Title
Chronological Ordering of Great Basin Prehistory

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Publication Date
1973-02-01

CONTRIBUTIONS
OF THE
UNIVERSITY OF CALIFORNIA
ARCHAEOLOGICAL RESEARCH FACILITY

Number 17 February 1973

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Part of the costs for the preparation and publication of this monograph have been supplied by the Jon and Francesca Wiig fund (1-443822-56410) for archaeological research in the Great Basin.

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PREFACE

This monograph is a slightly revised version of a doctoral dissertation submitted to the Graduate Division at the University of California, Berkeley, in November, 1972. During the period when this study was under preparation, financial support was provided through a Special Career Fellowship at the University of California, Berkeley.

To the members of my dissertation committee, Professors Robert F. Heizer (chairman), James J. Parsons, and John A. Graham, I express my appreciation for their aid and guidance. I am especially indebted to Professor Heizer for his encouragement, comments, and advice. Miss Jane Beaumont (secretary, Archaeological Research Facility) and graduate students Karen Nissen and Alan Albee were also of assistance. In addition, I wish to thank C. W. Clewlow, Jr. and D. H. Thomas for making available certain unpublished data.

It is difficult to find words capable of expressing my deep thanks to my wife, Lynda, for her patience and understanding during the research and writing phases, and most especially, for typing the final draft of the paper.

Thomas R. Hester
Berkeley

CHAPTER I

INTRODUCTION

"the backbone of history
is an agreed chronology"

Sir Mortimer Wheeler, 1964

The purpose of this study is to present a chronological overview of prehistoric cultural manifestations in the Great Basin area of western North America (Figure 1). Perhaps because of the harsh nature of the Great Basin environment, archaeologists working in this region have long been interested in the ecological adaptive responses of the prehistoric populations. Such interests continue to the present time, during a period when research trends in North American archaeology place heavy emphasis on similar processual studies. These anthropologically oriented endeavors are exemplified in the Great Basin by investigations into subsistence patterns (Napton 1969; Heizer and Napton 1969, 1970a; Fry 1969), settlement systems and ecological adaptations (Rozaire 1963; Napton 1969; Swanson 1970; Thomas 1971a; O'Connell 1971), relationships between hunting activities and rock art (Heizer and Baumhoff 1959), and technological analyses of stone tool manufacture and function (Hester 1970; Tuohy 1970b; Cowan 1972). This research is consistent with the states goals of modern archaeology (Flannery 1967; Watson, LeBlanc and Redman 1971; Hole and Heizer 1969; Hole 1971; Watson 1971; Trigger 1971; Harriss 1971). Deetz (1970: 115) has clearly defined three major aims toward which archaeologists should be working: (1) reconstruction of culture history; (2) the detailing of daily lifeway; (3) elucidation of cultural process, emphasizing the dynamic aspects of culture. It is obvious that it is of fundamental importance in each of these avenues of research to have a sound chronological framework. This concern has been shared by Great Basin archaeologists, but, unlike many other regional archaeologies of the past two or three decades, they have not subsumed their anthropological studies in the quest for rigid projectile point sequences which are then endlessly refined while other aspects of archaeology are ignored. Still, if meaningful and broadly applicable studies of cultural dynamics are to be pursued, chronology is important. A case in point are the investigations of Hill (1968) in the American Southwest. This significant research aimed at providing behavioral data from a Pueblo site, instead of the usual lists of pottery types and architectural descriptions. Yet his research interests would have been greatly hindered had not previous workers in the region established temporally sensitive pottery types and arranged these in a chronological framework (Hill 1968: 106). Another example is the settlement-subsistence research carried out by Thomas in the Reese River valley of central Nevada. Thomas (1971a: 88) remarks: "Without the solid chronological controls established by previous stratigraphic evidence, a project such as that attempted at Reese River would be impossible."

A proper defense of chronological studies was written by W. W. Taylor, one of the persons who laid the basis for the development of processual

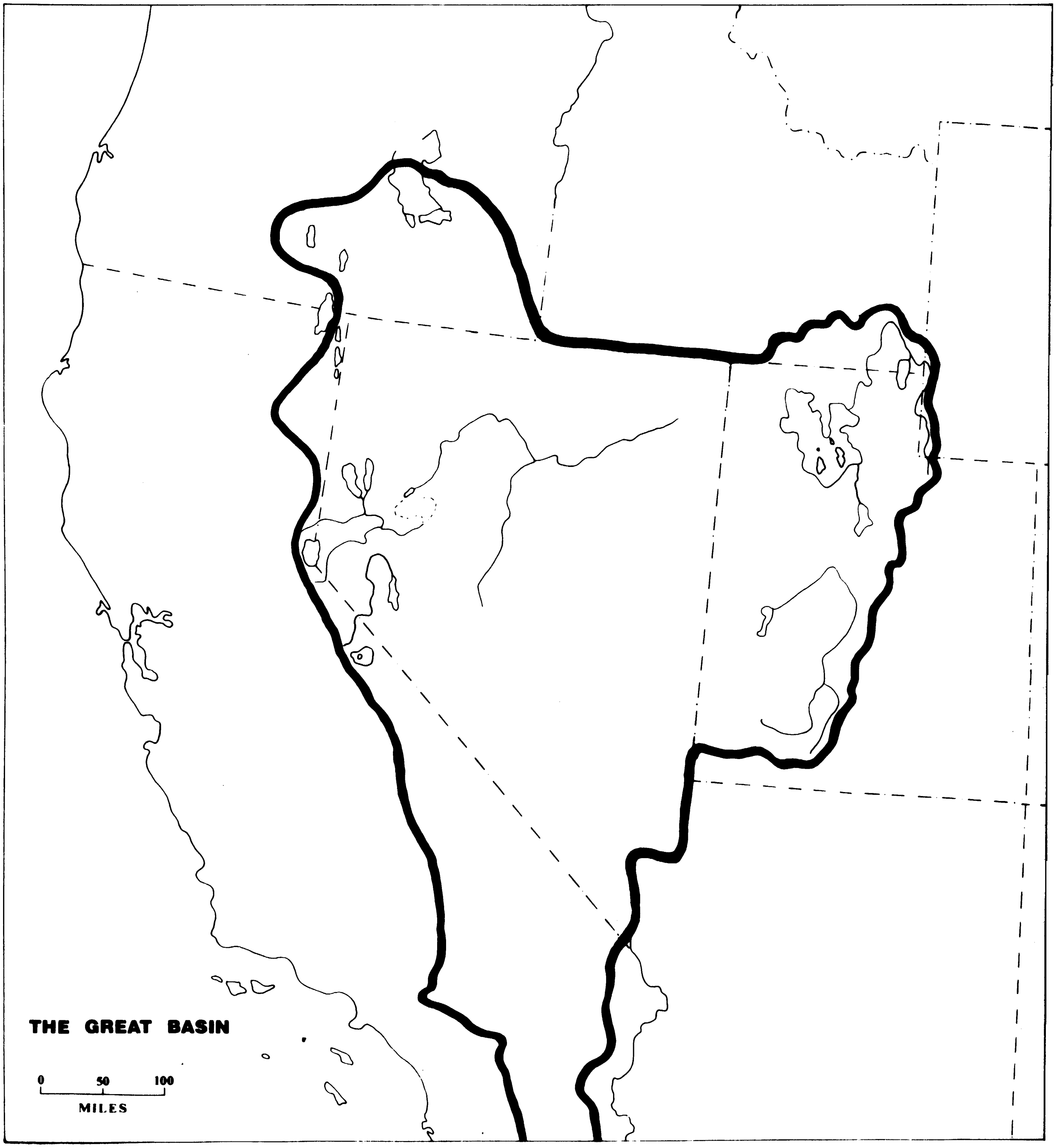


Figure 1. The Great Basin of the Western United States

studies in his Study of Archeology:

> "Chronology is admittedly an important factor in any archaeological research, the earliest and surest method of it is to be commended. But after a sequence of periods is known, we may justifiably ask 'so what?'. If we claim that chronology is a means to the end of understanding culture, we delude ourselves, for we are no further along in our study of culture than before. . . . Chronology is vitally important for cultural studies, if culture is also to be studied" (Taylor 1948: 62-63).

Another definition of chronology's role in archaeological research has been put forth by Hole and Heizer (1969: 212) and is quoted here:

> "Few cultural interpretations in archeology and none that have unique interest with respect to anthropology generally can be made without reference to time. Moreover, none can have demonstrated validity if the chronology used is not accurate and appropriate: accurate in the sense of correct, and appropriate in the sense of applicable in the situation under study. This remark is unfortunately not trite, because there are examples in most archeological journals where its tenets are ignored. It is not pedestrian nit-picking to ask that time be controlled when it is a priori obvious that many answers (all of them if they have historical implications) depend absolutely on it. We would go further and say that there cannot be 'proof' of a theory about cultural process unless time can be controlled."

Thus, the aim of this present undertaking is to consider and evaluate the available chronological data in Great Basin prehistoric research, with a view toward providing an up-to-date chronological outline. There have been several recent, and rather generalized, attempts at a chronological ordering of Great Basin prehistory (for example, Meighan 1959b; Bennyhoff 1958; Willey 1966), and much of what is presented in these attempts remains valid. However, there has been a proliferation of field research in the Great Basin since these chronological studies were prepared. As an example of the growth of archaeological research in the area, one need only to compare the rather meagre bibliography of Nevada archaeology published by Grosscup (1957a) with the impressive bibliographic compilation of C. Fowler (1970).

The history of archaeological research in the Great Basin has been recounted in numerous doctoral dissertations and published papers, and little purpose would be served in repeating it here. However, I would like to briefly review four paradigms which have marked the course of prehistoric research in the region. These paradigms were defined by R. F. Heizer and the writer (ms. in preparation). A review of the paradigms through which archaeology in general has passed is presented by Adams (1968).

The first paradigm (paradigm is used here as it was defined by Kuhn 1970, as a "problem-solving model") is termed as "artifact collecting and defining the variation of prehistoric evidence," persisting in the Great Basin between 1912 and 1938. Its beginnings are to be found in the work of Loud (Loud and

Harrington 1929) at Lovelock Cave. Loud, like most field workers of his day (he had no formal training in archaeology, and was in fact, a museum guard at the time he dug in the cave; see Heizer and Napton 1970b: 131-163) was concerned with acquiring interesting specimens for museum collections. Loud did, however, use rather good surface-collecting methods at sites in the Humboldt Sink near the cave (Loud and Harrington 1929). The other major field work in the Great Basin in this period was carried out by Mark R. Harrington. He was initially concerned with investigating the Puebloid materials in southern Nevada and one of his major contributions in this area was defining the easternmost limits of the Puebloid intrusion (the so-called "pottery boundary"; Harrington 1926, 1928). He later joined Loud for another period of excavation at Lovelock Cave (at this time, he introduced stratigraphic techniques in the Great Basin). In 1930, Harrington dug at Gypsum Cave, discovering what he felt to be evidence of early human occupation. During this period, he continued his reconnaissance in the southeastern Basin. Other regional variations of prehistoric culture were being brought to light in the southwest Basin by Mr. and Mrs. W. Campbell, and in the northern Basin by the initial efforts of L. S. Cressman. In the eastern Great Basin, little was known, although Neil Judd (1917a, 1917b, 1919) and Noel Morss (1931) were beginning to define the Fremont culture of that area.

Thus, by the middle to late 1930's, most of the major areas of the Great Basin had at least been sampled, and most of the basic elements of prehistoric culture had been observed, though they were not yet fully understood or clearly interpreted. This paradigm cannot be neatly terminated at the close of the 1930's since this exploration phase continues in the Great Basin to the present day, where there are still areas which have not been examined by the professional archaeologist.

The second paradigm (operating between 1929-1940) involved "fitting Great Basin prehistory into wider perspective." It was during this period that workers in the Basin tried to relate their finds to cultural manifestations in adjoining areas. Harrington (in Loud and Harrington 1929:119-123) correlated the perishable materials from Lovelock Cave with those of Basketmaker sites in the American Southwest. In a similar vein, he tried to find relationships between the later materials in the cave with the material culture of the historic Northern Paiute. Through his earlier work in the southern Basin, Harrington correctly linked the architecture and ceramic remains at Lost City and other similar sites in the Virgin-Muddy-Moapa Rivers area to the American Southwest, concluding that these were indeed the remains of a "transplanted" group of Southwestern agriculturalists. He also believed that there were materials of Pueblo and Basketmaker peoples in Gypsum Cave (Harrington 1933). At the same time, J. H. Steward (1936) was recognizing the presence of Puebloid remains in the eastern basin, and was utilizing elements of the Southwestern cultural sequence in an attempt to order the cave deposits he had excavated in the Great Salt Lake region (Steward 1937:103). In 1940, Steward discounted the theory that there was an early, widespread Basketmaker substratum in the Great Basin; he argued instead that "the total Intermontane culture was the product of diverse borrowing from different sources at different periods and of a certain measure of internal development" (Steward 1940:150).

A third paradigm, spanning the period from the late 1940's to the present time, is concerned with exact chronology. The main impetus for this concern with chronological matters was the development of the radiocarbon-dating technique. Great Basin archaeology had long been plagued by endless speculations about the age of certain high lake stands, the duration of postulated climatic episodes, or the age of ash-falls. However, by 1951, there were 13 radiocarbon dates available for Great Basin sites, thus providing an objective means of dating the Great Basin cultural sequence. As the list in Appendix 1 indicates, the number of radiocarbon assays for the Great Basin has grown tremendously since 1951. The radiocarbon technique has laid to rest the claims of man-ground sloth association at Gypsum Cave (Heizer and Berger 1970), and has provided absolute dates for distinctive artifact forms, such as projectile points, thereby making possible widespread cultural synchronisms. It is the chronological paradigm to which the present paper is devoted.

The "ecological interpretation model" is the fourth paradigm to be defined. Ethnographers were responsible for the early development of interest in this paradigm, since they could easily discern the special relationships between man and the Great Basin environment. This ecological model was fully elucidated in the major work of Steward (1938). In later years, ecological concerns led to the formulation of the "Desert Culture" (later called the Desert Archaic) concept (Jennings 1953; Jennings and Norbeck 1955). This interpretative model (postulating a cultural system adapted to arid-lands exploitation) has been a significant one in Great Basin prehistoric research, although in the past few years, it has been clearly shown that there was at least one other significant adaptive system used in the region, the lacustrine or lake-margin accommodation (Heizer and Krieger 1956; Rozaire 1963; Napton 1969, 1970; Shutler 1968a; Heizer and Napton 1970a). As pointed out at the beginning of this chapter, ecological studies, particularly those stressing settlement and economic systems, are being pursued with vigor at the present time. Such research includes attention to careful faunal analyses (Thomas 1969, 1971a) and the development of cybernetic models to study economic and settlement patterns (Thomas 1971c).

In the pages that follow, I will review the various methods and techniques which have been used in the Great Basin in attempts to obtain chronological data. The chronological situation within the major subareas of the Great Basin will be examined, and local sequences discussed and correlated. Finally, there will be a review of the sequence of cultural development in the Great Basin and the presentation of an integrated ordering of Great Basin chronology.

CHAPTER II

CHRONOLOGICAL METHODS IN GREAT BASIN ARCHAEOLOGICAL RESEARCH

Most discussions of chronological methods center around "relative" versus "absolute" techniques. Relative or indirect chronological methods are those which provide some basis for the sequential placement of cultural entities. Using such methods, we can pronounce something to be "older than" or "younger than" something else. Stratigraphy is without doubt the most widely applied technique for deriving relative chronology, though there are a variety of other methods, such as artifact seriation, the use of "horizon markers," cross-dating, geochronology, paleontology, and the application of fluorine and nitrogen tests to determine if bones are of similar ages. All of these techniques are described in detail in introductory archaeology texts, although especially good discussions can be found in Hole and Heizer (1969) and Rouse (1972).

Absolute or chronometric dating is used by the archaeologist to learn the precise time in prehistory when an event occurred. There are numerous chronometric techniques being applied today, ranging from the interpretation of ancient calendric systems to highly complex and sophisticated physicochemical methods such as potassium-argon dating, thermoluminescence, paleomagnetic dating and fission-track dating (for a review of these techniques, see Michael and Ralph 1971). The most widely used chronometric technique in archaeological research today is, of course, radiocarbon-dating. Because it can be used to date a variety of organic materials, the method can be applied in most areas of prehistoric research; refinements in the process in recent years have provided prehistorians with highly accurate chronometric assays. An even more precise dating technique, developed in the early part of this century, is dendrochronology (tree-ring dating). But it is quite limited in its application and at present is used primarily in the American Southwest. Obsidian hydration is a chronometric device developed in recent years; however, it, too, has limited potential and its full value has not been clearly ascertained.

In the following pages, I will review the major dating techniques, both relative and absolute, which have seen wide application (or which have the potential for wide application) in Great Basin archaeological research. I do not think it necessary to devote space to an explication of stratigraphic methods, since not only is such a method clearly understood, but it also has quite limited use, producing relative chronologic data usually pertinent to a single site. Another technique used for the relative ordering of archaeological materials is seriation. In the Great Basin, it has been used by Meighan (1959c) in arranging a sherd sequence at Paragonah, a Sevier Fremont site in Utah, and by Weide (1968:197) in research with obsidian scrapers from Warner Valley, Oregon. Here I am more concerned with those techniques which can and have been used in developing a broad chronological ordering of the regional prehistory. Therefore, in this section I will present discussions of geochronological, paleontological and climatic dating, radiocarbon dating, lexicostatistics, attempts to use patination and weathering of stone artifacts in chronometry, obsidian hydration, dendrochronology, and the use of rock art as a chronological indicator.

