top row and the first in the second row; Rectangular scrapers, last two, second row, and the bottom row.


*c*


*d*




*a* *b*

**Figure 7.** Several varieties of scrapers from the Sadmat site. *a,* Top row, keeled and blade end scrapers; bottom two rows, keeled and pointed scrapers; *b,* Elongate, keeled scrapers; *c,* Top row and first in second row, Tabular, or thumbnail scrapers; Last two in second row and all in bottom row, domed scrapers; *d,* Top row, block scrapers; Lower row, block side scrapers.


*c* *d*

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# Pebble Mound Complexes In Northwestern Nevada

BY

Amy Dansie

In 1968 Don Tuohy (1968:27) reported the occurrence of rock cairns on the Sadmat site in association with San Dieguito artifacts. At that time Tuohy noted that the stone features "...found at putative early sites...have not received the attention they deserve" (1968:27). Now, thirteen years later, these features are just beginning to receive the attention they deserve. This report will provide a summary of information which may serve to stimulate future research along many relevant lines of both data gathering and thoughtful interpretation.

In 1975 Don Tuohy and Amy Dansie discovered another site marked by an extensive complex of pebble mounds. It was located on the Carson Desert, northeast of the Sadmat site along the 4,000 foot Lahontan beach terrace (Rusco and Tuohy 1975). The mounds were constructed of pebbles gathered from the surrounding desert pavement, spaced roughly three to four meters apart. The mounds are approximately one meter across and from 40 to 60 cm high (Figure 1a). The pebbles are actually a combination of rounded stones from pebble to small cobble size, or 4 to 10 cm in maximum dimension. As Figure 1b shows, the stone cairns at this site (26Ch190) seem to show little disturbance and much stability for a relatively long period of time. The exposed outer surfaces are evenly weathered and the pebbles around the bottom are imbedded deeply in the surrounding sandy silt substratum. This condition does not obtain at all of the pebble mound complexes, however, as noted below.

Artifacts associated with the pebble mound complex at 26Ch190 consist of a few relatively large flakes which could represent the Western Pluvial Lakes lithic tradition (Bedwell 1973:170-173), but without diagnostic bifacial artifacts, the assignment of the flakes to a particular cultural entity is difficult, at best. An interesting feature which may or may not be directly associated with the pebble mounds yielded a cache of hammerstones. This feature, perhaps disturbed by relic hunters, is located in a rock outcrop covered by tufa. Figure 2 shows the three hammerstones, one within a faint circular rock alignment against the southern edge of a rock outcrop. Pebble mounds in the background show as dark patches against the light lower face of the beach bar. The possible significance of the hammerstones will be discussed later.

The pebble mounds at 26Ch190 are arranged in a pattern which has been noted subsequently at most of the other similar sites. A series of the pebble mounds are aligned parallel with the crest of the beach bar, and another alignment runs down slope on either side of the drainage channel which breaches the bar. The mounds then are spread out on the gentler slopes at the south end of the complex. Later aerial reconnaissance of this site suggests that the mounds extend over a much larger area than we noted on the ground when the site was originally investigated.

Because of the strictures of contract archaeology, no attempt was made to map or to systematically record this site in 1975. Its presence on one of the proposed power plant sites was enough to eliminate this area from further consideration. (The proposed power plant is now completed and in full glory at Valmy.) At the time of the original evaluative report, Don Tuohy made a tentative suggestion that the mound alignments on the desert pavement might have been of a religious or ceremonial nature (Rusco and Tuohy 1975:16), an interpretation consistent with Rogers' (1939;1966) studies of rock-aligned ceremonial sites in the southern Great Basin.

In 1977, John Roney, BLM Winnemucca district archaeologist, reported a pebble mound complex in the Carson Desert virtually identical to the one reported by Rusco and Tuohy in 1975. Figure 3 shows Roney's mapped pebble mound alignment, and the apparent correlation of the mounds with the beach bar and drainage cut. These mounds are reported as "110 to 160 cm in diameter, stand(ing) as high as 30 cm, and composed of pebble averaging 5 or 6 cm in diameter. They are very regular in shape and seem to clearly represent cultural features" (Roney 1977:3). Roney reports also in the vicinity a series of Anathermal age sites which demonstrate repeated occupation of the Carson Desert during early Holocene times (ca.9000 BP). A few sites of early Medithermal age were also reported, but not in as close a proximity to the mounds as the Lake Mojave type artifacts were located.

These isolated reports of pebble mound complexes were brought into new perspective recently when Sharon Edaburn and her pilot friend Charley Gomes, photographed the sites from the air (Figure 4a, b). Not only were the known sites larger than originally thought, but there were also several more similar sites located in the area between Hazen and Parran along the Lahontan beach terraces. So far, a total of five or six distinct clusters of pebble mounds have been recorded in this area. Some of them show remarkable linear alignments of mounds almost in a grid-like pattern. Low pebble rows or windrows are also associated with some of the mound complexes. The largest of the sites discovered from the air has been named the "Peg" Wheat site in honor of Margaret Wheat, longtime friend of Nevada archaeology, ethnography, and geology.

Another stone mound complex which may be related to the distinctive Sadmat pebble mounds, includes groups of smaller mounds using larger stones placed in the vicinity of Lahontan beach features. One of these, the Peter Ting, Sr. site, is located on the southern edge of the Black Rock Desert near Trego Hot Springs. Peter Ting, Sr. investigated this site, and the data presented here are excerpted from his report. There are 302 stone mounds, and most are on a low ridge on the east side of a shallow canyon. The mounds are 2½ to 5 feet across and 12 to 14 inches high, and most of them are eroded down. The pebbles are from 2 to 5 inches in diameter. In addition to these pebble mounds, John Roney has recorded smaller mounds composed of larger stones on the Peter Ting, Sr. site. There seems to be no directly associated artifacts on this site, although a Pinto point site was recorded two miles away.

One of the sites recorded by Roney consisted of larger stones in smaller clusters but in roughly similar arrangements as the other pebble mound complexes (Roney 1977). This variation in the size of pebbles and cobbles used is probably a direct function of the size of the locally available stones on the surface. The question to be dealt with next is why the stones were arranged in clusters in the first place.

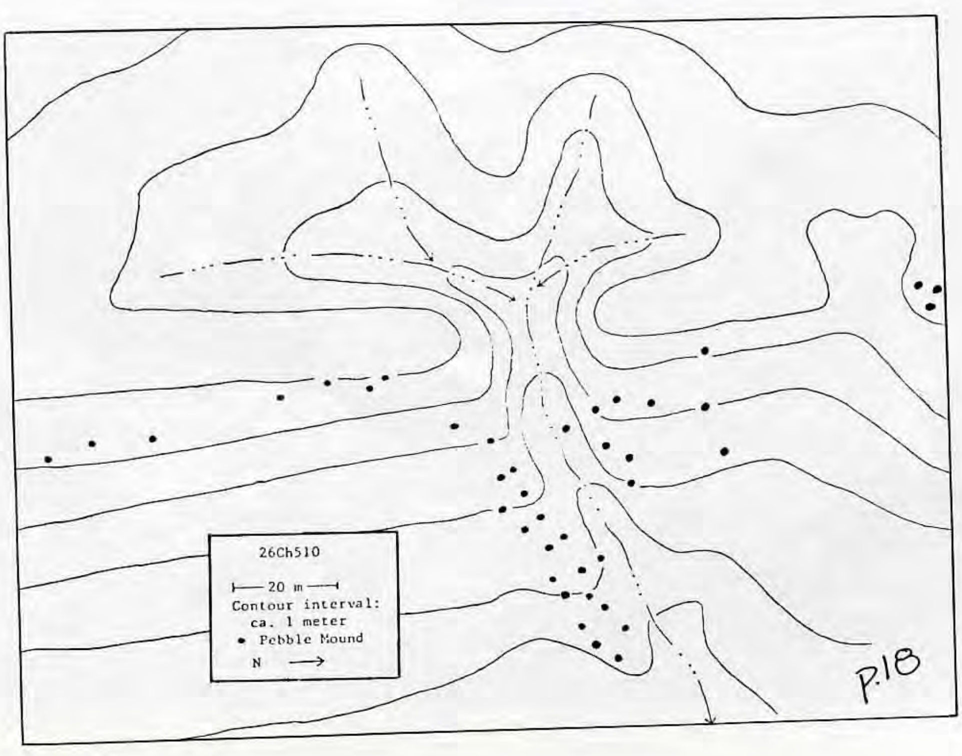
*a*

**Figure 1.** Pebble Mounds at site 26Ch190. *a*, Don Tuohy examining pebble mounds; *b*, Close up view of Pebble Mound. (Nevada State Museum)

*b*

**Figure 2.** Three hammerstones, one inside possible rock alignment on south side of tufa covered rock outcrop. Pebble mounds are visible as dark patches on beach bar in background. (Nevada State Museum)

**Figure 3.** Map of pebble mounds on beach bar and erosional cut (Roney 1975).



*a*

*b*

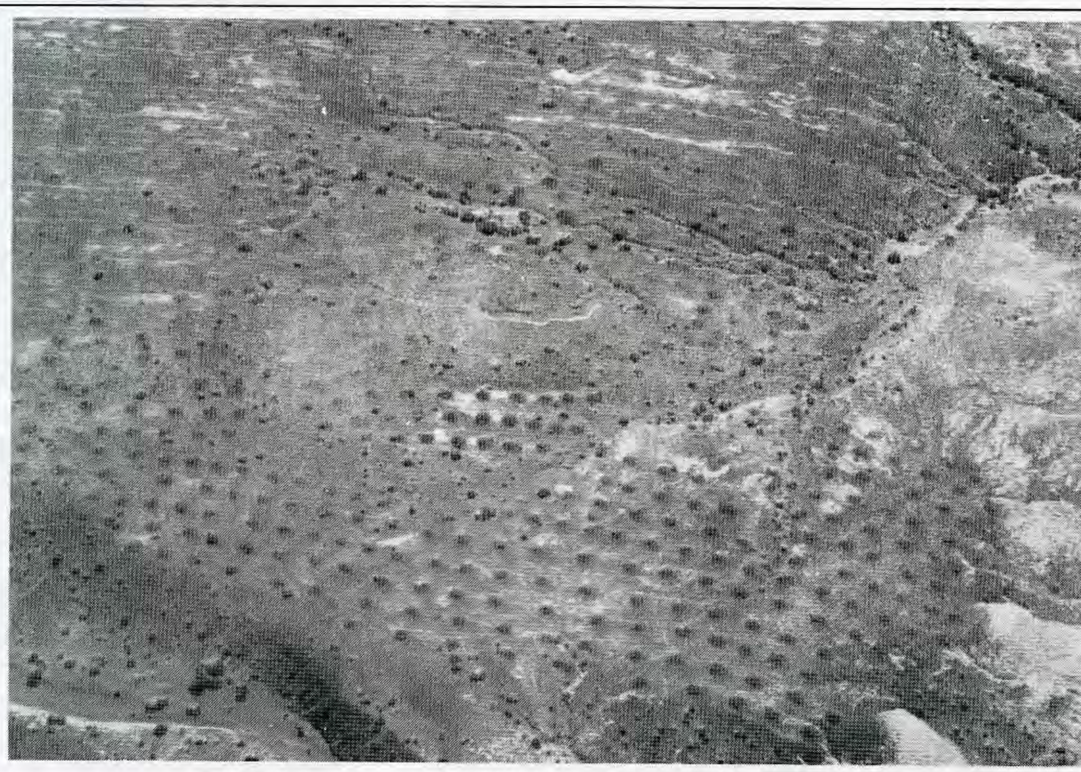


**Figure 4.** Aerial views of pebble mound complex on the "Peg Wheat" site. *a*, Long range view showing most of the complex; *b*, Closer view of grid-like arrangement of mounds. (Churchill County Museum)

One of the first steps taken in the study of the pebble mound phenomena is to ascertain the distribution of these and similar earth surface alteration features, first in the Desert West, and then, in the world in general. The problem herein is limited only to manipulation of surface lithics on desert pavement or cobble surfaces. We are not including rock alignments which seem to be related to hunting blinds or house rings.

Malcolm J. Rogers (1939) pioneered the study of surface archaeology in the southern Great Basin and Mojave Desert. His study of desert archaeology included the description of cleared and stone outlined "sleeping circles", trails, and boulder alignments in some of the most formidable desert regions of the American southwest (Rogers 1939:1966). As a result of his studies, Rogers developed a general classification of such features: "The creation of cultural features by the alteration of natural surfaces is widespread in the territory concerned, and takes many forms" (1966:52). The types we are concerned with here are among Rogers' "aligned rock ceremonials", which consist of three types: 1), intaglio (surface depressed configuration); 2), boulder outlined figure, and 3), grouped cobble cairn figure. Most of the intaglios representing recognizable figures are believed to be of relatively recent origin, particularly the intaglio horse and rider of Yuma Indian construction. Rogers believed the gravel and boulder alignments were the most ancient of the three, and noted that they were mostly constructed on flat terrain. He also noted: "In the main, San Dieguito cairns lie in complete isolation, without trails leading to them..." (1966:53), and he suggested that they may mark tabu areas or initiation sites. This "ideo-technic" interpretation (Binford 1962:219) of the feature is the most common prehistoric hypothesis suggested by the many archaeologists consulted to date.

In an earlier work Rogers (1939:9) discusses the gravel pictographs of the Mojave Desert vicinity as relief or intaglio techniques:

> "Relief designs were made by raking or stacking the gravel on lines or piles, intaglio designs by taking out sections of the black surface cobbles which exposed the light-colored subsurface material to form the pattern".