RADIOCARBON DATING

Chronometric studies in Great Basin archaeology have benefited most from the radiocarbon-dating technique. This technique, developed by W. F. Libby (Arnold and Libby 1949), has made it possible to construct a solid chronological framework for prehistoric research in this region. The numerous dry cave sites here have provided an abundance of perishables and other organic materials highly suitable for radiocarbon assay. However, the technique can be applied in error and the results misinterpreted (see Cook 1964 for an example from the Tule Springs locality). In addition, radiocarbon dates must in most cases be evaluated on the basis of strict stratigraphic controls, or else there may result unsubstantiated claims regarding the association of a radiocarbon date with totally unrelated materials (cf. Orr 1956). The warning expressed by Cressman in 1951, soon after the technique had been made available to archaeology, is still valid today:

> "The C-14 method is no miraculous tool for the archaeologist. Fortunately he is still going to have to depend on sound stratigraphic methods and cooperation with his colleagues from geology, paleontology, botany, climatology, soil chemistry, and cultural anthropology" (Cressman 1951:311).

Continued research into the radiocarbon technique has revealed that there have been cyclic changes in C^{14} inventory in the past. Because of these variations, adjustments in radiocarbon dates should be made if one wishes to obtain a "real" calendric date. Through the use of "dendrodates" (age determinations derived from dendrochronological studies), Ralph (1971:Table 1.5) has presented a series of correlations which make possible certain adjustments in radiocarbon dates. This table shows, for instance, that radiocarbon dates after A.D. 700 should be adjusted to calendric dates by the addition of 50 years, while dates between A.D. 700 and 225 B.C. should be reduced by the same amount. However, from the period between 225 B.C. and 4366 B.C. (the greatest time depth now available through dendrochronological cross-checking), all dates should be increased in age, ranging from +50 years between 226 B.C. and 676 B.C. to +750 years in the period between 4366 B.C. - 4060 B.C. Although the reader should be cognizant of this situation, I feel that it would introduce great confusion into the present study if all of the relevant radiocarbon dates were adjusted according to the Ralph table, especially since we shall deal with numerous dates of greater age than 4366 B.C. and which cannot be corrected at this time.

The first radiocarbon date list for the Great Basin, consisting of 13 entries, was published by Heizer (1951b). But, as noted earlier, numerous radiocarbon determinations have been made since then (for previous reviews of C-14 dates from the Great Basin, see Heizer 1951b; Cressman 1951; Cressman 1956a; and Grosscup 1958). In Appendix 1 of this study, I have tabulated an extensive array of archaeological radiocarbon dates. While there are no doubt a few dates missing from the list, I feel that it is a reasonably complete one. In Appendix 2, a selected group of geological radiocarbon dates is provided. There are many such dates in the Great Basin, but only a small percentage are directly applicable to archaeological problems.

In the text which follows, dealing with artifactual chronology and with the chronologies of various sectors of the Great Basin, I have expressed all radiocarbon dates in B.C./A.D. terms, and have omitted the plus-or-minus sigma of error. However, I have noted the laboratory number of each date mentioned, and the reader can consult the appendices for specific details (B.P. calculation, possible range of error, and published reference).

To facilitate the use of the two appendices, I have grouped the dates by state and by site. Because of the large number of archaeological radiocarbon dates, I have listed them in four arbitrarily defined periods. Period I contains dates ranging in age from 10,000 B.C. (or earlier) to 5000 B.C. In Period II are listed dates from 5000-2000 B.C., and in Period III, 200 B.C. to 0 A.D. Period IV encompasses the entire Christian era.

GEOLOGIC-CLIMATIC DATING

Aside from radiocarbon dating, the most important chronological methods used in Great Basin archaeology have been geochronology and interpretation of past climatic episodes. There have been some efforts to infer chronology from paleontological associations and these will also be considered in this section.

The primary concern in geochronological studies in this region has been directed toward the dating of ancient high beaches or levels of the pluvial lakes. For example, there have been many problems regarding the age of the artifacts found on high beach lines at Lake Mohave. In the first treatise on the materials at this locality, Antevs (in Campbell et al., 1937) interpreted the age of the artifacts found at the 946, 943 and 937 foot levels as being about 15,000 years old. This estimate was based on Antevs' conviction that the shorelines at 946 and 937 feet marked overflow levels for pluvial Lake Mohave, and he contended that the last time at which the lake could have reached such levels was during its "wettest stage" which he placed at the 15,000 year time level (for other information on high lake stands in the Lake Mohave basin, see Rogers 1939 and Heizer 1965). Since the initial discoveries at Lake Mohave, there have been continued claims of great antiquity for the lithic remains found there (Warren and True 1961; Warren and DeCosta 1964; Carter 1967; Warren and Ranere 1968), while others (especially Heizer 1965) have argued for a more cautious approach based on a rigorous interpretation of the extant data. A radiocarbon date of 7690 B.C. (LJ-200) has been obtained on Anodonta shells collected from levels between 925-930 feet (Warren and DeCosta 1964). Warren and DeCosta (Ibid.:207) have discounted any real evidence of human occupation at the 946-foot level, but believe that the ancient occupations began as the lake gradually receded to about the 937-foot level. In addition to the radiocarbon date (which, of course, is not directly associated with the deposition of the archaeological materials), Warren and DeCosta (Ibid.:208) cite as evidence the presence of water-worn artifacts on the beach levels, asserting that this supports their belief that "the occupation was contemporaneous with Lake Mohave during the latter period of overflow . . . This phase of the lake probably dates from the late Pluvial period." The question as to whether or not these artifacts are indeed water-worn has been raised by Heizer (1965) and E. L. Davis (1967). Davis indicates that it is much more likely that the artifacts have been altered by sand-blasting. As it now stands, it seems probable that the Lake Mohave (San Dieguito) materials date around 6500-7000 B.C., based largely on the supportive date from an early component at the C. W. Harris site (Warren 1967).

There has also been a great deal of discussion centering around the ages of the various stands of Lakes Lahontan and Bonneville, the two major Pleistocene lake systems of the Great Basin. Lake Lahontan is said to have undergone its major recession about 9000 B.C., according to Morrison and Frye (1965), and this is supported by the radiocarbon date (9248 B.C.) on bat guano from atop the Lahontan gravels at the base of Leonard Rockshelter (Heizer 1951a). This date is also significant since it provides a maximum age for the cultural deposits which lie on and above this basal layer. In the Carson sink area, detailed geochronological studies have provided new information on the history of Lake Lahontan. Morrison (1961a, 1961b) has defined the Sehoo formation which records the final lake cycles. Overlying this formation is the Turupah unit, bearing the Toyeh soil (Morrison and Frye 1965), a well-preserved and widely distributed geosol in the Lake Lahontan basin, and dated by radiocarbon and archaeologic determinations to a 1,000-year period ending ca. 3800-4000 B.P. (Morrison correlates this soil with the latter part of Antevs' Altithermal climatic episode.) The distinctive nature of the Toyeh soil permits its correlation with soils in other parts of the Lahontan basin and in adjacent areas. It would seem that such a soil, if properly identified, could serve to provide relative dates for archaeological remains in the region.

The Recent (Holocene) lakes in the Carson Sink (the Fallon lakes) have gone through a series of fluctuations. Five maxima have been discerned by Morrison (1965). The first was between 3200-3500 B.P. (with which Morrison 1964 equates the "loess layer" in Hidden Cave), and the last about 100 years ago. Morrison believes that each of these maxima "were marked by exceptionally heavy Indian habitation, both in open sites and in caves near the lake shores" (Morrison 1965:281).

The definitive works on the fluctuations experienced by Lakes Lahontan and Bonneville have been published by Broecker and Orr (1958) and Broecker and Kaufmann (1965). In the earlier paper, Broecker and Orr note that there was a high-water period for both lakes between 25,000-14,000 B.P. Both lakes rose to their maximum levels around 11,700 B.P., and there is some evidence for another maxima around 10,000 B.P. The lakes have been low since 9000 B.P. Their statements are supported by an extensive list of archaeological and geological radiocarbon dates (the latter obtained on shell, marl and tufa formations associated with high beach lines and terraces).

Refinement of the lake chronology appears in Broecker and Kaufmann (1965). This paper contains another impressive compilation of radiocarbon dates. The C-14 dates were used to date lake-level chronology in the post-pluvial period,

HIGH LAKE LEVELS	MODERATE TO LOW LAKE LEVELS
15,050 B.C.	16,050 to 20,050 B.C.
12,550 B.C.	11,550 B.C.
11,050 B.C.	9,050 B.C.
7,550 B.C.	6,050 B.C. to present

Table 1. Lake-Level Fluctuations, Lake Lahontan and Lake Bonneville, Great Basin. All dates converted to B.C., and based on data presented by Broecker and Kaufman 1965.

while earlier dates (greater than 30,000 B.P.) were determined by uranium series isotope measurements (Th^{230}-U^{234}). Their detailed chronologic sequence for Lahontan and Bonneville lake-levels is given in Table 1.

In the sections on "Early Man" and on the regional chronologies, I will be discussing the application of lake-level dating to various archaeological manifestations in the Great Basin.

Another means of geochronological dating is the rate of soil (and refuse) accumulation at archaeological sites. The earliest attempt at using this method was by Loud and Harrington (1929:122) in their work at Lovelock Cave. They calculated that it took 3000 years for the deposition of 12 feet of occupational debris at the site, roughly four feet per thousand years. However, Grosscup (1960:11) notes that if the rate of accumulation calculations of Loud and Harrington were applied, then "the whole of the Lovelock Cave deposits would necessarily date from the Christian era." Radiocarbon dates have shown that the human occupation of the cave began substantially earlier. Grosscup (Ibid.:11-12, and 1957b: 380) suggests a rate of deposition on the scale of one inch in about 20 years, and believes that the post-occupation bat guano layer was laid down at a similar rate. But, such equations are highly suspect, as Grosscup notes:

> "Needless to say, such extrapolations are relatively meaningless. We do not know that the rate of accumulation was constant, that the rate of accumulation was the same for both the occupational debris and the guano deposits, and that the bat population remained constant throughout the time interval involved" (Grosscup 1960:12).

Another attempt to calculate rate of deposition was carried out by Harrington (1933) at Gypsum Cave:

> "Let us say that the lower part of this layer (No. 1) is of Basketmaker age-1500 B.C., or 3,500 years old. If this is true, and provided the rate of deposit was reasonably uniform, and discounting the layer of broken rocks, which seems to have come down all at one time, we have a record here of something three times 3,500 years, or 10,500 years as the age of the fire places and the culture they represent" (Harrington 1933: 171).

Harrington uses this argument to date the putative man-ground sloth association at the site at ca. 8500 B.C. Hole and Heizer (1969:266) characterize Harrington's efforts as "an amusing example of an archeologist who achieved absolute accuracy of dating by utilizing what are known to be incorrect data."

In the northern Great Basin, Cressman (1951) believes that it took an average of 500 years for a foot of deposit of organic material to accrue in Paisley Five-Mile Point Cave No. 3, and further suggests (p. 308-309) that a period of 1,500 to 2,000 years may have been sufficient for the accumulation of a foot of sterile dust and roof spall weathering from the cave ceiling. Utilizing this logic, he calculates a date of ca. 11,500 B.P. for cultural remains found two and one-half feet below a level of Mt. Mazama ash. However, a radiocarbon date on materials from just below the Mazama ash suggests an age closer to 5669 B.C. (Y-109).

Yet another example is provided by Heizer, Baumhoff and Clewlow (1968: 25) based on their excavations at South Fork Shelter:

> "If we assume that the midden accumulated at a steady rate, then it would follow that each 12 inches of deposit was laid down at intervals of approximately 550 years."

Their estimates are supported by a series of radiocarbon dates from the site deposits.

Haynes (1968) has made a study of the rate of deposition of alluvial deposits (he terms this "alluvial chronology") in the western United States (see also Miller 1958). Using radiocarbon dating in conjunction with his research, Haynes (1968:612) has determined that the alluvial deposits associated with many tributaries "can be correlated over a wide area on the basis of soils, fauna and archaeology." When computation was possible, he found that alluvial deposition rates varied from 2.5 inches to 100 inches per century during the last 5,000 years. In the 8000-11,000 B.P. interval in east central Wyoming, the deposition rate was roughly two inches per century. His studies of the ceramic occupation deposits at Tule Springs indicate deposition at the rate of 16.4 inches to 22.7 inches per 100 years (Haynes' Deposition E Unit). In the earlier occupations of the site (Haynes' Deposition B_2) which contain a scraper and flakes, a series of radiocarbon dates between 7480 and 10,000 B.P. (see Appendix 1) imply a deposition of 4.4 to 11.2 inches per century.

Given the variable factors which affect the deposition of soils and organic remains at sites (population differences, changes in duration of occupation, climatic situation, and so forth), it would seem that only with additional supportive chronometric evidence (such as radiocarbon dating) should attempts at obtaining rate-of-deposition equations be made.

The relationship of Great Basin climate to archaeological chronology has been explored for several decades. The guiding force behind this avenue of research has been E. Antevs. Antevs' contributions to Great Basin chronology have been summed up by Jennings (1968:59):

> "His intuitive genius in combining diverse data from clay-varve counts, temperature ranges, river sediments, fossil-lake beaches, and other things, including many an assumption, enabled him to make many acceptable estimates of the age of numerous archeologic data. These estimates, time after time, were uncannily close to the (supposedly) accurate radiocarbon dates when the latter began to appear." (p. 60) "His 'absolute' datings, based on geologic observations, provided the first reasonable chronologic base available to Western prehistorians."

Antevs' studies (various) led him to propose a Neothermal climatic sequence consisting of an Anathermal period (7000 to 5000 B.C.), during which conditions were at first much like today, but then growing warmer and drier; an Altithermal period (5000 to 2500 B.C.) which was distinctly warmer than present, and quite arid (causing the disappearance of lakes, and, it is postulated, partial abandonment of the Great Basin by humans); and, the Medithermal (2500 B.C. to the present), with climate generally like that of modern times.

Needless to say, there have been many efforts directed toward testing this proposed climatic sequence and most of the controversy has centered on the reality of the hot, dry Altithermal (a theory of a thermal maximum of this sort had been advanced earlier by the geologist Russell in 1885). Although Antevs (1948) firmly believed that the Altithermal was dry and warm, and that it probably caused the human abandonment of the Great Basin, he does acknowledge that this apparent gap in the human occupation of the region" . . . may be partly artificial, created by archaeologists who have been too eager to find early man in their region . . . In part, the gap is locally or regionally real."

Support for the Altithermal concept is derived from a wide spectrum of data. Morrison (1964) sees geological evidence for the Altithermal in both the Lake Lahontan and Lake Bonneville basins. His studies in the Carson Sink (Lake Lahontan system) have resulted in the recognition of the Turupah formation, which bears the Toyeh soil dating from ca. 5550 B.C. to ca. 2050 B.C. This soil was formed as a result of eolian deposition and erosion during a time of complete lake desiccation (Morrison 1964:102-103; see also Morrison 1961b). Morrison (1965) has correlated the Toyeh soil with the Midvale formation in the Lake Bonneville area. Similar supportive data have come from investigations of past and present wind action in the Mohave Desert (Smith 1967). Smith (Ibid.:22) has concluded that desert conditions have not been constant in the Mohave since the pluvial period, and that there are definite signs of periods in the past which have been both more arid and less arid than at the present. One of the "more arid" periods, and one characterized by major wind action, was during the Altithermal. Smith has stated:

> "Eolian phenomena in general may provide the best available indicators of past climatic changes in areas where other evidence is lacking" (Smith 1967:21).

Haynes (1968) presents a depositional sequence, parts of which correspond temporally to Antevs' (1948, 1955) three-part Neothermal temperature curve. However, Haynes (Ibid.:614) warns that the accuracy of this correlation is still unknown.

From outside the Great Basin, there is geological evidence for the Altithermal at sites along the Lower Snake River, Washington (Bense 1971). However, in this area there is no indication that the thermal maximum had any effect on the human population (Ibid:40).

Obsidian hydration analyses in northern Nevada (Layton 1970:285) indicate a break in occupation which can be correlated with the Altithermal time span. In the Fort Rock Valley of southeastern Oregon, Bedwell (1970) reports archaeological evidence closely supporting the existence of the Altithermal, although the period was more compressed in this area, with the Medithermal beginning at an earlier time. Other archaeologic evidence suggesting that human populations deserted the Great Basin during the Altithermal maximum is presented by Baumhoff and Heizer (1965). This stance is supported by Swanson (1966). There are, in addition, some climatic data bearing on the problem. For example, the studies of Sears and Roosma (1965:678) at Lake Winnemucca suggest an extreme period of aridity around 4300 B.C. The onset of a dry environment is dated to 4800 B.C. (M-1087) at Wilson Butte Cave on the northern fringe of the Great Basin (Swanson 1966).

Malde (1965:127) has summed up the beliefs of Altithermal proponents:

> "Although prevailing ideas about uniformly dry climate during the Altithermal deserve critical scrutiny, the dates are needed for this period, conspicuous geologic signs characteristic of dry regions are too pervasive and too diverse to be ignored. Our knowledge is incomplete, but my guess is that the Altithermal was at first rather arid and then gradually became wetter."

Cressman (1966:287) and Davis (1966:149) generally support Malde's statement, although Davis notes that the evidence indicates that the effects of the Altithermal were not uniform everywhere. While most investigators would certainly now agree that the effects of the Altithermal were not evenly felt in all areas of North America, there are archaeological and palynological data supporting its occurrence in the northern Plains (Hurt 1966), southern Idaho (Butler 1972), Texas (Story and Bryant 1966; Sollberger and Hester 1972), and northeastern Mexico (Epstein 1972).

There are also those who completely discount the idea of an Altithermal interval. Aschmann (1958) suggests that there may have been seasonal shifts in rainfall patterns which would leave geological evidence indicative of aridity. These views are supported in large part by Martin (1963) and Martin and Mehringer (1965). Jennings (1966) equates the Great Basin environment of the last 10,000 years with that of today (for a different opinion, see DeCosta and Warren 1967:34), and discounts the retreat of populations from the Great Basin during the Altithermal. His condemnation of the Altithermal concept is quite strong:

> "Although widely accepted, the concept of the Altithermal has never been fully satisfactory on a commonsense basis or in explaining all the archaeologic finds" (Jennings 1968:59).

The most persuasive evidence against the existence of the Altithermal comes from Hogup Cave in the eastern Great Basin. Durrant and Harper (1969), Harper and Adler (1970) and Durrant (1970) have conducted extensive analyses of the faunal and floral remains from the site. Although these data indicate a moderately high temperature during the Altithermal, there is little evidence for sudden or dramatic alterations in the vegetation or fauna with the beginning of the thermal maximum. All species which occurred in the cooler and more moist Anathermal are all common to Altithermal layers, and all are still found within a 20-mile radius of the cave today. Human activity was not reduced at Hogup Cave during the time span allotted to the Altithermal, but rather there are indications of increased activity at this time (Durrant and Harper 1969:11). However, they do note the presence of the Pallid Bat (Antrozoas pallidus) in strata 4-9, attributable to the Altithermal time span; these bats are indicative of possibly higher temperatures and more arid conditions. I do not know if they have been recovered from archaeological deposits of similar age elsewhere in the Great Basin.

Before concluding this discussion of climatic dating, one additional topic should be considered, and that is the use of the climatic sequence for cross-dating archaeological remains. Archaeologists working in this region have often correlated their materials with the Antevs Neothermal sequence, placing certain stratigraphic units in the "Medithermal" or assigning a lithic assemblage to the "Anathermal" (cf. Lanning 1963; Ranere 1970). Aschmann (1958:23) has cautioned against forcing archaeologic data into the convenient pigeon-holes provided by the Antevs sequence. Bryan and Gruhn (1964) are of similar opinion, suggesting that the Neothermal temperature curve, with its three episodes should not be used "as time periods with fixed absolute dates or climatic periods with defined characteristics, but rather be considered as phases of the Neothermal temperative curve which in different ecological areas resulted in locally varying climatic conditions which must be determined by direct evidence" [emphasis mine] (Bryan and Gruhn (1964:307)).

Perhaps the best summary of the current state of affairs surrounding the Altithermal problem is given by Heizer (1966:244):

> "it must be admitted that we control so few facts that any reconstruction is largely speculative."

Ash falls resulting from volcanic activity have been used as geologic chronological markers in the northern Great Basin. There are two ash layers noted in caves and rockshelters in southeastern Oregon (Cressman, various; Bedwell 1970). One is derived from the eruption of Mt. Mazama. The radiocarbon dates on the ash fall are variable, with the most acceptable dates being ca. 4500 B.C. (C-247, W-858; see Appendix 2). Dates from below the Mazama pumice layer cluster around 5000 B.C. As Bedwell (1970:97) has remarked, the question of the exact date of the Mazama eruption has not yet been determined. The other major ashfall occurred with the eruption of Newberry crater, probably around 100 B.C. (cf. Libby 1955). It is obvious that such phenomena are extremely valuable for relative dating purposes. Newberry pumice layers are to be found at Fort Rock Cave and Cougar Mountain Cave, with Mazama layers occurring at the three Paisley Five Mile Point caves.

Dating of human cultural remains by paleontological associations has been done in several instances in the Great Basin, primarily in connection with presumed "Early Man" discoveries. Harrington (1933) believed that extinct ground sloth remains were associated with human materials at Gypsum Cave, a supposition which has been proved erroneous by later research (Heizer and Berger 1970). Another instance of a presumed early association of fauna and man was Tule Springs, now also discredited. At Lake Winnemucca, Orr (1956) reported horse and camel bones from human occupation levels. In the northern Great Basin, there was a putative association of man and Pleistocene horse at Catlow Cave No. 1 (Cressman 1942), and a possibly more secure association of obsidian artifacts and hearths with extinct camel and horse at Paisley Five Mile Point Cave No. 3. At Wilson Butte Cave, occupational remains from Stratum E (occupation I) were reputedly in association with horse and camel bones (this association is reported to date to ca. 13,000 B.C.; M-1410).

Heizer and Baumhoff (1970) have critically reviewed the evidence for these paleontological associations. They completely discard Orr's data from Lake Winnemucca on the basis of poor excavation techniques and worse reporting. While they accept Paisley Five Mile Point Cave No. 3 as a possibly strong case, they suggest that the bones of extinct fauna could have been introduced into this site and others by carnivores or packrats.

OBSIDIAN HYDRATION

It has been determined that the formation of a hydration layer (caused by the absorption of water from the atmosphere) on the surface of obsidian occurs at a constant rate, and this fact has led to the development of a chronometric technique known as obsidian hydration dating. The full potential of this relatively new technique has yet to be realized, since there are a number of variables inherent in the formation of the hydration layer. Friedman and Smith (1960) believe that the rate of hydration is controlled by time and temperature. Aiello (1969:2) notes that chemical composition of obsidian is so heterogeneous that it also must be considered as a variable. Other variables include differences in soil temperature, the erosion and weathering of artifacts after they have been exposed, different soil conditions in sites where obsidian artifacts are deposited, climatic fluctuations, solar radiation, relative humidity and so on (Michels and Bebrich 1971).

Thus far, the major effort at using obsidian hydration measurements in developing local chronologies has been undertaken by Layton (1970). Layton's obsidian materials were analyzed without taking into account the varying chemical composition which might be represented among the specimens; this was done since it was believed that the local obsidian was fairly homogenous. A projectile point sequence was inferred from the obsidian hydration measurements, and it generally concurs with that previously known from stratigraphic excavations elsewhere in the Great Basin (Layton 1970:Table 15). Two major gaps were noted by Layton (1970:285) in his chronological framework. One gap is correlated with the Altithermal maximum, and the second, with a series of major droughts in the High Rock area between A.D. 200 and A.D. 1300. Layton has also carried out obsidian hydration analysis of obsidian artifacts from Cougar Mountain Cave (Cowles 1960), but the results are not yet published.

There have been other minor attempts at using the obsidian hydration technique in the Great Basin. Tuohy (in Davis and Shutler 1969:170-171) submitted three Clovis points and one lanceolate point (in reputed association with one of the Clovis points) for obsidian hydration measurement at the University of California, Davis, Obsidian Hydration Laboratory. The readings for the Clovis specimens varied from 9.3 to 15.7 microns (the lanceolate point fell within this range), believed by Tuohy (Ibid.:171) to be "a valid range for the Clovis points in question." Tuohy notes the difficulty of assigning calendric years to obsidian hydration readings. An obsidian artifact (not described) from the Coleman locality on Winnemucca Lake (Tuohy 1970b:147) was also submitted for obsidian hydration rim cuts. The reading for the specimen was 10.2 microns. While Tuohy (Ibid.) notes that this reading is of interest, he acknowledges that since it is the only reading from the site, it is meaningless.

I am aware of at least one instance in which a radiocarbon date and an obsidian hydration reading are available for a single specimen. An atlatl shaft, to which was attached an obsidian "Bare Creek Eared" (Pinto series) projectile point, was radiocarbon dated to 1880 B.C. (GaK-2387; D. R. Tuohy, personal communication to R. F. Heizer, 1972). Later, H. Crew (University of California, Davis) obtained an obsidian hydration reading on the point of 3.2 microns. If we apply the conversion rate of one micron per thousand years (Meighan and Haynes 1968), we come up with a date of ca. 1250 B.C., not greatly different from the radiocarbon assay, and well within the age range of the Pinto series.

Although outside the Great Basin, some interesting results have been obtained from obsidian hydration analysis of a large series of fluted points and other artifacts from the Borax Lake site, California (Meighan and Haynes 1968). The average reading for the specimens was nine microns, and if the estimated rate of hydration is correct (one micron per 1,000 years) then the early lithic assemblage at the Borax Lake site dates to ca. 7000 B.C. or perhaps earlier. This seems to be a likely age for the assemblage, which contains elements (such as crescents) characteristic of the Western Pluvial Lakes Tradition of this approximate time period.

LEXICOSTATISTICS

Lexicostatical dating, or glottochronology, is a technique of calculating absolute time based on the rate of change in the basic vocabulary of a language. However, its use in archaeological research is quite limited, for as Rouse (1972:136) has observed: "Positive correlation of glottochronological dates with prehistoric peoples is impossible in the absence of written records." Although the glottochronological method has been widely criticized, Miller, Tanner and Foley (1971:142) believe that it does work fairly well, and will provide useful information if the results are applied with care.

The primary use of lexicostatistical methods in the Great Basin has been to provide data on the time of entrance of Uto-Aztekan groups into the region. Lamb (1958), for instance, contends that, on the basis of glottochronology and dialect geography, Numic speakers were in the western Great Basin by less than 1,000 years ago, and came from a "homeland" in the Death Valley area of southeastern California. This postulate is generally acceptable to other Great Basin linguists, notably Hopkins (1965), Miller (1966), Goss (1968), Jacobsen (1968), and Miller, Tanner and Foley (1971). The latter investigators have stated:

"The subdivision of Central and Southern (and probably also Western) Numic into two languages must certainly have begun over one millennium and probably under two millennium ago. And this subdivision must have occurred before the movement into the Great Basin" (Miller, Tanner and Foley 1971:163).

Hopkins (1965:58) has advanced the hypothesis that the presence of horticultural communities in the southern and eastern basin prior to A.D. 1000 retarded the expansion of Numic speakers into these areas. Aikens (1972:62) shares similar views, believing that the Numic speakers entered the Great Basin via the southwestern sector, and thinks that this entry into the basin might be related to the disappearance of Fremont culture in the eastern basin.

Divergent views as to the entry of the Numic (Uto-Aztekan) peoples are held by Taylor (1961) and Gunnerson (1962). For example, Taylor (1961) places Hokaltecan speakers in the Great Basin at an early time, and links them to the Desert Culture; this, however, leads to considerable difficulty when attempting to explain the presence of Uto-Aztekan speakers in the Great Basin in the historic era.

Ranere (1970:70) has postulated that the ancient Hascomat complex is the ancestral cultural pattern for the Uto-Aztekan linguistic family. This, of course, seems highly unlikely since Lamb, Miller, Goss and other linguists, are of the firm opinion that Numic speakers entered the Great Basin only during the Christian era.

For a review of linguistics and lexicostatistics in the Great Basin, see Miller (1966:85 ff).

PATINATION AND WEATHERING

There have been numerous efforts to use the amount of patination or weathering on lithic surfaces as a chronological gauge. The chemical alteration or patination of chipped stone artifacts was once thought to be an indication of the artifact's age, but recent research (such as that published by Goodwin 1960; see also Péwé 1954) has pointed out the numerous complex variables inherent in the formation of patina.

Borden (1971) has tried to use the varying degrees of surface erosion noted on chipped stone tools from a site in the Mohave Desert to establish a chronological sequence (for an earlier and similar study using basalt artifacts from western Nevada, see Carter 1957). He has set up four categories of surface alteration on the artifacts, and has used these to make temporal correlations. These categories were established through microscopic examination of the artifact surfaces with the most heavily altered assumed to be the oldest and so on. His "Erosion Category IV" (the oldest) contains projectile points of the Lake Mohave type, as well as other lanceolate bifaces. "Erosion Category III" also contains Lake Mohave points, with the addition of the Silver Lake type. In "Erosion Category II" are Silver Lake, Lake Mohave(?), and Elko-like points. In the final category (I; the youngest) are Silver Lake points, bipointed specimens, and other stemmed projectile points. In Table 5 of his paper, Borden correlates Category IV with the Anathermal (roughly 8000-9000 B.C.), Category III, from late Anathermal to early Altithermal times, Category II from ca. 2000 B.C. to 500 B.C., and Category I, from 500 B.C. to the beginning of the Christian era. Although Borden's projectile point sequence is based on a surface collection, his careful sorting of these surface erosion categories led him to construct an ordering which closely matches the previously established sequences in the Mohave Desert area.

Similarly, Hunt (1960) has attempted to correlate the amount of desert varnish on chipped stone artifacts from Death Valley with the relative age of the specimens. For example, tools collected from Death Valley I sites are heavily stained with desert varnish, but no desert varnish is reported on specimens made in subsequent periods. Hunt concludes:

> "The archaeological evidence . . . strongly supports the view that only insignificant amounts of desert varnish have formed during the last 2000 years, but that there were one or more episodes prior to then when much varnish was deposited" (Hunt 1960:292).

In my opinion, the efforts made by Borden and Hunt exemplify the kind of approach which should be made if one is to use patination and weathering for making chronological inferences. In both cases, they have defined their criteria, and Borden (1971:6-9) details the variables one must consider when attempting such a study. It is obvious that such investigations must be limited to a particular study area where as many of the variables as possible can be controlled.

Moen (1969:6) has provided the following comments regarding the inference of age from the amount of weathering and erosion observed on petroglyphs:

> "The relative scars of these petroglyphs [Paiute Springs site, Clark County, Nevada] is difficult to estimate. Some of the pecking scars are almost obliterated with a deposit of desert varnish, while comparatively speaking, others seem fresh and more recent. Many of the stick figures and circles are of the latter type. The problem of evaluating the relative age of petrogryphs at this site and at other petroglyph sites, is made difficult because of differential weathering. Many glyphs weather faster because of their position on rock faces. Some are more exposed to weathering agents and, thus, they look older even though this may not be so."

In his early synthesis of California rock art, Steward (1929:231) reported petroglyphs in the extreme southwestern Basin which were covered by travertine deposits. He reasoned that since the formation of the travertine dated back between 300 and 1,000 years, then the petroglyphs "must be at least three hundred years old and are possibly more than a thousand, for they may have been made long before the deposit occurred."

Heizer and Baumhoff (1962:232-233) have also dealt with the problem of calculating age based on the extent of weathering and patination of petroglyphs. They found only two Nevada sites which exhibited strongly varying degrees of desert varnish or patina. They were able to make gross distinctions between "old" and "new" petroglyph elements (circles, sun discs, meanders, and so forth), and thus roughly order the represented styles.

DENDROCHRONOLOGY

Only very minor attempts have been made to use dendrochronological methods (tree-ring dating) in the Great Basin (a review of the development and applicability of this technique can be found in Hole and Heizer (1969:252-255). Ferguson and Wright (1963:10) have summarized the problem as follows:

> "There has been no dating of archaeological tree-ring material in the Great Basin due to a combination of the paucity of excavated wood and charcoal and to the difficulty of dating any such material."

They believe that the greatest potential for the future application of dendrochronology lies in the western sector of the Great Basin. A review of work with modern and archaeological specimens from Death Valley, California, and Hawthorne, Nevada, is provided in the paper by Ferguson and Wright (1963).

ROCK ART AS A CHRONOLOGICAL INDICATOR

There have been substantial efforts made to develop a sequence of rock art styles in the Great Basin (cf. Heizer and Baumhoff 1962), but these data can rarely be applied to chronological problems in the regional culture sequence. The age of particular rock art manifestations can often be inferred from the presence of certain recognizable objects, such as horses or other distinctive Anglo-European traits, while more ancient forms are indicated by the depiction of atlatls (Grant, Baird and Pringle 1968:48) or the presence of fauna which have been absent from the immediate vicinity in modern times (Cressman 1937:15, believes that a mastodon is depicted in a petroglyph in southeast Oregon). Recently, Thomas and Thomas (1972) have made an effort to date pictographs by applying typological classifications to what they believe are projectile points shown in the rock art at the sites of Toquima Cave and Gatecliff Cave, in the Monitor Valley of central Nevada. "Types" represented in the pictographs include Eastgate Expanding Stem, Elko Eared (or possibly Pinto Barbed), and a lanceolate form which they believe to be reminiscent of Lind Coulee points. Using the known temporal span of these point types, they proceed to postulate the time range of certain pictograph styles defined by Heizer and Baumhoff (1962). They warn that their assigned dates represent nothing more than hypotheses to be tested. One test being pursued by the Thomas' (1971:68) is the attempt to radiocarbon-date pigment from pictographs at the sites. It is my belief that the use of these putative "projectile points" for dating purposes is extremely tenuous. Most of these "points" may indeed represent some entirely different object or "idea" which the prehistoric artist was trying to portray (see especially Fig. 2, e, f, and h in Thomas and Thomas 1972). It also seems very hazardous to link to established types those poorly executed forms which have been suggested as representing projectile points.

CHAPTER III

ARTIFACTS AS CHRONOLOGICAL INDICATORS

In this chapter, I will review the use of various types of artifacts as chronological markers in Great Basin archaeology. I have selected four major artifact forms which are currently the most valuable for temporal correlations: projectile points, basketry, ceramics, and shell beads. There are several other kinds of artifacts which have limited utility for chronological ordering. For example, there is the L-shaped awl, widely distributed temporally and spatially in the Great Basin and in the American Southwest. With more data, one might also consider the chronological placement of such items as the atlatl, grooved rabbit sticks, horn sickles (Heizer 1951c) and hafted knives (Hester 1970). However, I have chosen to emphasize the four groups mentioned above since, in most cases, they are associated with a number of radiocarbon dates and presently offer the greatest potential for precise cross-dating among Great Basin sites.

PROJECTILE POINTS

The use of projectile points as chronological indicators is quite firmly established in New World archaeology (see the useful discussion in Krieger 1960:145). In many areas of North America, stratigraphic excavations have provided evidence that projectile points are subject to distinctive morphological variation through time, and these changes have made them extremely important as "time-markers" (the "historical-index" types of Steward 1954) in archaeological research. The value of projectile points in chronological ordering has in the past caused perhaps too great an emphasis on the development of local point sequences. However, no one can deny the value of projectile point types in the chronological ordering of prehistoric cultural development. As W. A. Davis (1966:151) has stated:

> "The archaeological record provides a succession of specialized lithic artifacts, the projectile points, which substantially support theories of culture change by providing a chronological framework based upon index forms."

Projectile points are found in abundance in the Great Basin, and at many sites, such as those at which there is no preserved organic material, they provide the sole means of establishing temporal control. Thus, we are fortunate that a number of projectile point types, with restricted temporal and geographic distribution, have been defined; because most of these types have been placed in their appropriate context, through stratigraphic means and the association of radiocarbon dates, they can be satisfactorily employed as <u>fossiles directeurs</u> by archaeologists working in the Great Basin.