He emphasizes the magnitude of these features and concludes that they were probably built by the

> "...concerted action of a group of workers, and in connection with a cult. For this reason it is believed that their purpose was ceremonial in nature".

While it is worth considering the probability of concerted action of a group to account for the construction of these extensive features, the function of the features might be more profitably examined in light of Binford's (1962) three part scheme for interpreting function of material culture within the total adaptive system.

Three major functional subclasses of material culture are distinguished by Binford (1962:219); they may be useful in organizing the multiple possible interpretations of the pebble mound complexes. *Technomic* artifacts are those "...having their primary functional context in coping directly with the physical invironment". *Socio-technic* artifacts are those which have "...their primary functional context in the social sub-system...as the extra-somatic means of articulating individuals". The third subclass is the *ideo-technic* class of artifacts, which function in the "...ideolocal component of the social system. These are the items which signify and symbolize the ideological rationalizations for the social system and further provide the symbolic milieu in which individuals are enculturated...".

As noted previously, Rogers' (1966:52) interpretations of the aligned rock ceremonials, by definition, are ideotechnic in function. Other similar hypotheses, such as astronomical alignments, are also ideo-technic in nature. Considering the enormous amount of work involved in the construction of the complexes in their geographic and archaeological settings, it is incumbent on concerned archaeologists to attempt a more powerful analysis than calling everything not understood "ceremonial".

One particularly interesting site reported by Rogers (1939:10) is:

> "...an alignment of conical piles of gravel extending 489 feet north and south... The piles in each instance were constructed by raking the surface gravels of the mesa from a circular area, 6 feet in diameter, to the center of the space. This left a depressed circular rim about each pile, which has an average 5 feet."

The description of this site matches almost exactly the sites recorded on the Carson Desert. But Rogers (1939:10) makes some additional observations which may be important in the comparison of similar features across large areas:

> "Some of the gravel cairns have worked flakes in them which resemble quarry waste. On the terrace surface, material of the same nature was found flaked into knives, scrapers, and blades characteristic of the Playa and Pinto Industries... The structure does not have the appearance of great antiquity as the soil has not been washed out of the cairns."

Rogers describes several other cobble cairns which contain apparent quarry waste, noting the probable mixture of cultural affiliation and age, from the earliest occupations up through the Yuma. The variation in size of cairns and the component stones, and in the number of cairns per site seems to be greater in the Mojave Desert than in the small sample from the Carson Desert. The geographic location on flat mesa tops is also at variance with the Carson Desert sites, which are all located on or near beach bars with erosional breaches.

The possibility that the gravel cairns or pebble mounds represent float quarry extractive behavior should not be discounted without further field work, but investigations conducted to date indicate that the Carson Desert mounds have no chipped lithic debris directly associated with the mounds. Don Tuohy (1981) excavated one of the mounds at the Sadmat site and reported finding no flaked lithic material within or on the mound. Because of the extremely dense concentration of chipped lithics on the surface of the site, this observation was considered directly relevant to the time of construction of the mounds with reference to the occupation of the site. If the mounds had been raked into piles from the desert pavement of the site, surely some of the debitage or artifacts embedded in the desert pavement would have been incorporated into the mounds, - particularly if the mounds were made after the purportedly early occupation of the site. While this line of reasoning makes sense, it may not be focused correctly on the problem. The mounds at the Sadmat site, upon recent reexamination by Tuohy (1981), seem to show too much mixture of weathering and nonweathering of the component pebbles to be as old as the Anathermal age arechaeological biface assemblage indicates. Without further careful field examination, the possibility that some of the mounds could have been disturbed recently by relic hunters or by other forces cannot be dismissed. It seems that the degree of weathering present on the pebble mounds' surface stones is not consistent from one site to another. As noted above for site 26Ch190, only a detailed study of the sites can hope to ascertain whether this difference is a function of different times of construction, or of variations in the degree of post-construction disturbance of the features.

If the mounds are related to quarrying activities, the function would be within the technomic realm of adaptive behavior. The occurrence of flakeable stone in the pavement gravels has been confirmed for one area of the Sadmat locality in the Carson Desert but this distribution pattern must be studied in greater detail. Even if some of the pebble mounds were used in connection with quarrying activities, the variation in gravel constructions and configurations in the Desert West seem to represent something more than just quarrying of float gravels. But the hammerstone cache, previously noted, may lend some support to the quarry hypothesis.

An example of the difficulty in interpreting not only the function of, but also the cultural group responsible for the formation of gravel arrangements is exemplified by the Topoc Maze, or Mystic Maze, located in southern California on one bank of the Colorado River. This Mystic Maze is an extensive feature consisting of regularly spaced gravel windrows in a complex pattern. While it is in no way a true maze, it is apparently a carefully constructed feature which retained a distinctive component which Rogers calls a phallus (1939:10) and which Haenszel (1978:22) compares to the "eye" of a hook and eye fastener, accented by a single conical pile of cobbles. This feature also may have included a large anthropomorphic figure which was reportedly destroyed by the construction of the Topoc Bridge in 1893.

There is a long history of controversy as to whether this Topoc Maze was prehistoric or was related to surface gravel mining activities associated with the construction of the Topoc Bridge. Although there apparently was some actual gravel raking performed by construction crews, Rogers (1939:10) and Haenszel (1978:36) are apparently both convinced that such activities served only to damage a previously existing cultural rock alignment complex. Several eyewitness accounts describing the site before the bridge was constructed are the best evidence for a pre-commercial, if not pre-contact, date for the original gravel pictograph. The damage to a large portion of this site from erosion, noted by Rogers (1939:10) may be relevant in light of the following discussions.

The possibility of historic origins for the Carson Desert and Black Rock Desert pebble mound complexes has been considered (Edaburn, Dansie, Davis, and Roney 1981). The most plausible historic origin explanation must be related to known historic land use practices in the immediate vicinity of the sites. Both localities are near railroads and emigrant trails. The gathering of surface gravel for construction apparently is an established historic and modern practice in some areas, and, as such, must be considered very carefully in the interpretation of these sites.

Sharon Edaburn, industrial archaeologist and director of the Churchill County Museum, is academically well qualified to assess the probable types of equipment which may have been available for gravel mining operation in the deserts of western Nevada. Her collection of photographs of old construction equipment in action was displayed at the May, 1981 Nevada Archaeological Association meeting in Tonopah. All of the heavy horse drawn and mechanical equipment available in historic to modern times would leave recognizable scars on the fragile desert pavement. Only through the action of hand raking could the major accumulation of gravel mounds have been created without leaving tell tale scars in the nearby pavement. While a single horse drawn fresno, a type of earth scraper, might have left the least amount of surface scarring, there is no doubt that such simple, heavy equipment would probably have left its mark. On-the-ground investigation and use of aerial photographs show no signs of any kind of equipment tracks around the mound complexes. An occasional automobile road track may approach, and sometimes even cross some of the sites, but it is obvious such tracks are not related to mound construction. It is this writer's opinion, shared with industrial archaeologist Sharon Edaburn, that no heavy equipment, including horse-drawn fresnos, were used to construct the mound complexes.