Projectile point types in the Great Basin are generally designated by a binomial descriptive system (earlier research, such as that reported by the Campbells in 1935 and 1937, used a monomial system in naming point types). The first term in the binomial system generally refers to the site at which the stratigraphic position of the type was first established; the second designator is descriptive of some aspect of the point's form. In this paper, I have followed the lead of Lanning (1963) by grouping, where possible, several associated point "types" (e.g., Elko Eared, Elko Corner-Notched, Elko Side Notched) into a series.

In the section that follows, the dating of the major Great Basin projectile point types is reviewed, and some new data are added. There has been considerable previous research into the chronological ordering of point types in this region (Baumhoff and Byrnes 1959; O'Connell 1967; Clewlow 1967). This earlier work has established a "Medithermal" point sequence, and while new chronological information is provided in the following pages, the basic structure of this sequence remains unaltered (cf. Fowler 1968b:13). Some comments are also provided here on the weaknesses inherent in the definition of certain types. Along similar lines, Thomas (1970a) has suggested "Key 1," a technique for the objective quantification of regional point type attributes. Aside from recognizing some problems in the Rose Spring and Pinto series, Thomas' technique "reproduces the accepted Great Basin types" (Ibid.: 48).

The Humboldt Series

The Humboldt series was first defined by Heizer and Clewlow (1968), based on materials from NV Ch 15, the Humboldt lake bed site. The points are lanceolate to triangular in outline, and three varieties have been named: (1) "Concave Base A"; (2) "Concave Base B"; (3) "Basal Notched." Of these, Humboldt Concave Base A seems to be the most common in Great Basin sites. Several radiocarbon dates are available, and most are primarily applicable to Humboldt Concave Base A (LJ-212, UCLA-295, and 296 and WSU-944 can also be related to the Basal Notched variant).

DATE*	LABORATORY NO.	SITE
1100 B.C.	LJ-289BB	Hidden Cave (Roust and Clewlow 1968)
1370 B.C.	LJ-212	South Fork Shelter (Heizer, Baumhoff and Clewlow 1968)
2360 B.C.	UCLA-295	do
2410 B.C.	UCLA-296	do
3350 B.C.	WSU-994	Hanging Rock Shelter (Layton 1970)
3920 B.C.	WSU-511	Newark Cave (Fowler 1968b)

* B.P. dates are available, along with possible range of error, in Appendix 1.

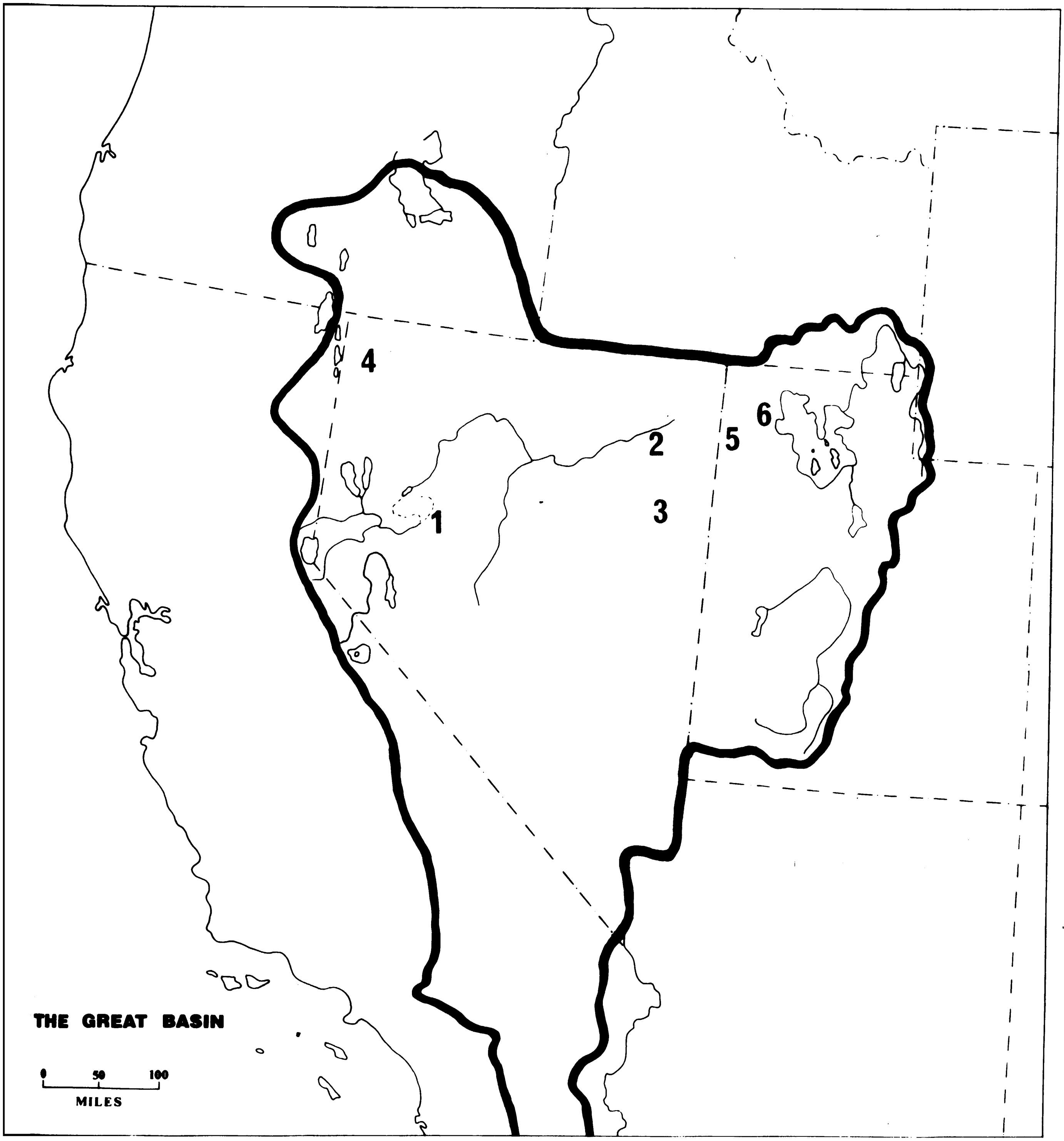


Figure 2. Locations of Sites Which Have Provided Chronological Data for the Humboldt Series

1. Hidden Cave
2. South Fork Shelter
3. Newark Cave
4. Hanging Rock Shelter
5. Danger Cave
6. Hogup Cave

The date of 1100 B.C. from Hidden Cave represents the termination of the Humboldt series at that site; Clewlow (in Roust and Clewlow 1968:108) believes that the series does continue throughout the Great Basin projectile point sequence, becoming smaller in size through time. The series may have earlier origins than indicated by the ca. 4000 B.C. date from Newark Cave. For example, four specimens of Humboldt Concave Base A occur in the Mud Flow gravels at Hidden Cave (Roust and Grosscup 1957), attributed to the Anathermal climatic episode. Similarly, Humboldt points are found in Danger Cave II and III (see Appendix 1 for the dates from these units), and in strata 5-10 (ca. 5300 B.C. to 650 B.C.) at Hogup Cave (Aikens 1970b; Fry and Adovasio 1970). Thomas (1971a:91) believes that Humboldt Concave Base A is equivalent in age to the Pinto series. Layton (1970:249) has excavated Humboldt series points at Hanging Rock shelter. He divides his specimens into six numbered varieties (Nos. 1-6). Humboldt No. 1 is equivalent to Humboldt Concave Base A and B, and is believed by him to postdate the local Parman Phase of the early Anathermal (ca. 6000 B.C. ?). Humboldt No. 2 points are the same as Humboldt Basal Notched, and are dated at their maximum popularity at between the Altithermal maximum and 3350 B.C. (WSU-994).

The Pinto Series

Pinto points were originally defined by Amsden (in Campbell and Campbell 1935:43-44) based on the analysis of specimens from the Pinto Basin site in the southwestern part of the Great Basin. More recent evaluations and discussions of Pinto series points have appeared in Harrington (1957) and Lanning (1963). Harrington's specimens were excavated from the Stahl site near Little Lake. Using the 497 specimens from the site, he established five varieties ("subtypes") which he called "shoulderless," "sloping shoulder," "square shoulders," "barbed shoulders," and "one-shoulder." Reference to these varieties is still made in the typological analysis of Pinto points in the Great Basin (cf. Heizer and Clewlow 1968). In his paper on the Rose Spring site, Lanning (1963:250-251) refers to Pinto points as the "Little Lake" series, in which he includes only those specimens from the Stahl site and Rose Spring.

Some investigators, notably Layton (1970) and O'Connell (1971), have observed that the Pinto series is very broadly defined and loosely applied. Thus, in their particular areas, they have set up new types which subsume forms originally included in the Pinto series. In Surprise Valley, O'Connell (1971:68) has defined the "Bare Creek" series, with "sloping shoulder," "square shoulder" and "barbed" variants. Layton (1970), working in the High Rock area of northwestern Nevada, has proposed the "Silent Snake Bifurcate Base" (Pinto Barbed) type. Layton believes the continued use of the type is "naive," and suggests that there are important differences between Pinto points as illustrated by Campbell and Campbell (1935:Plate 13), and those shown by Harrington (1957:Figure 39). Layton is, of course, entitled to his own evaluation, but as I compare the two illustrated series, I can see nothing but similarities, especially if we delete specimens a, d, and m from the Campbells' series (a and d are reminiscent of the Silver Lake type). However, I will agree with Layton, O'Connell and others that the Pinto series is in great need of further analysis and refinement. Until

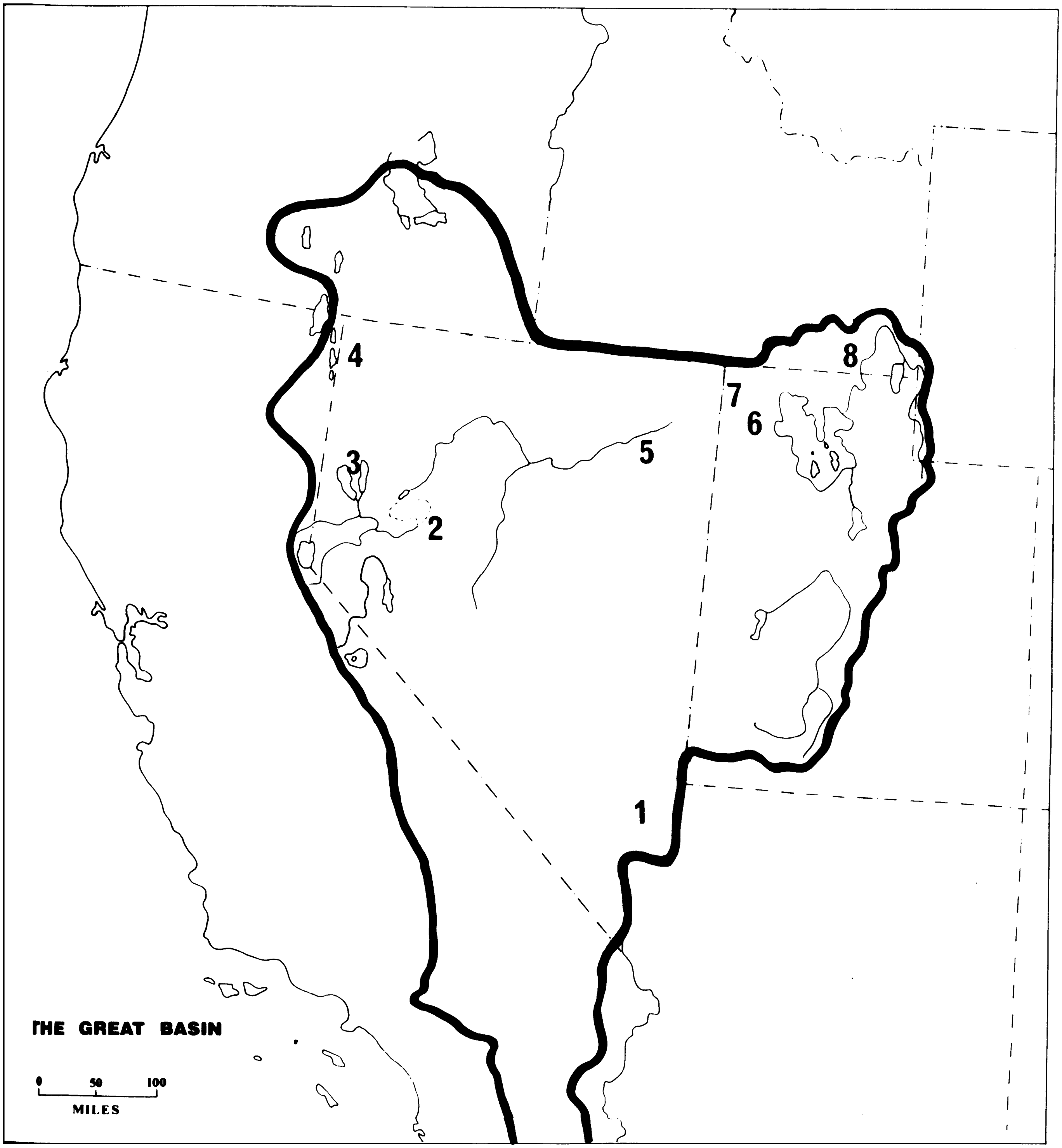


Figure 3. Locations of Sites Which Have Provided Chronological Data for the Pinto Series

1. Stuart Rockshelter
2. Hidden Cave
3. Kramer Cave
4. Hanging Rock Shelter
5. South Fork Shelter
6. Hogup Cave
7. Swallow Shelter
8. Weston Canyon Rockshelter

this is done, I prefer to retain the original designation (cf. Thomas 1971a: 89), as I believe that it still has cultural-historical significance.

The age of the Pinto series has been the subject of many estimates. It was once thought to represent an "early" form (cf. Wormington 1957:168-169), although some, like Rogers (1939) guessed that it was much later. There are now several radiocarbon dates which can be applied to the problem.

DATE*	LABORATORY NO.	SITE
670 B.C.**	UCLA-1222	Rodriguez site (O'Connell 1971)
680 B.C.	RL-109	Swallow Shelter (G. Dalley, letter to R. F. Heizer, 1972)
1680 B.C.***	GaK-2387	Kramer Cafe (D. Tuohy, letter to R. F. Heizer, 1971)
1920 B.C.	M-377	Stuart Rockshelter (Shutler, Shutler and Griffith 1960)
2100 B.C.	M-376	do
2360 B.C.	UCLA-296	South Fork Rockshelter (Heizer, Baumhoff and Clewlow 1968)
3350 B.C.	WSU-994	Hanging Rock Shelter (Layton 1970)

* B.P. dates along with possible range of error, are given in Appendix 1.

** O'Connell has told Thomas (1971a:89) that he believes this date to be ca. 300 years too late.

*** This is a very significant date in that the Pinto specimen ("Bare Creek Eared") was attached to the atlatl dart shaft which was dated.

Thus, it seems that the Pinto series may have been in use during the time between ca. 3000 B.C. - 700 B.C. It is possible that the type began somewhat earlier, given the occurrence of Pinto-like points in the Aeolian Silts at Hidden Cave, believed to be of Altithermal age by Roust and Grosscup (1957) and Roust and Clewlow (1968). Pinto series points are present at Hogup Cave in strata 3-9 (Aikens 1970b), although they are most common in strata 7-9, roughly 1000 B.C. (cf. GaK-1564). I do not think that an isolated "Pinto" from stratum 1 at Hogup (ca. 6400 B.C.) can be truly assigned to this type (cf. Aikens 1970b:40). At Weston Canyon rockshelter, Idaho, barbed or square-shouldered Pinto points are said to appear prior to 5200 B.C. (S. Miller, in Green 1972:14).

The Elko Series

The Elko type was originally defined by Heizer and Baumhoff (1961; see also Heizer, Baumhoff and Clewlow 1968 for specimens from the type site, South Fork Shelter). There are several varieties including "side-notched," "eared," "corner-notched," and "contracting stem." The series is found throughout the Great Basin (including the Lake Bonneville area), and is particularly abundant in central and western Nevada. A study of the significance of this type (particularly the eared and corner-notched varieties) as a time-marker was carried out by O'Connell (1967). On the basis of data available at that time, O'Connell (Ibid.:134-135) postulated that the type appeared in the eastern basin after 1300 B.C., and in the central and western basin, between 1500-500 B.C.; the type declined in popularity in the early Christian era, terminating around A.D. 500-600. There is some evidence, suggested on stratigraphic evidence by Bedwell (1970), that Elko series points occur in the Fort Rock area of Oregon at a much earlier date.