This conclusion leaves us solely with hand raking to account for the construction of the mounds within the historic period of origin hypothesis. For the sites near the railroad, hand raking of gravel for use in the railroad grade would be a plausible explanation for the occurrence of mound complexes. However, most of the sites are located from one to three miles from the railroad. What is most interesting along these lines of thought are the occurrences of what look like typical mound complexes from the air, but which on the ground show that the mounds seem to have been removed. That is, cleared circles that have no gravel mound centers are present. Some of these are located near the railroad grades. As with the Topoc Maze, it is possible that historic railroad construction crews made use of prehistoric gravel mounds. The complete study of the spatial distribution and relationships among all the mound complexes, and their internal variation and the historic construction features should clarify this aspect of the problem.

While there remains the possibility that the emigrants may have tried to gather gravel for improving the wagon roads in the vicinity of the mounds, this hypothesis is not consistent with the known hardships and stresses the people on that part of the trail were encountering. By the time the pioneers got to Hazen Butte area, they were lucky to be alive. If there were barely enough food and water available to support the most direct route of transport of people and livestock, then it is not likely that human energy anywhere near the requisite magnitude implied by pebble mound construction would have been expended on raking of gravel over several square miles of waterless desert pavement. The only conceivable use for gravel the emigrants possible would have had was for use in roadway stabilization. if they went to the beach bar sources of gravel, they would have noticed that the beach bars themselves made excellent natural roadbed. For these basic reasons, the hypothesis of historic origin related to emigrant activities is rejected. The possible association of the mounds with the railroad construction in 1868 and 1904 is not rejected, pending further investigations, but it is not well supported by the evidence available to date.

If we had no more than these examples of gravel alteration sites to compare, we would probably be left with little hope for a possible functional interpretation of these Desert West pebble mound and windrow complexes. But in the course of exploring the literature and wracking the memory for dim recollections of similar phenomena, a discovery of virtually identical pebble mound complexes located half way around the planet in Isreal's Negev Desert presented a whole new possibility for interpretations of functional associations. What is most remarkable about the Negev pebble mounds is that they have been studied in detail by hydrologists, soil scientists, and archaeologists, with published experimental data to supplement the archaeological data.

Gravel mounds and strips which compare closely with the Carson Desert mound and strip complexes have been observed in Israel since 1871, when Palmer noted their occurrence and offered an hypothesis to explain their possible function. Evanari et al (1961:979-996) brought the mound complexes to the general attention of the scientific community with their *Science* article "Ancient Agriculture in the Negev." They note that "...gravel mounds are low heaps of gravel artificially arranged in long rows with a more or less uniform distance between the mounds. Mounds and strips are often intermingled and form all kinds of intricate patterns" (Evanari et al 1961:985). They also note that ever since Palmer's original report "...all authors dealing with them agree that they are related to agriculture..." (1961:985), with four basic hypotheses suggested by several different authors. In brief, these hypotheses are 1., that the mounds were used to grow grapes (Palmer's idea, based on his Bedouin associates' arabic name for them); 2., that the mounds were used to collect dew; 3., that the mounds were constructed to increase soil erosion to build up the soil in the lower elevations for farming; and 4., that the "...mounds and strips were extablished in order to increase the amount of surface runoff and gain more water for the fields below" (Evanari et al 1961:985).

Evanari et al (1961) rather convincingly reject the first three hypotheses with the following basic observations. The soil on the slopes is so shallow and saline that only the hardiest desert plants can grow there, and that there is no where nearly enough rainfall in Negev to supply grapes with adequate water. Their experiments show that the mounds do not collect dew or alter the water relations of the soil below the mounds. The soil erosion hypothesis seems the least likely of all of these, as it would take 20 to 50 years to accumulate enough soil to farm, and several of the gravel mound features lead to cisterns where increased silting would destroy the drinking water system of the people making the mounds. The fact that the gradient was inappropriate to the transfer of silt to the lower fields is enough to reject this hypothesis.

We are left with Evanari, Shanan, Tadmor and Aharoni's (1961) hypothesis that the mounds were designed to increase runoff as an integral part of the desert agriculture on the Negev. In their studies, over 100 runoff farms have been studied, dating from the 10th century B.C. to their peak during the Roman-Byzantine era. They have conducted numerous experiments in which they constructed small sample plots using the natural surface control and then altering the surface in several ways to duplicate the observed features of the mound and strip complexes (Evanari, Shanan and Tadmor 1971). Their summary statement (Evanari et al 1961:988) is quoted at length, with the observation that the soils of the Carson Desert are essentially identical in their infiltration characteristics (James Young, Seminar discussion 1981).

"...the infiltration capacity of the prevailing soil of the region decreases markedly with the formation of a characteristic surface crust through the physical slaking of the upper layer during the wetting-drying cycle. This increases the runoff. Crust formation is prevented by clearing the slopes, the soil surface was exposed, crust formation was enhanced, and runoff was increased. This resulted in greater water yields from the slopes. Thus, mounds were only a by-product of clearing the surface of stones. Strips sometimes fulfilled an additional function in channeling water from the slopes to the fields."

In their more recent and detailed report on the Negev data, Evanari, Shanan and Tadmor (1971) demonstrate that the effective rain fall range for the runoff farms is one characterized by light rainfall of 15 to 20 millimeters of rain per storm (about .5 to .75 inch of rainfall) or less. Figure 5 shows the relationship between rainfall and surface treatment of desert pavements. In a small catchment area, runoff may begin after 3 to 6 mm of rain has fallen (less than 1/4 inch). The surprising result of their experiments, and actual measurements of runoff on reconstructed runoff farms, was that the smaller the watershed, the higher the relative runoff yield. For example, a large watershed of 345 hectares produced an average of 7500 cubic meters of runoff per year over a 7 year period, or 24 cubic meters per hectare, with 70 percent of the total coming from the extremely wet year of the measuring period. In contrast, a 30 hectare watershed produced an average of 79 cubic meters per hectare per year, with only 40 percent of the total coming from the wet year. During the driest year of the recording period, the large watershed produced only 1 cubic meter per hectare compared to 11 cubic meters per hectare for the small watershed (Evanari, Shanan and Tadmor 1971:145).

While there is much more detail in the Negev data base, the conclusions are inescapable: clearing the desert soil of surface stones (desert pavement) can significantly increase the amount of runoff from even very light rainfall episodes, enough so that crops can be brought to harvest even in the driest years. The association of the pebble mounds in the Old World with agriculture practices was not a difficult step to take, even with several different functional hypotheses to account for their occurrence. However, such a step is not taken so easily in the northern Great Basin. In fact, prehistoric agriculture, incipient or fully developed, in the northwestern Great Basin area we are studying, has never been proposed or documented (Winter 1974:73). The well known sowing of wild seed in

**Figure 5.** Schematic diagram of the relationship between rainfall and runoff on natural and cleared desert pavement surfaces. Based on Evanari et al (1971).