Radiocarbon dates linked to the Elko series are listed below:

DATE*	LABORATORY NO.	SITE
A.D. 1080	RL-43	O'Malley Shelter (Madsen 1971)
A.D. 1060	RL-42	do
A.D. 370	GaK-3610	Gatecliff Cave (D. Thomas, letter, 1972)
A.D. 280	GaK-3609	do
A.D. 130	I-2846	Shaman's burial near Pyramid Lake (Tuohy and Stein 1968)
30 B.C.	RL-41	Conway Shelter (D.Fowler letter to R.F.Heizer. 1971)
100 B.C.	RL-39	do
140 B.C.	RL-40	do
200 B.C.	I-3209	Rodriguez (O'Connell 1971)
290 B.C.	UCLA-1093A	Rose Spring (Clewlow, Heizer and Berger 1970)
330 B.C.	GaK-3617	Gatecliff Cave (D. Thomas letter, 1972)
400 B.C.	LJ-76	Karlo (Riddell 1960)

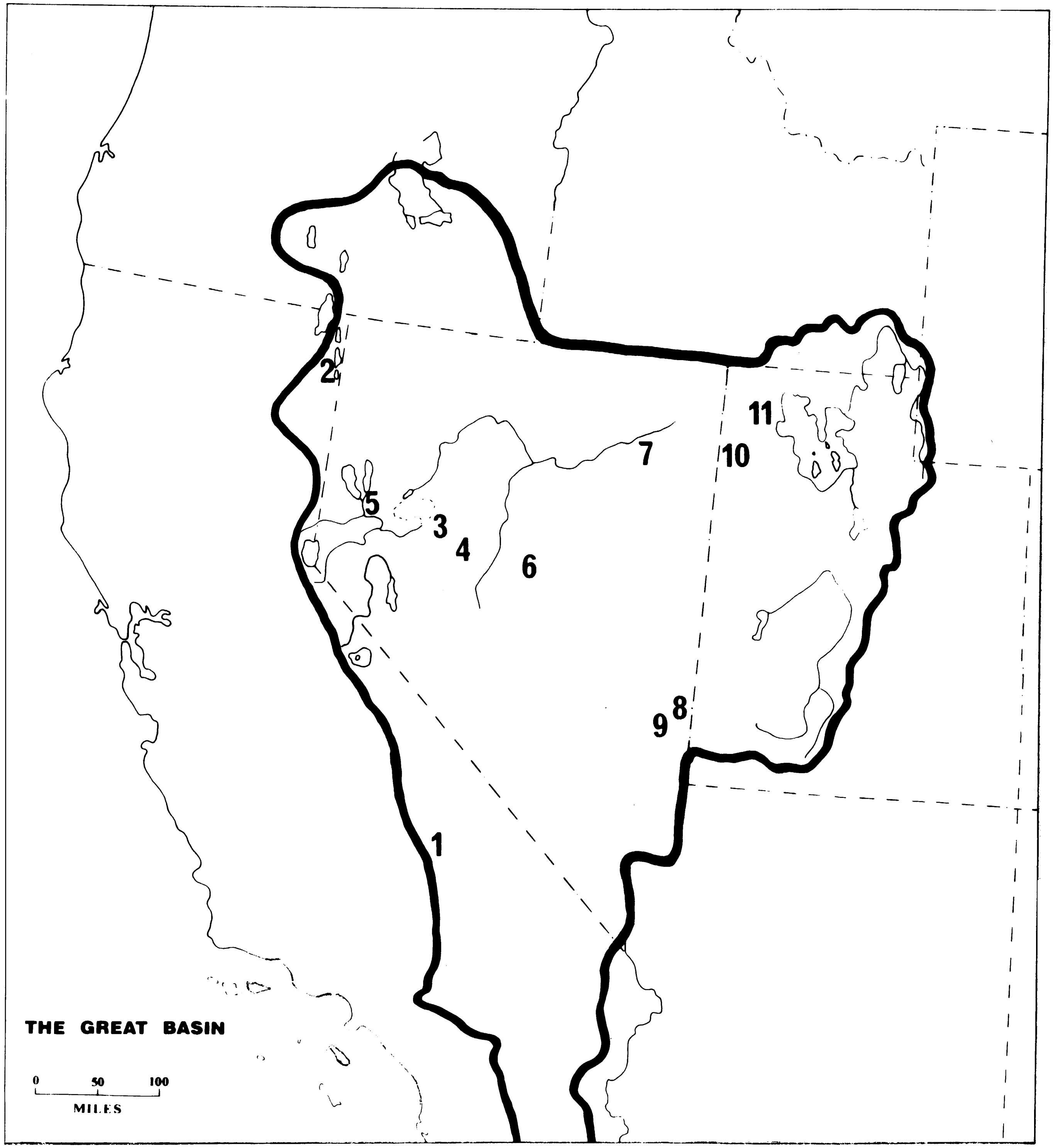


Figure 4. Locations of Sites Which Have Provided Chronological Data for the Elko Series.

1. Rose Spring
2. Rodriguez
3. Hidden Cave
4. Wagon Jack Shelter
5. Pyramid Lake
   (NV Wa 1016; "shaman's" burial)
6. Gatecliff Cave
7. South Fork Shelter
8. O'Malley Shelter
9. Conway Shelter
10. Danger Cave
11. Hogup Cave

680 B.C.	RL-109	Swallow Shelter (G. Dalley letter to R. F. Heizer 1971)
950 B.C.	UCLA-1093B	Rose Spring (Clewlow, Heizer and Berger 1970)
980 B.C.	LJ-203	Wagon Jack Shelter (Clewlow, Heizer and Berger 1970)
1020 B.C.	RL-44	O'Malley Shelter (Madsen 1971)
1100 B.C.	LJ-289BB	Hidden Cave (Roust and Clewlow 1968)
1190 B.C.	GaK-3615	Gatecliff Cave (D. Thomas letter, 1972)
1370 B.C.	LJ-212	South Fork Shelter (Heizer, Baumhoff and Clewlow 1968)
1740 B.C.	GaK-3618	Gatecliff Cave (D. Thomas letter, 1972)
1990 B.C.	RL-45	O'Malley Shelter (Madsen 1971)

* B.P. dates, along with possible range of error, are given in Appendix 1.

Summarizing briefly, the radiocarbon dates suggest a time span for the Elko series of ca. 2000 B.C. to A.D. 1080. However, it is possible that the two most recent dates (both from O'Malley shelter) may be aberrant, although at Hogup Cave, Aikens (1970b) presents data which indicate the survival of the Elko Corner-Notched variant to ca. A.D. 1350. In fact, the data from Hogup suggest that Elko Corner-Notched may be useless as a time-marker (cf. Aikens 1970b:51), as it begins in stratum 3 (ca. 6000 B.C.) and persists through stratum 14 (ca. A.D. 1350). Elko Eared points at Hogup first appear in stratum 1 at ca. 6400 B.C. and terminate in stratum 8 (ca. 1250 B.C.); the type is most common in stratum 5. These data, and similar data from Danger Cave (Fry and Adovaiso 1970; Aikens 1970b), suggest an early origin for the Elko series in the eastern Great Basin.

The Rose Spring and Eastgate Series

The Rose Spring and Eastgate types were originally defined as separate types, Rose Spring by Lanning (1963), and Eastgate by Heizer and Baumhoff (1961). Rose Spring has three varieties; (1) "side-notched"; (2) "corner-notched" (the most common); (3) "contracting stem." In the Eastgate series, there are "expanding stem" and "split-stem" forms. In general, both series are small arrow points with triangular bodies, and stems which show quite similar treatment (cf. Heizer and Baumhoff 1961:Figure 2). In the past few years, many archaeologists working in the Great Basin have come to suspect that both series, since they usually occur together, represent in fact a continuum, with only subtle morphological differences. One of these differences, and one which has been used to separate the two series, is that on Eastgate points the barbs are usually squared (Heizer and Clewlow 1968; see Heizer and Baumhoff 1961:Figure 2, o, q, and s). On the other hand, Eastgate points seem to have a distribution largely restricted to central and western Nevada, and Rose Spring points are found in most parts of the Basin.

There has recently come to light some new evidence bearing directly on the Rose Spring-Eastgate problem. An animal-skin pouch, found buried in a cave on the south shore of Lake Winnemucca, contained a variety of materials, the most important of which were a pressure-flaking tool and numerous projectile points, both finished specimens and blanks. A discovery such as this one, as in the finding of a cache of projectile points or a number of points associated with a burial, provides the ideal method of testing the validity of a typological construct. The materials in the pouch from the Winnemucca Lake are currently under study by the author and R. F. Heizer. There are 98 projectile points (29 of these are triangular blanks) from the pouch. Based on comparisons with illustrated specimens of both series (Lanning 1963; Heizer and Baumhoff 1961; Heizer and Clewlow 1968), it is my opinion that the specimens fit well with the Eastgate category. Most of the specimens have the distinctive squared barbs, and there are at least two Eastgate Split-Stem points. Those specimens without squared barbs have the broad bodies (with convex lateral edges) and workmanship characteristic of Eastgate points from other sites. Only one small basalt specimen shows a resemblance to the Rose Spring type. I believe that these findings support the hypothesis that the Eastgate type is a discrete entity, and that the series represents a local typological development in western and central Nevada.

Assembled below are radiocarbon dates for the Rose Spring and Eastgate series. Since the dates for both series overlap, it seems only sensible to present them in this manner.

DATE*	LABORATORY NO.	SITE
A.D. 1720	RL-36	Conway Shelter (D.Fowler, letter to R.F. Heizer, 1971)
A.D. 1110	WSU-463	Newark Cave (Fowler 1968b)
A.D. 1080	RL-43	O'Malley Shelter (Madsen 1971)
A.D. 1060	RL-42	do
A.D. 1010	RL-38	Conway Shelter (D.Fowler letter to R. F. Heizer 1971)
A.D. 950	GaK-3608	Gatecliff Cave (D. Thomas letter, 1972)

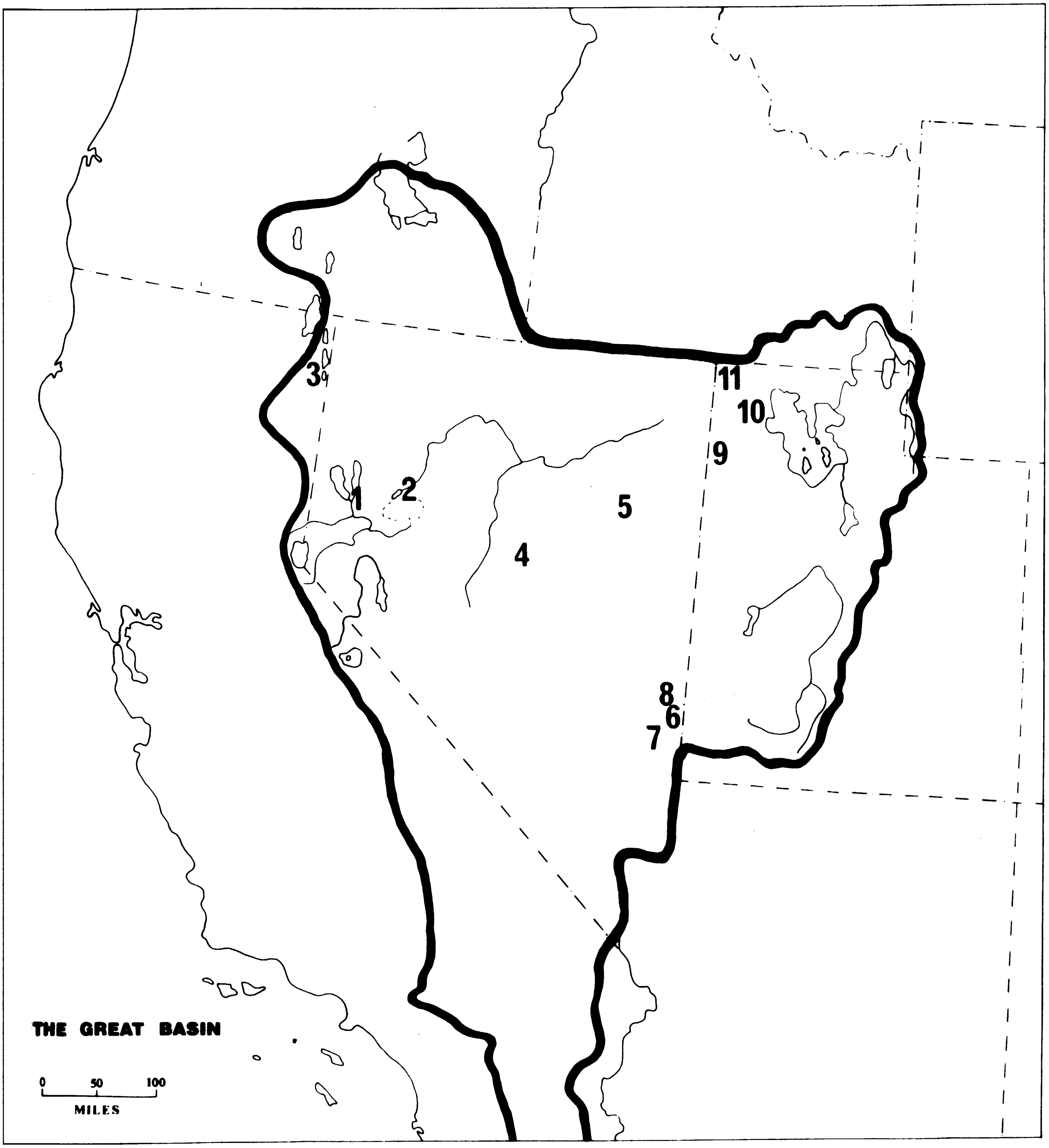


Figure 5. Locations of Sites Which Have Provided Chronological Data for the Rose Spring and Eastgate Series.

1. Nicolarsen Cave (Winnemucca Lake)
2. Lovelock Cave
3. Rodriguez and King's Dog Sites (Surprise Valley)
4. Gatecliff Cave
5. Newark Cave
6. O'Malley Shelter
7. Conway Shelter
8. Scott Site
9. Danger Cave
10. Hogup Cave
11. Swallow Shelter

A.D. 980	RL-47	Scott site (D. Fowler, letter to R. F. Heizer, 1971)
A.D. 900	I-3208	Rodriguez site (O'Connell and Ambro 1967)
A.D. 740	UCLA-1071F	Lovelock Cave (Heizer and Napton 1970a)
A.D. 620	GaK-2580	King's Dog Site (O'Connell 1971)
680 B.C.	RL-109	Swallow Shelter, Utah (G. Dalley, letter to R. F. Heizer, 1972)

* B.P. dates, along with possible range of error, are given in Appendix 1.

On the basis of this date list, it would appear that both series experienced a floruit between A.D. 600-700 and A.D. 1100, with specimens continuing to be used into historic times. The date from Swallow Shelter is for Eastgate specimens found at that site, and I suspect that it is in error. However, obsidian hydration measurement of Rose Spring and Eastgate specimens from the High Rock area (Layton 1970) suggests that the types began by 300 B.C. or earlier. Similarly, Aikens (1970b) presents stratigraphic data which would indicate the appearance of Rose Spring and Eastgate points in the eastern Great Basin at ca. 2500 B.C. More dates will be needed before this question is satisfactorily resolved.

Two local types which probably fit within the Rose Spring series have been defined for Surprise Valley, northeastern California (O'Connell 1971: 64 ff). These are "Surprise Valley Split Stem" and "Alkali Stemmed," both of which occur in O'Connell's Alkali phase. Both types appear to closely resemble Rose Spring series points, with "Alkali Stemmed" showing particular affinities with Rose Spring Corner Notched.

It is possible (in fact, it is highly likely) that the introduction of Rose Spring and Eastgate points can be equated with the introduction of the bow and arrow. There have been various guesses as to the date of the appearance of the bow and arrow in the Great Basin, ranging from 1250 B.C. to A.D. 1 (Grosscup 1957b:380; W. A. Davis 1966:151; Grant, Baird and Pringle 1968:51; Aikens 1970b:200). The Rose Spring and Eastgate series represent a "break" in the projectile point sequence--the appearance of smaller and lighter points of the sort that were commonly used elsewhere in North America with the bow and arrow. Heizer and Baumhoff (1961) and O'Connell (1971:67) have suggested that these two series may have developed out of the Elko series given the need for smaller points when the bow and arrow was introduced. If both series are indeed arrow points, then it seems that the date for the appearance of the bow and arrow might be closer to A.D. 500 or shortly thereafter.

The Desert Side-Notched Series

Triangular, side-notched arrow points are a common style in late prehistoric times in the Great Basin, and are characteristic of late phases from Mexico to the Northern Plains (cf. Kehoe 1966). In the Great Basin, these points are called "Desert Side-Notched" (Baumhoff and Byrne 1959). Four major varieties ("sub-types") have been defined (Ibid.): (1) "General"; (2) "Sierra"; (3) "Redding"; and (4) "Delta" (the latter two being confined primarily to California). Baumhoff and Byrne (1959) postulated a date of A.D. 1500 for the introduction of Desert Side-Notched points. Current radiocarbon dates for the series are listed here:

DATE*	LABORATORY NO.	SITE
A.D. 1720	RL-36	Conway Shelter (D.Fowler letter to R. F. Heizer)
A.D. 1710**	GaK-2389	NV-Wa-355 (Pyramid Lake; D. Tuohy letter to R. F. Heizer, 1971)
A.D. 1630	UCLA-1071D	Hesterlee site (Clewlow, Heizer and Berger 1970)
A.D. 1620	TX-1390	Thompson site (Elston and Davis 1972)
A.D. 1480	GaK-3613	Gatecliff Cave (D. Thomas letter, 1972)
A.D. 1400	GaK-3614	do
A.D. 1360	GaK-3607	do
A.D. 1200	GaK-3606	do
A.D. 1110	WSU-463	Newark Cave (Fowler 1968b)
A.D. 440	WSU-245	Deer Creek Cave (Shutler and Shutler 1963)

* B.P. dates, with range of error indicated, can be found in Appendix 1.

**This radiocarbon assay is on an arrowshaft to which a Desert Side-Notched point remains attached.

The radiocarbon dates indicate that the Desert Side-Notched type appeared sometime after A.D. 1100-1200 and persisted in the Historic era. The date of A.D. 440 from Deer Creek cave has been discounted as much too early by Shutler and Shutler (1963:51). However, there is a date of A.D. 20 (C-635) attributed to the type at Danger Cave (discounted by Aikens 1970b), and there are indications of a similar early origin for Desert Side-Notched points at Hogup Cave (Ibid.).

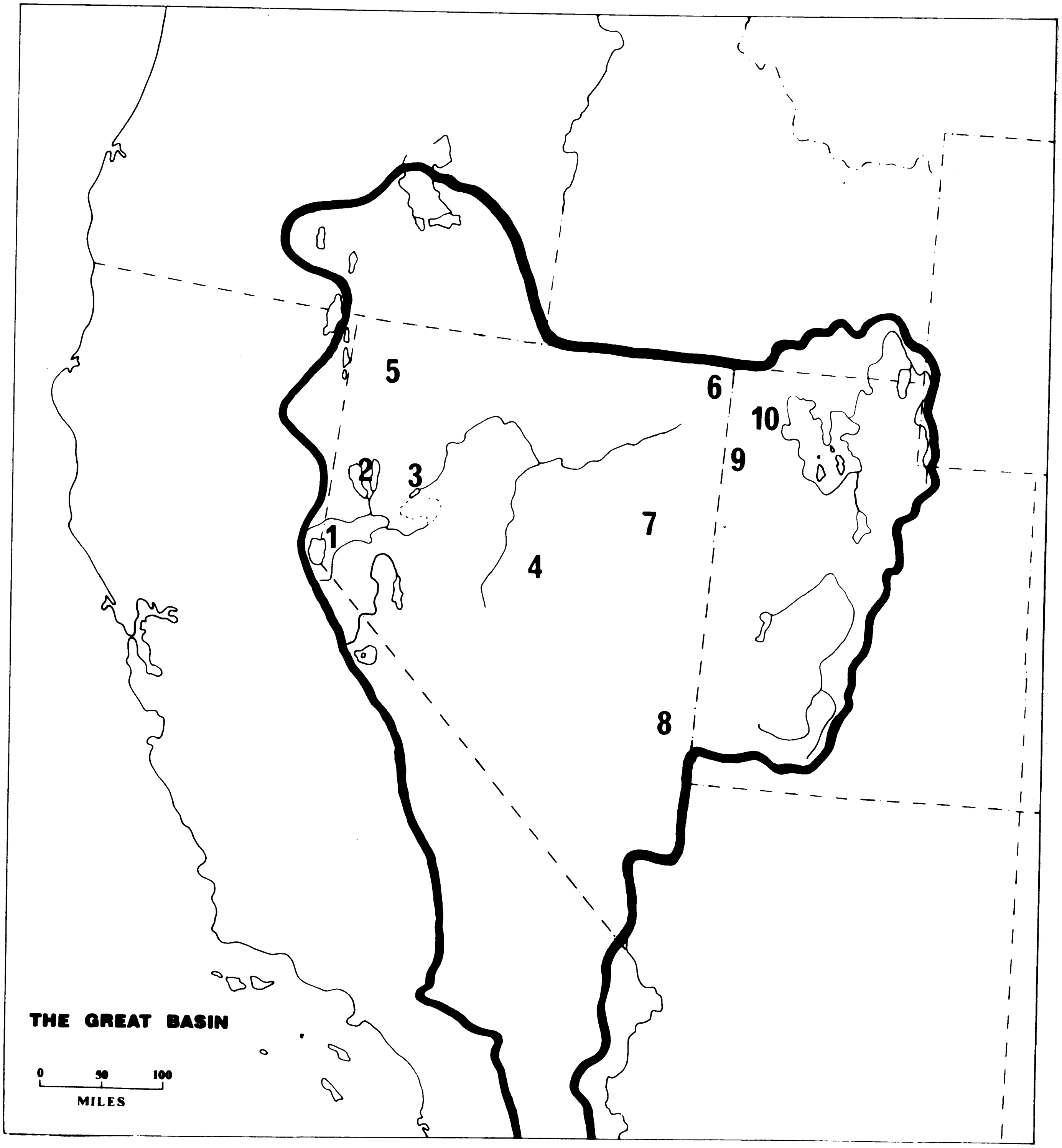


Figure 6. Locations of Sites Which Have Provided Chronological Data for the Desert Side Notched Type.

1. Thompson Site
2. NV Wa 355 (Pyramid Lake)
3. NV Pe 67 (Hesterlee Site)
4. Gatecliff Cave
5. Hanging Rock Shelter
6. Deer Creek Cave
7. Newark Cave
8. Conway Shelter
9. Danger Cave
10. Hogup Cave

Desert Side-Notched points continued to be used well into the 18th century, and were being used by known ethnographic peoples. Layton (1970:225) found a Desert Side-Notched specimen in association with the charred bones of a domestic cow at Hanging Rock Shelter, northwestern Nevada; he infers the use of the type by historic Northern Paiute.

The Cottonwood Series

The Cottonwood series was originally proposed by Lanning (1963) in his analysis of projectile points from the Rose Spring site. He recognizes two varieties, Cottonwood Triangular and Cottonwood Leaf-Shaped. A third variety, Cottonwood Bipointed, was later added by Heizer and Clewlow (1968). These small arrow points are common in late prehistoric and historic times in the Great Basin (for an example of the series in a historic context, see H. S. Riddell 1951). In many instances, Cottonwood points co-occur with specimens of the Desert Side-Notched series. There are five radiocarbon dates which can be applied to the Cottonwood series:

DATE*	LABORATORY NO.	SITE
A.D. 1630	UCLA-1071D	Hesterlee site (Clewlow, Heizer and Berger 1970)
A.D. 1110	WSU-463	Newark Cave (Fowler 1968b)
A.D. 1010	RL-38	Conway Shelter (D. Fowler letter to R. F. Heizer 1971)
A.D. 980	RL-47	Scott site (D. Fowler, letter to R. F. Heizer 1971)
A.D. 900	RL-37	Conway Shelter (D. Fowler letter to R. F. Heizer 1971)

* B.P. dates, with range of error indicated, can be found in Appendix 1.

These dates suggest that the series may have begun prior to ca. 1300 A.D., the date indicated by Lanning (1963) for its origin.

The Martis Series

The Martis type was first defined by Heizer and Elsasser (1953) on the basis of their work in the central Sierra Nevada of California. Recently, Elston (1971) has revised the classification to include three separate types: Martis Triangular, Martis Stemmed Leaf, and Martis Corner Notched. This series appears confined to the westernmost Great Basin, particularly that area around and to the east of Lake Tahoe, occupied in ethnographic times by the Washo. Elston (1971:35) considers the series to be a time marker of the Martis Complex, and based on radiocarbon

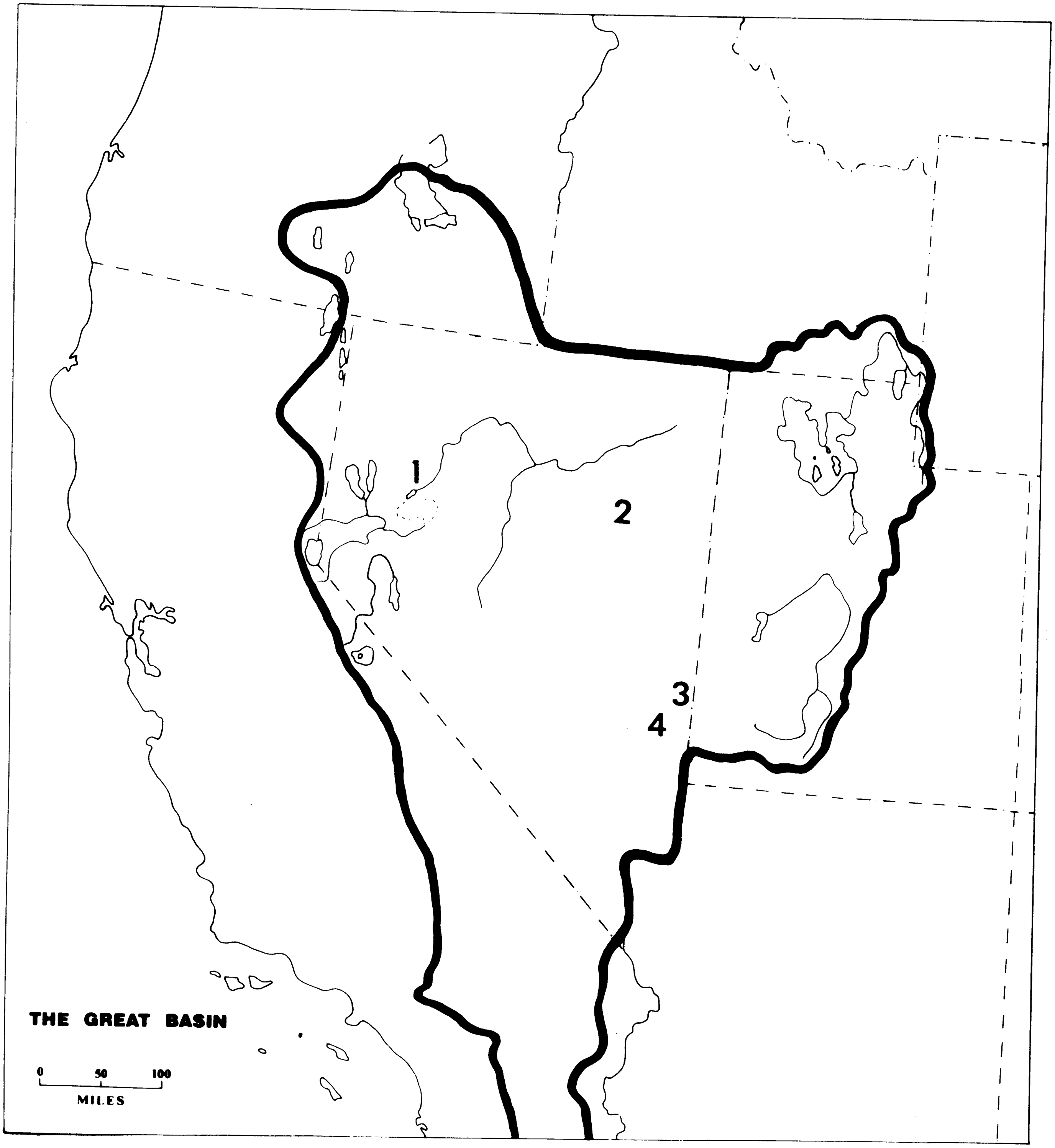


Figure 7. Location of Sites Which Have Provided Chronological Data for the Cottonwood Series.

1. NV Pe 67 (Hesterlee Site)
2. Newark Cave
3. Scott Site
4. Conway Shelter

dates from the Spooner Lake site (see Appendix 1), he places their age at 1000 B.C. to A.D. 500.

The Sierra Stemmed Triangular Type

This is another type defined by Elston (1971:35), and found in the Washo area, and possibly in parts of California. Elston (Ibid:92) notes some similarities between this type and the Gypsum point. Sierra Stemmed Triangular points were popular during the early phase of the Martis Complex, sometime between 1000 B.C. and A.D. 1.

The Lake Mohave Type

Lake Mohave points were defined by Amsden (in Campbell et al. 1937: 80 ff) based on collections from high terraces bordering Lake Mohave. The specimens are often lozenge-shaped, with long contracting stems and rounded bases. The type is a major element in the San Dieguito complex, and a specimen reminiscent of the type was found in the San Dieguito component at the C. W. Harris site (radiocarbon-dated between 6500-7100 B.C.; see Appendix 1). A Lake Mohave point was also found in deep deposits at Fort Rock Cave, Oregon (Bedwell 1970), associated with a radiocarbon date of 11,250 B.C. (GaK-1738).

The Silver Lake Type

These are stemmed points first recognized during the investigations at Lake Mohave (Amsden, in Campbell et al. 1937:84). They have often been collected from sites in apparent association with Lake Mohave points. However, if they were indeed coeval with the Lake Mohave type (there is, in fact, considerable morphological intergrading between the two types), they appear to have survived later in time. E. L. Davis (1970) believes that Silver Lake points begin sometime after 4000 B.C. in the Panamint Basin. There are also numerous Silver Lake points at the Stahl site (Harrington 1957). In the northern Great Basin, Layton (1970) has combined Silver Lake and Lake Mohave points into his "Lake Parman series," which he attributes to a long time span predating the onset of the Altithermal.

The Northern Side-Notched Type

Gruhn (1969) has applied this rubric to a series of large side notched points, one of the traits of the Bitterroot culture, an early adaptational pattern defined by Swanson (1966). In Idaho, Northern Side-Notched points are believed to date between ca. 7000-1000 B.C.

However, specimens of this type are found in the Great Basin, particularly in the northern fringes, such as the High Rock country (Layton 1970) and in the Black Rock Desert (Clewlow 1968a). In northern Nevada, Layton (Ibid.) believes that the type occurs prior to the introduction of his "Silent Snake" points (cf. Pinto). Northern Side-Notched points were also found by Riddell (1960) at the Karlo site (he termed them

"Madeline Dunes" points). In Surprise Valley, O'Connell (1971) reports that Northern Side-Notched points are a key element in the local Menlo phase (ca. 5000-2000 B.C.). Several radiocarbon dates are available for this phase, and one of them (I-4782; 3300 B.C.) appears to be directly applicable to Northern Side-Notched points. In the eastern basin, Northern Side-Notched points are a part of the "Early Complex" at the Weston Canyon Rockshelter (Delisio 1971: 52), dating between 5250-1300 B.C.

The Black Rock Concave Base and Great Basin Transverse Types

In his research in the Black Rock Desert, Clewlow (1968a) recorded a number of Paleo-Indian and other "early" projectile point forms. Among these is a locally defined type named Black Rock Concave Base by Clewlow (Ibid.:13-14). In many respects, these are similar to the Plainview type of the Plains area, although the Black Rock Concave Base points tend to be considerably thinner than Plainview. The type exhibits parallel flaking and has light smoothing on the lower lateral edges.

Specimens known as "crescents" in the Great Basin literature (cf. Tadlock 1966) were found in numbers in the Black Rock Desert. Since these crescentic chipped stone objects are thought to have been used as transversely mounted projectile points (used in hunting waterfowl), Clewlow has designated them as the Great Basin Transverse type.

Both of these point types are assumed to be Anathermal in age (cf. Clewlow 1968a) and are considered to be traits of the Western Pluvial Lakes Tradition. An anomalous situation apparently exists at Hogup Cave, where the Black Rock Concave Base type begins around 5850 B.C., yet survives to stratum 9, dated between 1250 and 650 B.C. Black Rock Concave Base specimens were the earliest points excavated at Hanging Rock Shelter (Layton 1970). Layton (Ibid.) reports obsidian hydration measurements indicating great antiquity for the type.

Clewlow (1968a) indicates that the Black Rock Concave Base type is a tentative one. It is clear that morphologically similar points occur prior to 5000 B.C. in the Great Basin and constitute an element in the Western Pluvial Lakes Tradition. However, the data from Hogup Cave suggests that the typological criteria for Black Rock Concave Base need to be more clearly defined.

An "eccentric" crescent was found in the San Dieguito component at the C. W. Harris site, southern California (Warren 1967:Figure 2,d). Dates for the San Dieguito materials at that site range from 6540-7080 B.C. Crescents (in the typical form of the Great Basin Transverse point) have been excavated at the Connley Caves, Oregon (Bedwell 1970), and are attributed to his Period III which has a time span of 9000-6000 B.C. (the Western Pluvial Lakes Tradition).

A different view of the function of Great Basin Transverse points has been offered by Butler (1970:39). Butler's laboratory assistant examined 84 of these specimens (from Coyote Flat, southeastern Oregon) under low-power magnification. According to Butler (Ibid.), the results point to the use of these artifacts "as scrapers, as knives and as gravers." Unfortunately, Butler does not describe the types of wear which were observed on the specimens and which enable him to make this broad statement about their function. If his specimens are like those from the Black Rock Desert, they have undergone considerable weathering, and I would suspect that most meaningful wear patterns (if present) might be badly obscured. In addition, extensive smoothing of artifact edges, a feature which usually indicates use, could have been caused on these specimens through weathering processes while they were exposed on the surface (cf. Hester 1970:48; Hester and Green 1972). Thus, I believe that Butler's hypotheses as to the use of these specimens require further test; I would urge that when such tests are made that the procedure and results be more fully described.

The hypothesis advanced by Tadlock (1966) and by Clewlow (1968a) that Great Basin Transverse specimens served as projectile points has been partially tested in experiments at the University of California, Berkeley. Though these experiments were inconclusive, they did show that such specimens, hafted as transverse points, did not affect the trajectory of a shaft while in flight and thus could have served as projectile tips.

The Gypsum Type

Projectile points with triangular bodies and short, contracting stems were found by Harrington (1933) at Gypsum Cave, Nevada. He referred to the points as the "Gypsum Cave" type, and because of their apparent association with extinct fauna at the site, they have long been considered by many archaeologists as dating from Paleo-Indian times (Wormington 1957: 157). However, radiocarbon analyses published by Heizer and Berger (1970) have established that the presence of man in Gypsum Cave is much more recent in time. It is likely that Gypsum points date from sometime around 450 B.C. - 950 B.C. (UCLA-1069; UCLA-1223), or earlier, as D. Fowler (letter to R. F. Heizer, 1971) has found 50 Gypsum points in Unit III at O'Malley shelter, radiocarbon-dated to 1790 B.C.

The McKean Type

In a paper delivered at the 1972 Northwest Anthropological Conference, J. P. Green (1972) discussed the occurrence of McKean points (Wheeler 1952) in the Great Basin. His studies have revealed that true McKean points are found at Wilson Butte Cave (in the Wilson Butte V assemblage, dated at 2000-500 B.C.) and in the collections from Coyote Flat, southeastern Oregon (Butler 1970). Butler (Ibid.) has included McKean points in a "McKean-Humboldt Concave Base A-Pinto series," a most confusing congeries. Green (Ibid.:10) points out that McKean is technologically distinct from either the Humboldt or Pinto series and he notes that specimens clasified as McKean at Danger Cave are definitely not of that type.