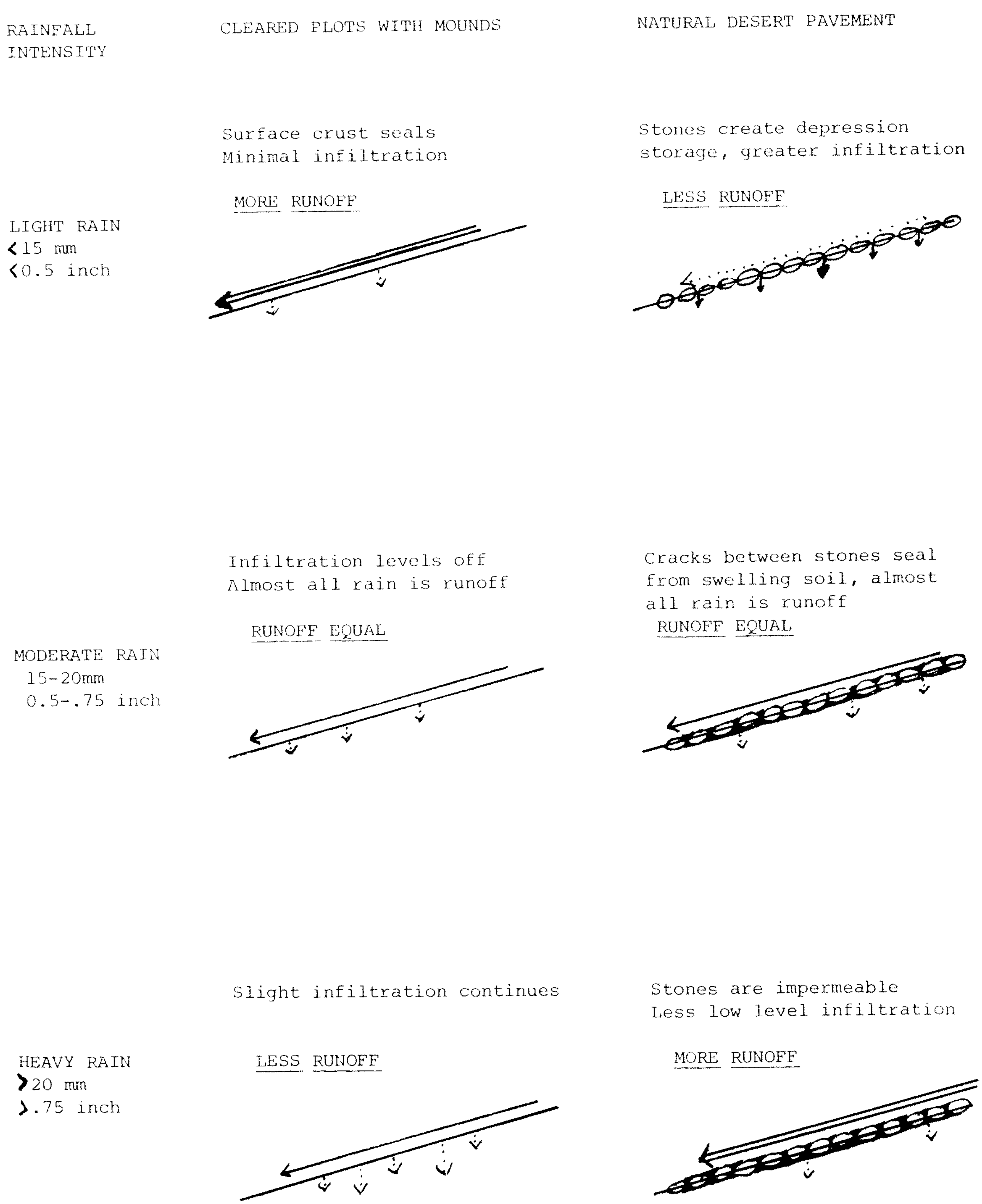


**Figure 6.** Geographic distribution of selected climatic characteristics in Nevada. The Sadmat locality and the Peter Ting Sr. site are shown as black dots. *a*, Average growing season; *b*, Growing degree-days; *c*, Average annual precipitation less than 4 inches; *d*, Season of maximum precipitation. Based on Houghton, Sakamoto and Gifford 1975:33,34,45,46.

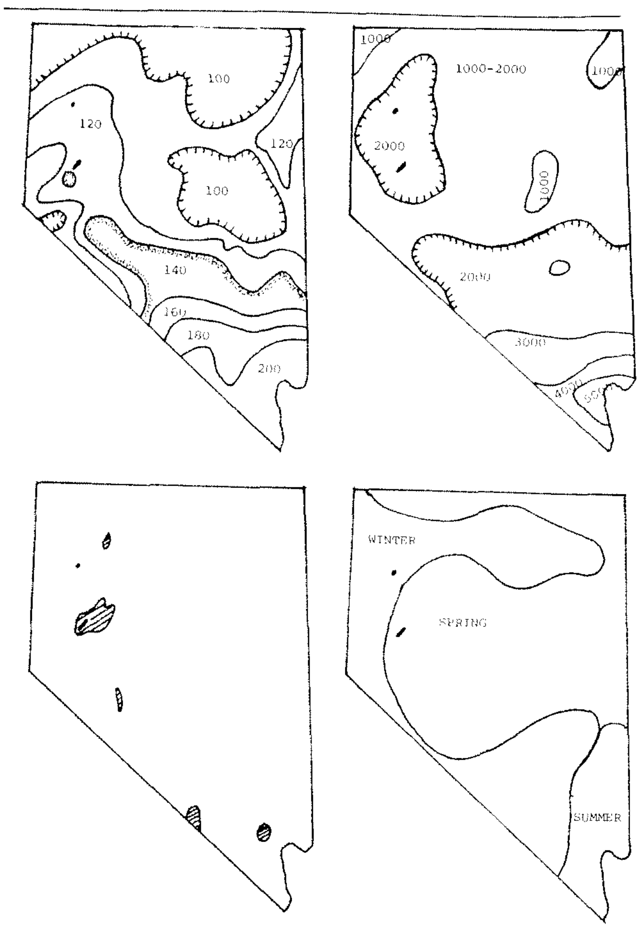



**Table 1.** Comparison of Annual Rainfall and Runoff Potential in the Negev and Nevada Deserts.

| | Nevada (Carson Desert) | Negev (Israel) |
|---|---|---|
| Annual Rainfall | 100 mm | 100 mm |
| Size of mound Complexes [2] | 4 to 36 ha[1] | 10 to 100 ha |
| Runoff Yield Potential[3] | 200 $m^3$/ha/yr | 100 $m^3$/ha/yr |
| Irrigated area Potential[4] | up to 1 ha/ site | 1 to 3 ha/ farm |

Notes:

1. ha = hectare, 1 ha = 10,000 square meters, 2.5 acres
2. The Sadmat site appears to have the largest area of mounds, but only the Wheat site has been measured at 32 ha (80 acres)
3. Smaller catchments produce relatively higher runoff yields.
4. Compared with the Negev data, only one hectare of land could be irrigated by the largest known Nevada mound complexes. Native plants with lower water requirements than domesticated crops may result in larger areas of effective irrigation potential. The smallest mound complex (estimated at 4ha) could supply irrigation water to 1100 square meters at the ratio determined in the Negev.

central Nevada (Winter 1974) is an entirely different kind of subsistence behavior than systematic runoff management as used to explain the Negev pebble mound complexes. Such a water control device is not even mentioned in Winter's extensive review of Great Basin and northern Southwest agriculture (Winter 1974:135-143). Because of the remarkable similarity in the mound complexes between the Negev and the Nevada deserts, however, it is worth exploring the possiblities of similar function further.