Miscellaneous Early Man Points

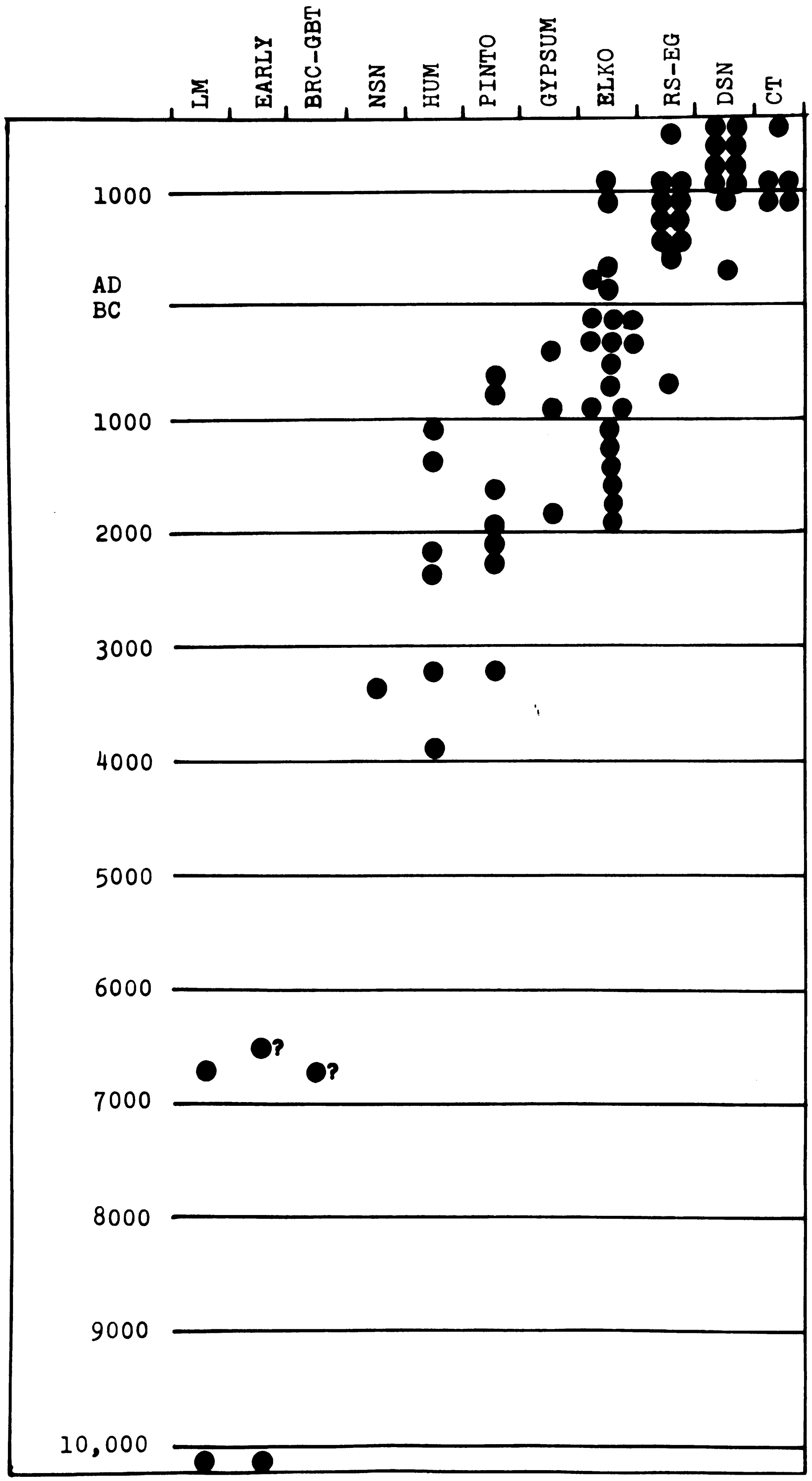
There are a variety of projectile points found at Great Basin sites which can be attributed to Paleo-Indian times. These include the Haskett type (defined by Butler 1965, 1967), a trait of the Hascomat complex defined by Warren and Ranere (1968). The type is thought to date around

Figure 8. Distribution of Radiocarbon Dates for Certain Great Basin Projectile Point Types.

Each black dot represents a radiocarbon assay.

Abbreviations used in the figure are:

LM	Lake Mohave
EARLY	Miscellaneous early types (fluted, Haskett, Cougar Mountain, and so forth)
BRC-GBT	Black Rock Concave Base and Great Basin Transverse specimens
NSN	Northern Side-Notched
HUM	Humboldt Series
RS-EG	Rose Spring and Eastgate Series
DSN	Desert Side-Notched
CT	Cottonwood Series


LM
EARLY
BRC-GBT
NSN
HUM
PINTO
GYPSUM
ELKO
RS-EG
DSN
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1000
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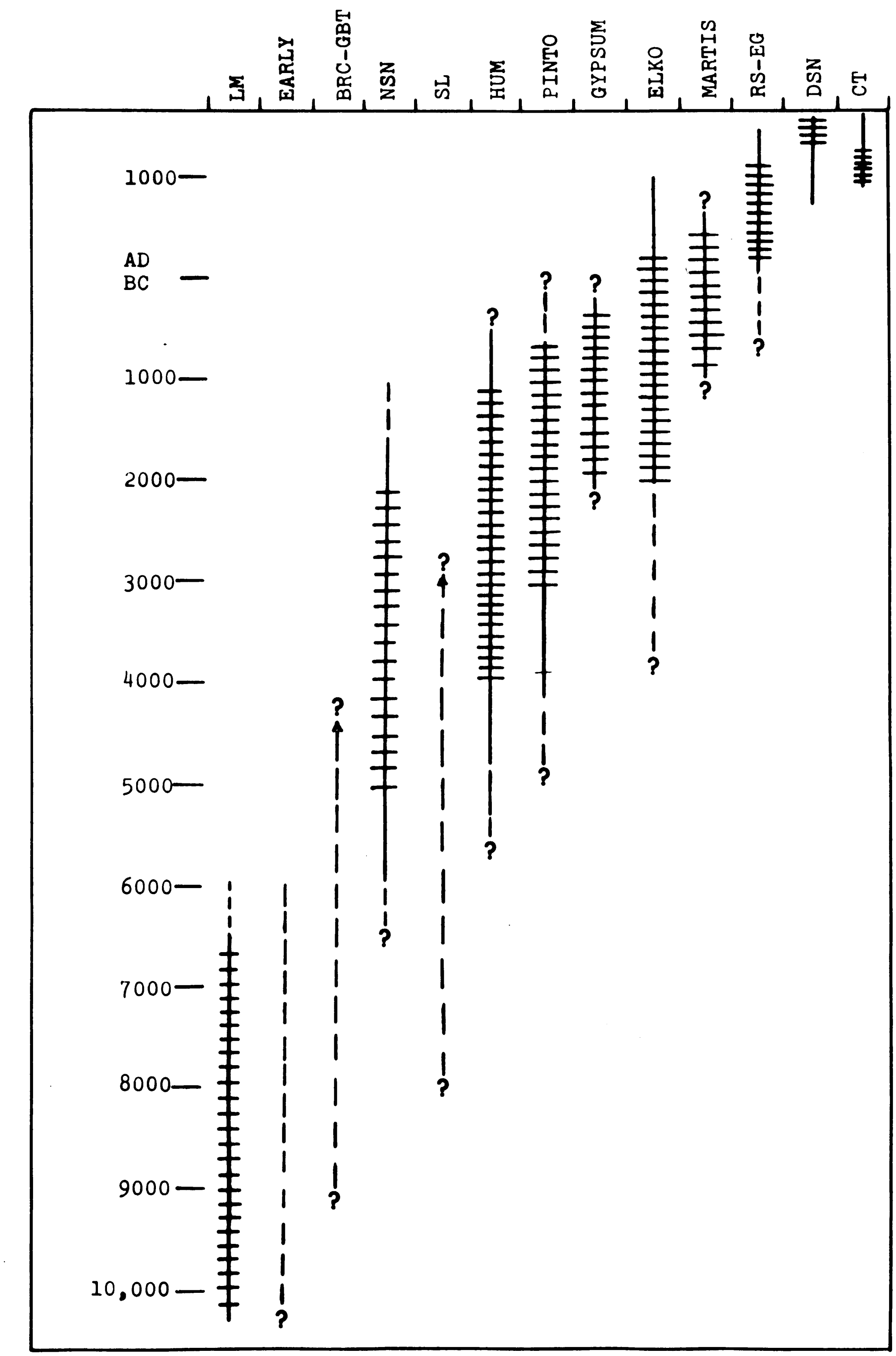
BC
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
?
?

Figure 9. Hypothesized Fluorits of Great Basin Projectile Point Types

Duration of fluorit indicated by horizontal bars.

Abbreviations used in the figure are:

LM	Lake Mohave
EARLY	Miscellaneous early types (fluted, Haskett, Cougar Mountain and others)
BRC-GBT	Black Rock Concave Base and Great Basin Transverse Specimens
NSN	Northern Side-Notched
SL	Silver Lake
HUM	Humboldt Series
RS-EG	Rose Spring and Eastgate Series
DSN	Desert Side-Notched
CT	Cottonwood Series


LM
EARLY
BRC-GBT
NSN
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PINTO
GYPSUM
ELKO
MARTIS
RS-EG
DSN
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4000
5000
6000
7000
8000
9000
10,000

5000-6000 B.C. (there are radiocarbon dates applicable to the type from the Veratic rockshelter, Idaho; see Butler 1965). Another similar form is the so-called Cougar Mountain point, described by Layton (1970) as large, edge-ground points with tongue-shaped stems (similar to his "Lake Parman series" points; see discussion of the Silver Lake type). These points, originally found at Cougar Mountain Cave, Oregon (Cowles 1960), may have been present in the Great Basin around 6500 B.C., if the date from level 1 of Cougar Mountain Cave is considered to be applicable (UCLA-112). Specimens resembling the points found at Lind Coulee (Daugherty 1956) have been reported by Clewlow (1968a) from the Black Rock Desert; their age in the Great Basin is not known. Cascade points, characteristic of Butler's hypothetical Old Cordilleran culture (see Butler 1966), are found in some sites in the northern Great Basin; for example, Weide (1968) places them in her "Early" period in the Warner Valley, Oregon. Finally, there are a variety of fluted points, and as mentioned in Chapter IV, many of these can be typologically linked to the Folsom and Clovis types, and some resemble specimens found at the Borax Lake site, California (cf. Clewlow 1968a for such specimens in collections from the Black Rock Desert).

Ordering of Point Types

In Figures 8 and 9, I have assembled the available chronological data on Great Basin projectile point types. In Figure 8, radiocarbon dates of similar age have been grouped together. In Figure 9, radiocarbon age has been combined with a variety of stratigraphic data, ages based on geological evidence, and age estimates based on pure speculation. The postulated floruit of each of the types has been indicated. Where possible, the duration of the floruit is based largely on applicable radiocarbon dates; in other cases, the floruit is hypothetical.

BASKETRY

Basketry and other woven materials are found in many of the dry cave and rockshelter sites in the Great Basin. It was early recognized (cf. Cressman 1943) that certain basket styles had restricted temporal and geographic distribution. With the advent of radiocarbon dating, the chronologic position of several of these styles has been established, and is continuing to be refined.

Catlow Twined basketry (Cressman 1942, 1943, 1944) is characterized by Cressman (1943:240) as a "semiflexible ware with both warp and weft made from 2-ply twisted tules . . . , with the pitch of the stitch down to the right. New warps are added by simple insertion. The rims are mostly finished by having the warp trimmed flush with the top of the last twining row. Occasionally, the warp is bent back at the time and inserted in the adjoining weft stitch for binding." Cressman's distributional map (1943:Map 4) shows Catlow Twined concentrated in southeastern Oregon and northwestern Nevada. Cressman was of the opinion that Catlow Twined was quite old, and believed that it was represented below the pumice layer at Fort Rock Cave; however, this has been discounted by Baumhoff (1958:21). There are several radiocarbon dates now available for Catlow Twined, and these are listed in the following table:

DATE*	LABORATORY NO.	SITE
A.D. 470	not given	Falcon Hill (Rozaire 1969)
A.D. 610	GaK-2809	26 Wa 528 (Pyramid Lake; D. Tuohy, letter to R. F. Heizer, 1971)
1670 B.C.[1]	UCLA-976	Falcon Hill (Adovasio 1970)
1710 B.C.	UCLA-905	do
5290 B.C.[2]	RL-49	Fishbone Cave (Adovasio 1970)
5875 B.C.	not given	do
9245 B.C.	not given	Falcon Hill (Adovasio 1970)

* B.P. dates, with possible range of error, can be found in Appendix 1.

[1] The 1670 and 1710 B.C. dates are for Catlow Twined with overlay.

[2] The last three dates are for Catlow Twined without overlay.

Another major basketry style is Lovelock Wicker. A general description is provided by Grosscup (1960:43):

> "Virtually all wicker baskets . . . are started at the apex with plain twining (over 2 or 3, under 2 or 3) with rounded wefts, followed by a number of rows of over 1 under 1 plain twining with ribbon wefts. The bulk of the basket is then in wicker (ribbon wefts), although occasionally one or more rows of plain twining may be inserted. At the broad end of the basket the ribbon wicker is ended off with one or more rows of plain twining (over 2 under 2) before the selvage starts. The selvage is formed by bending the warps diagonally, usually in pairs, and intertwining them, usually in a wicker weave."

Lovelock Wicker is geographically confined to western Nevada, and is one of the hallmarks of Lovelock culture (see Figure 11). According to Grosscup (1960:Figure 10) it is restricted temporally to Transitional Lovelock and the first half of Late Lovelock (it is not known ethnographically among the resident Paiute populations). Rozaire (1969:184) reports four radiocarbon dates, ranging from A.D. 550 to A.D. 1370, for Lovelock Wicker specimens from Falcon Hill, Lake Winnemucca. The A.D. 1370 date seems much too late and should be checked by further radiocarbon determinations. However, Adovasio (1970) apparently accepts this late date, listed in his Table 3 (UCLA-677; A.D. 1370±80).

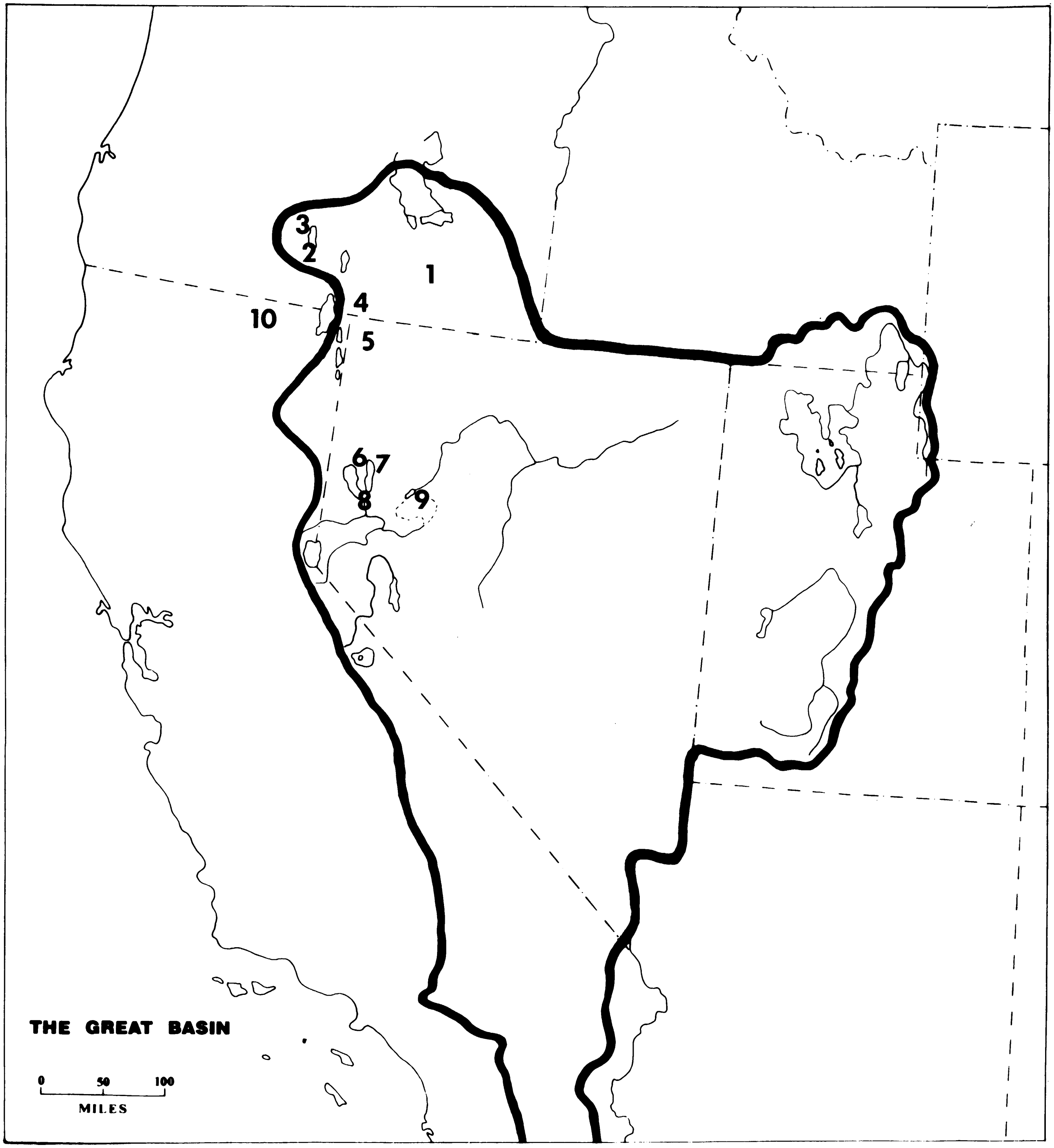


Figure 10. The Distribution of Catlow Twined Basketry in the Great Basin.