Without categorically rejecting the other hypotheses to explain the pebble mounds, let us assume for purposes of the following discussion that the mounds could have been constructed in order to increase natural rainfall runoff directed to some target resource. The basic questions to address then become: 1), *Why*, for what particular purpose? 2), *When* were they constructed and how long were they used? 3), *How* was their function discovered? 4), *Where* are the mound complexes disbributed geographically? 5), *Who* constructed them? This latter question is tied to the question of when, but it also asks what kind of total cultural system or society the builders were operating in at the time.

If the mounds are runoff enhancement devices, then their distribution should be tied to topographic and climatological factors which allow for the adequate function of the runoff systems as defined by the Negev data. Evanari et al (1971) have demonstrated that the mound systems do not function to increase the amount of runoff in moderate to heavy rain, but that their primary value lies in the remarkable increase in available irrigation water under very light rainfall regimes (Figure 5).

Climatic conditions relevant to water availability and plant utilization on the Carson and Black Rock Deserts show some interesting features. The Carson Desert has a mean annual rainfall of less than 4 inches (100 mm); the largest area of this lowest range in the entire state (Figure 6c). Only the Gabbs valley area, Las Vegas, and the edge of Death Valley are as low in annual precipitation. The Black Rock Desert is within an area of 4 to 8 inches (100-200 mm) of mean annual rainfall (Houghton, Sakamoto and Gifford 1975).

In an average year, some 40 to 50 days have measureable precipitation of over .01 inch (0.25 mm) per 24 hour period, but only 20% of those rainy days have over .25 inches (6.35 mm) of rain (or 8 to 10 days a year of rain over ¼ inch or 6 mm). Even in extreme years, the 50 year maximum 24 hour period precipitation is under 2 inches (50.8 mm) in the Carson Desert and 2 to 2.4 inches in the Black Rock Desert. Thunderstorms are likely only 10 to 15 days out of the year in the Carson Desert and less than 10 days in the Black Rock Desert. The seasonal period of maximum precipitation is in the Spring for the Carson Desert and Winter and Spring for the Black Rc_k (Figure 6d).

With these very low precipitation values for the two areas we are considering, any form of native agriculture seems unlikely. Houghton, Sakamoto and Gifford (1975:63) note, however, that "in no part of Nevada where the growing season and topography are suitable for agriculture can crops be grown without irrigation." But they also note (ibid) "the extend of natural forage production on rangelands depends, in part, on the length of the period in which the temperature is high enough for plant growth and water is also available". While the growing season in each area is about 120 days long, the two areas stand out in all of northern Nevada in the measure of growing condition efficiency measured by the "growing degree days" (Houghton, Sakamoto and Gifford 1975:47-48). The common concept of Fallon and Fernley as the "banana belts" of northern Nevada demonstrate the modern reflection of this growing efficiency of the local climate in the lower Lahontan Basin, and Figure 6b shows the distribution of this variable across the state.

One additional characteristic of rainfall in northern Nevada that contrasts with the southern areas having such high growing degree day rates, is that "...frequent light storms are characteristic of higher latitudes but...fewer storms with greater precipitation are the general rule in the subtropical belt" (Houghton, Sakamoto and Gifford 1975:47). The breakdown in measureable rain at .25 inch (6.35 mm) noted above is used because .25 inch of rain is considered a 'soaking rain' "...capable of adding considerable moisture to the soil" (Houghton et al 1975:47). Furhtermore, "although the storms in the north tend to be lighter, their more frequent occurrence is beneficial for crop agriculture and grazing lands due to the more regular wetting of the soil." Houghton et al (1975:47).

The above notes on the rainfall pattern are remarkably consistent with Evanari's data from the Negev. Evanari et al (1971) note that useable runoff begins to flow off cleared areas after as little as 3 to 6 mm of rain have fallen, indicating that the relatively frequent light rains of the northern Nevada area, even in the driest parts around the Carson Desert, could have functioned to provide useable irrigation water if the runoff were artificially enhanced. Table 1 compares the two areas, and shows that the Nevada data indicate a smaller scale than the larger Negev systems.

The infrequent heavier rains in southern Nevada may not have been suited to such types of runoff management, for in addition to the flash flooding which would wash out any runoff related constructions, the long time periods between rainfall episodes allows the soil to dry out, requiring supplemental irrigation when none is available.

So far, we can document the occurence of pebble mound complexes only in the Carson Desert near Hazen and in the Black Rock Desert near Gerlach. There may be others, according to pilot Charley Gomes, but these have not been confirmed yet. The search for similar mounds reported by Tuohy (personal communication) near Mud Lake east of Tonopah was conducted by air very intensively by two people who have seen the Carson Desert mounds from the Air (Johnathan Davis and Charley Gomes), and by three experienced archaeological field observers who were familiar with the aerial photographs (Amy Dansie, Nancy Botti, and Valerie Firby) but with no success. The area was searched so thoroughly that it is fairly certain that what Tuohy saw from the ground is not like the other mound complexes, and for the time being is not included in the data base for investigation into the pebble mound problem. The topography and apparent soil type, as seen from the air, are not conducive to the type of constructions documented for the Carson and Black Rock Deserts.

Although the base data are admittedly scant, there is so far a close correlation of the mounds with the only area in Nevada which has high growing efficiency combined with relatively frequent light rains concentrated during the spring and early summer months. So even under modern climatic conditions the mounds theoretically could function much as in Isreal. While the known areas of mound complexes lie within the driest climatic region of Nevada, they also lie within the sinks of the major interior drainages; these sinks also contain two Great Basin rivers and basins which have been in the past the 'wettest' parts of the Great Basin, containing lakes and marshes at various times.

In order to place the mound complexes into perspective with the variations in Lahontan Basin lake levels, Figure 7 has been compiled showing the elevations and approximate times of the known lake fluctuations compared to the known elevations of the mounds in the Carson Desert area. Unfortunately, while this method may be very useful in visualizing such fluctuations and in narrowing the dating parameters, the uncertainty of the elevation of the first Fallon Lake high stand, the date and elevation of the last Anathermal Lahontan high stand, and the elevation of the lowest mounds are critical gaps in this data base. The last problem can be alleviated by systematic archaeological field work, including mapping and elevation measurements. For the time being, one thing is clearly shown by the diagram. There has been virtually constant change in the land and water relationships in this area since well before the coming of man, regardless of when that might have been. The only long term stability in lake levels was during the 3000 year long dry period commonly called the Altithermal, when all but Pyramid Lake was dry land, and when a soil horizon formed in the other lake beds (Morrison & Frye 1965). Other apparently shorter soil-forming (dry) episodes have occured in the lower lake beds also, and short lake rise intervals may have occured during the Altithermal (Johnathan Davis, personal communication).

The lake level diagram, Figure 7, shows another baseline fact: the mounds cannot predate 9,000 years, and if the 7,000 year old high stand did occur, as questioned on the chart, the mounds must post-date 7,000 years. The later high stand is so questionable at this time (Jonathan Davis ibid) it is not included in the general graphic interpretation. The mounds examined to date seem to show no evidence whatever of ever having been inundated by lake shore waters. Because of the repeated association of the pebble mounds with Western Pluvial Lakes Tradition artifacts, the earliest dates are regarded as still possible; that is, until the first Fallon Lake of ca 3,500 years ago is shown to have been higher than the lowest mounds, the 7,000 to 9,000 year time range remains open for the possible time of mound construction. Only careful field work can resolve the problem of mixed patination on the mound stones which both Don Tuohy and John Roney consider as shedding considerable doubt on the great antiquity of the mounds.

Related to the problem of when the mounds were constructed is the question of how the possible runoff function might have been discovered. To this question there is a relatively simple answer, especially if the sites are old. The Western Pluvial Lakes Tradition occupations of the Desert

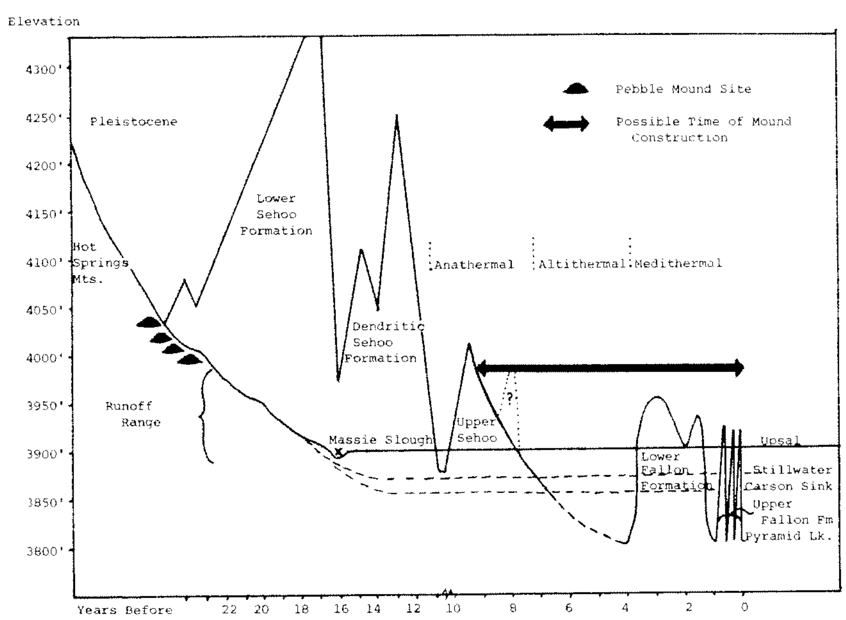



**Figure 7.** Approximate Chronology and Elevation of Lake Lahontan and Pebble Mound Sites in the Carson Desert, Sadmat Locality. Based on Morrison and Frye (1965) and Jonathan Davis, personal communication.

West, Including Rogers' San Dieguito and Playa complexes, were apparently based on a widespread common cultural foundation dating to the earliest occupation times in traditional New World archaeology, about 12,000 BP for the earliest sites in the Great Basin. Entrenched in the Desert West for at least three or four thousand years, these early people had plenty of time to explore all kinds of technomic experiments within the constantly changing late Pleistocene and early Holocene environment. The well known San Dieguito desert pavement constructions noted earlier in this paper, were widespread enough to have been known and to have been practiced by most, if not all, the early populations. It is not difficult to envision the probable ease of discovery, that when gravel was cleared from certain landforms and soil types (for whatever reason), more water ran off that catchment, making the plants below greener and/or more productive.

The similarity of such a scenario to a process we can all observe today along any desert highway makes the probability of prehistoric discovery a matter of common sense. A small microcatchment area equivalent to a 10 by 2 foot area (3 x 6 m or 1.8 m$^2$) of highway pavement provides enough concentrated runoff to bring to harvestable development one or two water-requiring alfalfa plants. Recalling the statement that no part of Nevada is conducive to agriculture without irrigation, this type of runoff phenomenon would probably qualify as irrigation, even on the small scale as illustrated for a small stretch of a desert highway. A 2 square meter area can irrigate at least one full alfalfa plant, and probably 2 to 3 square meters of grass, as one may observe along many miles of highway in Nevada.

That potential irrigation is less than the irrigation potential of one pebble mound, which clears an area of about 16 square meters. The pebble mound complexes observed to date appear to cover about 30 hectares, and are comparable to the smaller runoff farms in the Negev in scope (Table 1). The potential water yield might be enough for a highly productive natural seed harvest; or it might prolong the life of a marsh; or it might even provide one more source of drinking water in severe droughts.

One of the more convincing aspects of the runoff function of the Carson Desert pebble mounds is that they are neither arranged just like the Negev mounds, nor just like the Mojave desert mounds, but in just such a way as to take advantage of the particular topography of the Lake Lahontan beach bars and the natural drainage breaches through them; just *as if* they were related to the influence of water runoff or to these erosional features in some functional way. Furthermore, in an area with appropriate slopes, soil and surface pavement conditions, and the most efficient growing conditions of temperature and sunlight, we find just what one would expect if the mounds actually worked as hypothesized under those conditions. That is, mounds occur all along that particular lengthy stretch of beach bar from Hazen to Parran, a distance of about 20 miles. The mounds are also located above an area of extensive sandy silt in a complex dune and blowout system, far from any barren playa. Food plants such as wild rye could grow in the soil below the mounds (James Young personal communication).

Because the potential use of increased runoff includes food resources other than cultigens, or domesticated plant crops, and because the age of these mound complexes may extend well into a late Pleistocene or early Holocene subsistence system, a brief review of other suggested target food resources is in order. While there may be other ones, the following uses are suggested: 1) flooding of rodent colonies for food procurement; 2), drinking water by "tank" filling (like modern stock tanks) for use by game or people; 3), marsh enhancement; stabilizing a dying marsh for marsh vegetation and wildlife procurement; 4), spawning run enhancement on minor fishery tributaries for fish procurement; 5), general "pasture" enhancement for large and small game.

The rodent procurement, flooding, and fish spawning enhancement seem the least likely, for people would have to be there when the runoff flowed for the moisture to do them any good. Drinking water procurement and possibly, at the same time, pasture enhancement would be consistent uses for people with a hunting subsistence focus. Marsh enhancement would be consistent with lacustrine oriented subsistence systems, especially if the people adapted to the marsh resources were able to perceive the lowering water levels within a single life span, or if they had a cultural tradition or knowledge of fluctuating lake levels.

The seeming limited distribution of the mound complexes might suggest a short term technomic experiment which was not used long. Even if the experiment worked, if it were discovered before the Altithermal climatic period, the severe drought conditions of the Altithermal might have made it impossible for people to stay in the valleys, resulting in the loss of the cultural knowledge of runoff enhancement.

Because the process of desert pavement formation tends to re-establish an equilibrium over time (Evanari et al 1961), the possible function of runoff enhancement from pavement clearing is not expected to be permanent. The surface must be cleared again to maintain the surface crust formation process. Therefore the effects of increased runoff may not be visible even a few dacades or centuries after initial construction. Some of the aerial photographs show that certain areas of the mounds are more pronounced than others, as if more productive areas or areas with more rapid pavement reformation were cleared repeatedly. At this time we have not determined whether there is a present increase in availablbe water downstream from the mounds, except that John Roney recorded a modern stock tank downstream from the mound complex at 26Ch190 which uses the runoff from two drainages below the mounds.

Whatever the function was to the creators of the mounds, there is a good chance that careful study of settlement patterns and artifact assemblages found in the vicinity of the mounds, especially if they can be found below the mounds, will reveal the information necessary to eliminate some hypotheses and to formulate more informed testable hypotheses than is possible with current information. One of the intriguing possibilities, just discussed, is that the mounds might represent the evolution of an ideo-technic artifact complex into a technomic one under certain narrowly defined environmental conditions. The example Binford uses to explain how this kind of shift takes place shows how technomic stone axes evolved into socio-technic copper axes solely as status indicators no longer useful as functional tools (Binford 1962).

In conclusion, the exact significance of the pebble mounds in the northwestern Great Basin has not yet been determined, except that the mounds constitute a significant challenge to archaeologists whose professional responsibility it is to explain such undeciphered evidence of human behavior. The question of origins may be approached through many channels. Using the evidence of the apparent association between the distinctive structural features and distinctive human artifacts found at the Sadmat locality, the possibility of a Western Pluvial Lakes Tradition correlation is indicated, but this may be mere coincidence. Using evidence of mineralogical conditions such as iron staining of the pebble surfaces compared to a geological understanding of the condition of surrounding desert pavement, a "relatively recent" time of construction is indicated for some of the mounds. Yet, there is no substantiated evidence for use of large mechanized equipment in mound construction.

Using a functional comparison of virtually identical mound complexes in Israel and in other areas of the Old World, an intriguing but unprecedented interpretation of prehistoric Great Basin desert water management is indicated. Intensification of resource exploitation is usually associated with population pressure and if the mounds represent incipient agriculture, the most probable time of mound construction would have been during the period of maximum population growth, probably indicating an Elko/Martis/Lovelock Culture time range (ca 2000 B.C. to A.D. 500), as suggested by Robert Elston (personal communication).

I have spent many hours of research, thought, and conversation with colleagues on this problem. While our surprise over the remarkable similarity between the Negev mounds and the Nevada mounds was an exciting development, the implications are that we have discovered something really new in Great Basin prehistory, and the investigation will have to proceed with caution (lest they be found to be CCC busy work, or Soil Conservation Service busy work, possibilities Sharon Edaburn is currently researching).

It is indeed with caution that I present my view that the mounds may have been intentionally created by humans as technomic devices to increase runoff from light rainfall episodes. For what purpose, and at what time the mounds were constructed I shall not be so presumptuous as to suggest. Only further fieldwork can hope to answer even the most basic questions of chronology and associated technology. Several suggestions have been offered such as the irrigation of Great Basin wild rye as the most probable target resource (Young and Cluff personal communication). But whatever the function, I believe there are enough provocative data to support further research into the manner of articulation of such unique possible irrigation devices within a hunting and gathering based Great Basin type of subsistence level cultural system.

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This paper would not have been possible without all these people's assistance, but I take full responsibility for the shortcomings and conclusions reached.

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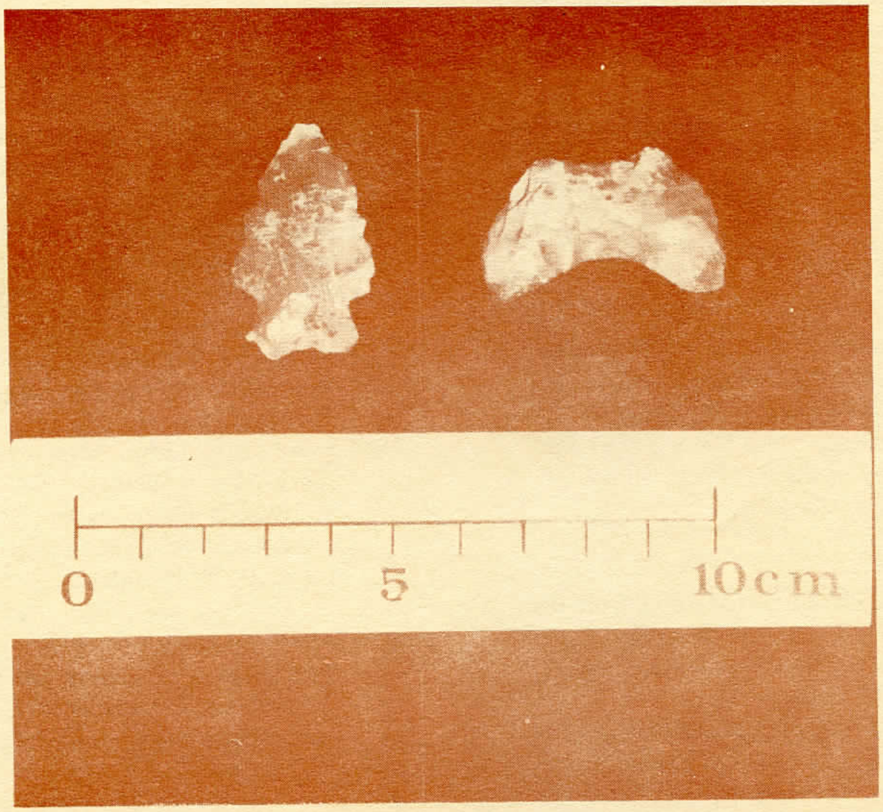


Pinto type of projectile point and a crescent from east-central Nevada. (Photograph courtesy the Nevada State Museum, Carson City).

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