1. Catlow Cave
2. Paisley Five-Mile Point Cave
3. Fort Rock Cave
4. Plush Cave, Warner Valley
5. Massacre Lake Caves
6. Falcon Hill Sites
7. Fishbone Cave
8. Thea Heye Cave
9. Humboldt Sink Sites (Humboldt Cave, Ocala Cave. Lovelock Cave, NV Pe 8)
10. Tule Lake

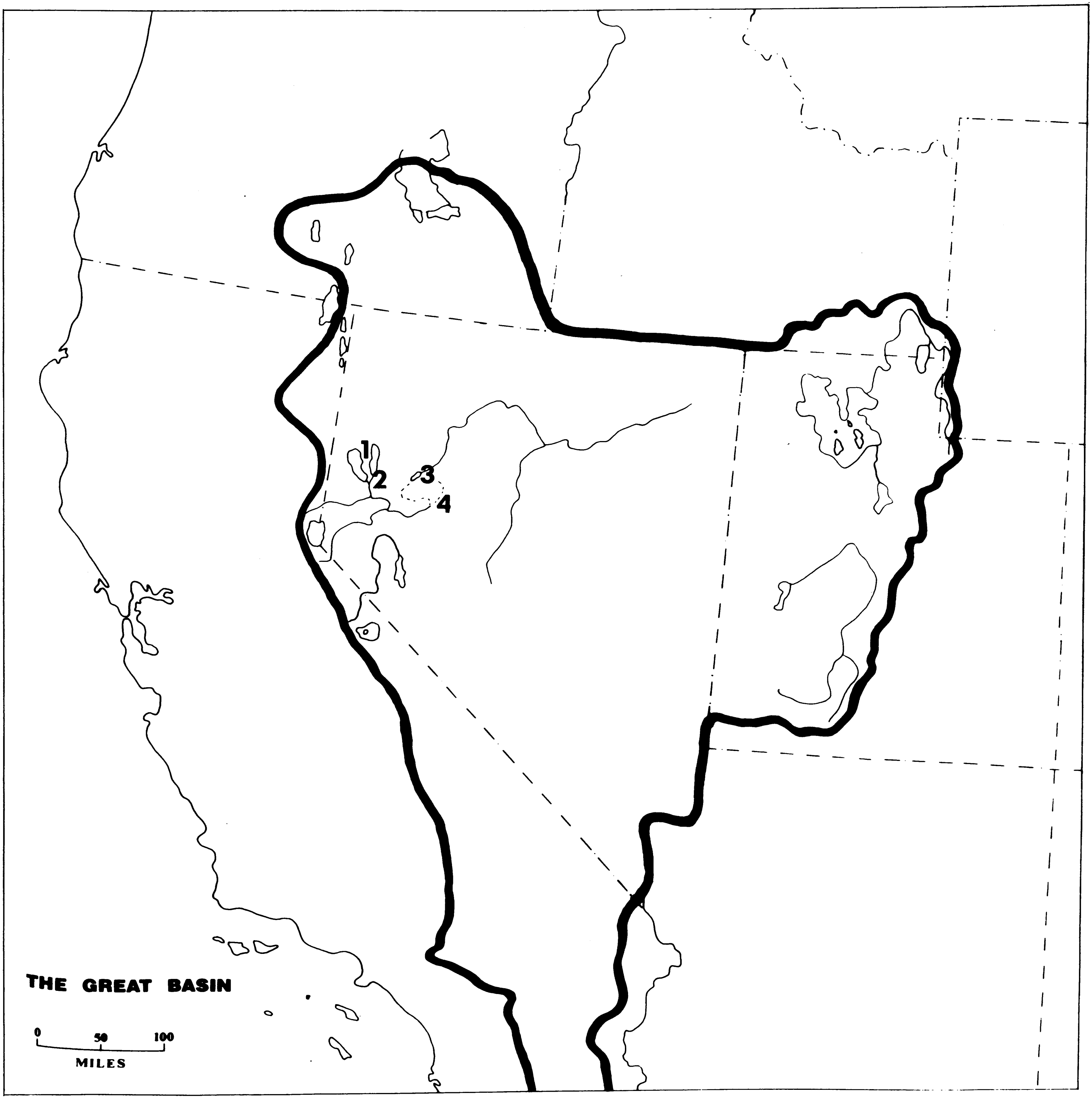


Figure 11. Distribution of Lovelock Wicker Basketry in the Great Basin

1. Pyramid and Winnemucca Lake Caves (including Falcon Hill)
2. Cave at South End of Winnemucca Lake (Hester and Heizer ms.)
3. Humboldt Sink Sites (Granite Point, Lovelock Cave, Humboldt Cave, Ocala Cave)
4. Hidden Cave

Also present in the western Great Basin is a fine coiled style, termed "Outland Coiled" by Baumhoff and Heizer (1958). They believe that all such basketry was not indigenous to the western Nevada area, but was traded in from an outside source, probably California (Ibid.:53). Fine coiled basketry of this style is reported by them to be present in all periods of Lovelock culture.

However, much of the basketry from the Great Basin does not fall within one of these three major styles. This material, along with Lovelock Wicker, Outland Coiled, and Catlow Twined, has been chronologically ordered by Adovasio (1970).

Adovasio defines a "Western Nevada Complex" in which he places Lovelock Wicker, Catlow Twined, and basketry exhibiting close simple twining, close diagonal twining, open diagonal twining, and close coiling. Four sequential stages are postulated:

Stage 1 (8000-4500 B.C.)	Catlow Twined without overlay
Stage 2 (4500-2000 B.C.)	Coiling techniques are popular
Stage 3 (2000-1000 B.C.)	Lovelock Wicker; Catlow Twined with overlay
Stage 4 (1000 B.C. to A.D. 1000 or later)	Lovelock Wicker continues; coiling is common

Woven materials from the eastern part of the Great Basin are arranged in Adovasio's "Eastern Basin Complex," also with four hypothetical stages:

Stage 1 (8000-6500 B.C.)	Twining; no named types
Stage 2 (6500-4600 B.C.)	Coiling and twining
Stage 3 (4600-2000 B.C.)	Coiling is dominant
Stage 4 (2000 B.C. to A.D. 1200)	Coiling; with techniques appearing in southern Nevada and other areas adjacent to the eastern basin (cf. Adovasio 1971)

Some additional comments on basketry techniques in the eastern Great Basin have been offered by Fry and Adovasio (1970:212). They report that coiling appears in Hogup Cave stratum 3 (ca. 6800 B.C.), while at Danger Cave, it is absent before Danger III, roughly 1500 years later. At Danger Cave, twining is more common than coiling.

Adovasio (1970) has also postulated an "Oregon Complex," but it is not well dated. He believes (Ibid.:14) that the presence of Catlow Twined in Oregon and in western Nevada hints at stronger ties between these two areas than between either of them and the eastern sector of the Great Basin. Rozaire (1963:74) offers a possible explanation for this similarity between the two areas:

"Lovelock Wicker and Catlow Twined basketry may indicate regional and temporal traditions which coincided with peoples who had adapted wholeheartedly to a lake-side situation."

CERAMICS

Pottery appears late in the Great Basin cultural sequence, continuing in use in most areas into the historic period. For this reason, it is useful for indicating the late prehistoric or historic occupation of archaeological sites.

Sites in the eastern and southeastern Great Basin often yield ceramics similar to those made in the American Southwest. This phenomenon results from an intrusion of pottery-making agriculturalists (in the Puebloid tradition) into the eastern basin sometime shortly before A.D. 500, and then disappearing ca. A.D. 1150 (spanning the Basketmaker II through Pueblo III phases of the American Southwest). Tuohy (1965b:5) has described the boundary of this intrusion as extending "from Cobre in Elko County, along U.S. Highway 50 to Ely in White Pine County. From Ely, the boundary parallels U.S. Highway 6 to the vicinity of Tonopah, Nevada. From that point, the boundary turns south roughly paralleling U.S. Highway 95 between Tonopah and Beatty" (see Figure 12). Earlier studies of this "pottery boundary" had been done by Harrington (1926, 1928). Pottery types in this area are varied, and the reader is referred to Shutler (1961a) for further discussion.

Other ceramics resembling those made in the American Southwest occur in the Fremont culture, which in the eastern Great Basin is represented by the Sevier or Western division (west of the Wasatch Mountains in Utah; Gunnerson 1969:12). These ceramics are in the Anasazi tradition (there are several defined types), dating between A.D. 950 and A.D. 1150-1200 (Ibid.:170). Data on the distribution of these types can be found in Rudy (1953:Figure 12).

In practically all parts of the Great Basin, there occur several varieties of plain brownware ceramics attributable to both the Shoshonean and Paiute populations. The ceramics thought to have been made by prehistoric and protohistoric Shoshoneans have been dubbed "Shoshoni Ware" (Rudy 1953; Tuohy 1956; Coale 1963), and are widely distributed--from south-central Montana, into Wyoming and Idaho, and in the western and eastern Great Basin (see Fowler 1968a:Figure 2). Pottery attributed to Paiute populations is also widespread in the Great Basin. In the southwest Basin, Owens Valley Brown Ware apparently represents Northern Paiutes (Steward 1933; E. L. Davis 1963). It, along with Tizon Brown (of the Patayan tradition), comprise the two distinct ceramic traditions in the southern California deserts (Wallace 1962:177). The Southern Paiute also manufactured a brownware (sometimes called "Southern Paiute Utility Ware"; Baldwin 1950:53), found particularly in the southern parts of the Great Basin (cf. Shutler, Shutler and Griffith 1960). In the southwest Basin, Meighan (1953) once suggested that the Southern Paiute ware preceded Owens Valley Brown Ware.

It is difficult to be exact about the temporal origin of either Shoshone or Paiute brownware, a fact stemming primarily from the simple reason that it is often hard to distinguish between the two in many published

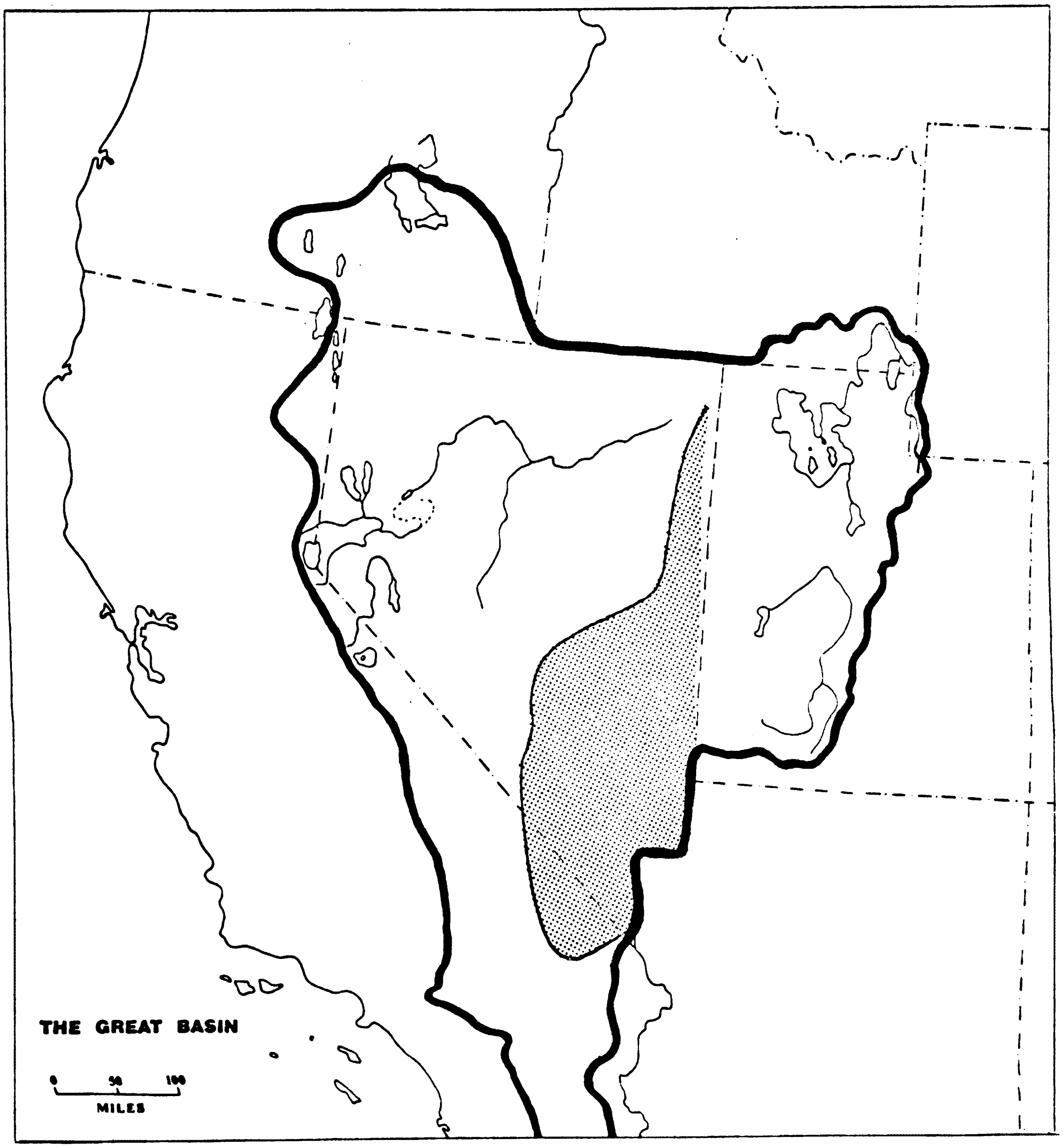


Figure 12. Approximate Distribution of Puebloid Ceramics in the Great Basin (after Harrington 1928; Grosscup 1957a).

reports (a situation which Fowler 1968a has rectified to some degree). On the basis of his research, Fowler (Ibid.:33) suggests that pottery of the Shoshonean tradition did not appear until after A.D. 1300. The manufacture of Southern Paiute brownwares may have begun considerably earlier, as Shutler (1961a:69) believes that these peoples entered the Great Basin between A.D. 700-1100. The Owens Valley Brownware type, made by Paiutes in that region (and by some of their non-Paiute neighbors) apparently began around A.D. 1650 (H. S. Riddell 1951:20-23; Fowler 1968a:10).

A variety of decorated pottery from the Great Basin has been defined by Tuohy (1963). This is "Riddle Textile-Impressed," typical of the Shoshoni brownware tradition, but having textile impressions on the base, and in one case, diagonal incisions (fingernail punctations) below the rim (cf. Tuohy and Palombi 1972). It is not known if the basketry impressions on the base of these vessels are intentional or merely the result of the vessels having been placed on twined or coiled mats during the manufacturing process.

SHELL BEADS

Beads and other ornaments manufactured of marine shell are found at numerous sites in the Great Basin, particularly in the western and southwestern sectors. These artifacts reached the area through trade with the cultures of Central California, and they can thus be cross-dated with the shell bead types occurring within the Central California chronological framework (for a review of the culture sequence in Central California, see Beardsley 1948; Heizer 1949; Belous 1953; Ragir 1972).

The major work on shell beads and cross-dating with Great Basin sites is that of Bennyhoff and Heizer (1958). They note the occurrence of shell beads at the Cottonwood and Rose Spring sites in the Owens Valley, and by correlating these with Central California data, they date the occupation at Cottonwood to protohistoric and historic times, and at Rose Spring, from upper Middle Horizon (Central California) times through the protohistoric period. However, the main focus of their paper is on shell beads from 25 archaeological sites in western Nevada (specifically the lower Humboldt sink) and northeastern California. The shell specimens from these sites span the entire Central California sequence, from Early Horizon through Phase 2 of the Late Horizon. They view this synchronism as evidence of continuous contacts between the western Great Basin and Central California over the past 3000-4000 years (Bennyhoff and Heizer 1958: 71). Through the co-occurrence of bead types, they were able to correlate the Early and lower Transitional Lovelock periods with the terminal Early and lower Middle Horizons of Central California. More recent studies of shell bead types from the Humboldt sink (Tuohy 1970a) confirms their findings.

A shaman's burial found at Pyramid Lake had, as part of the burial furniture, Haliotis type 3 beads in association (Tuohy and Stein 1969). A radiocarbon date of A.D. 130 was obtained for the burial (I-2846; see Appendix 1). There is another radiocarbon date from the Pyramid Lake area (site 26 Wa 525) of 2520 B.C. (GaK-2808) which is applicable to several bead types (D. R. Tuohy letter to R. F. Heizer, 1971).

For some additional data on cross-dating with shell beads in the Great Basin, see O'Connell and Ambro (1968:132) and Cowan and Clewlow (1968:200).

CHAPTER IV

PREHISTORIC CHRONOLOGY IN THE GREAT BASIN

The primary goal of this study is to review cultural chronology in the Great Basin, and to offer an up-to-date chronological ordering based on stratigraphic and chronometric data. The available information on cultural sequence will be summarized and this review begins by considering the problem of "Early Man." This topic has received much attention throughout the period of prehistoric research in the Great Basin, and remains a subject of discussion, debate, and research at the present time. The remainder of the chapter will be devoted to a perusal of the chronological situation in each of the major areas of the Great Basin. For convenience in handling these data, I have divided the Basin into four regions or sectors: southwestern, northern, western and eastern (see Figure 13). These divisions closely parallel those established for use by contributors to the Great Basin volume in the forthcoming Handbook of North American Indians. In defining the limits of the Great Basin, I have followed Steward (1938; see also Jennings and Norbeck 1955). The boundaries drawn here very closely follow the outline of the interior drainage pattern used by some to delineate the Great Basin region (cf. Meighan 1959a;Bennyhoff 1958; Morrison 1965).

In the sections on the regional chronologies, it will be necessary to treat with detailed cultural sequences pertinent to small areas within the particular region. From this, a regional chronological ordering is developed. In other words, major emphasis will be placed on the study of cultural entities limited both in time and space. In the broader picture, many of these localized developments have been grouped into the "Desert Culture" or "Desert Archaic." The "Desert Culture" generalization was conceived by Jennings (1953) and Jennings and Norbeck (1955), growing largely out of Jennings' research in the Danger Cave and other sites in the Wendover area of northwestern Utah. In essence, the cultural model postulated by Jennings emphasizes a general, widespread adaptation to an arid environment over a long time span. The Desert Culture was conceived of as the lifeway of small socio-political units in a sparsely populated habitat, with a subsistence system based on intensive exploitation of a wide range of resources, with special attention given to harvesting and processing of small seeds. The adaptation began around 6000-7000 B.C. and continued largely unchanged to 1000-2000 B.C., or "down to the ethnographic present in some localities" (Jennings et al. 1956:70). Jennings and Norbeck (1955) hypothesized a three-phase sequence within the Desert Culture: (1) Desert Culture-Peripheral Big Game Hunting; (2) Desert Culture—Horticultural; (3) Historic Desert Culture.

In a later paper, Jennings (1964) included the Desert Culture in a more widespread "Desert Archaic," which he characterized as a "stable, successful adjustment to a special environment, an environment characterized by chronically deficient moisture" (Ibid.:153). Into the Desert Culture, Jennings has grouped most of the major sites of the Great Basin:

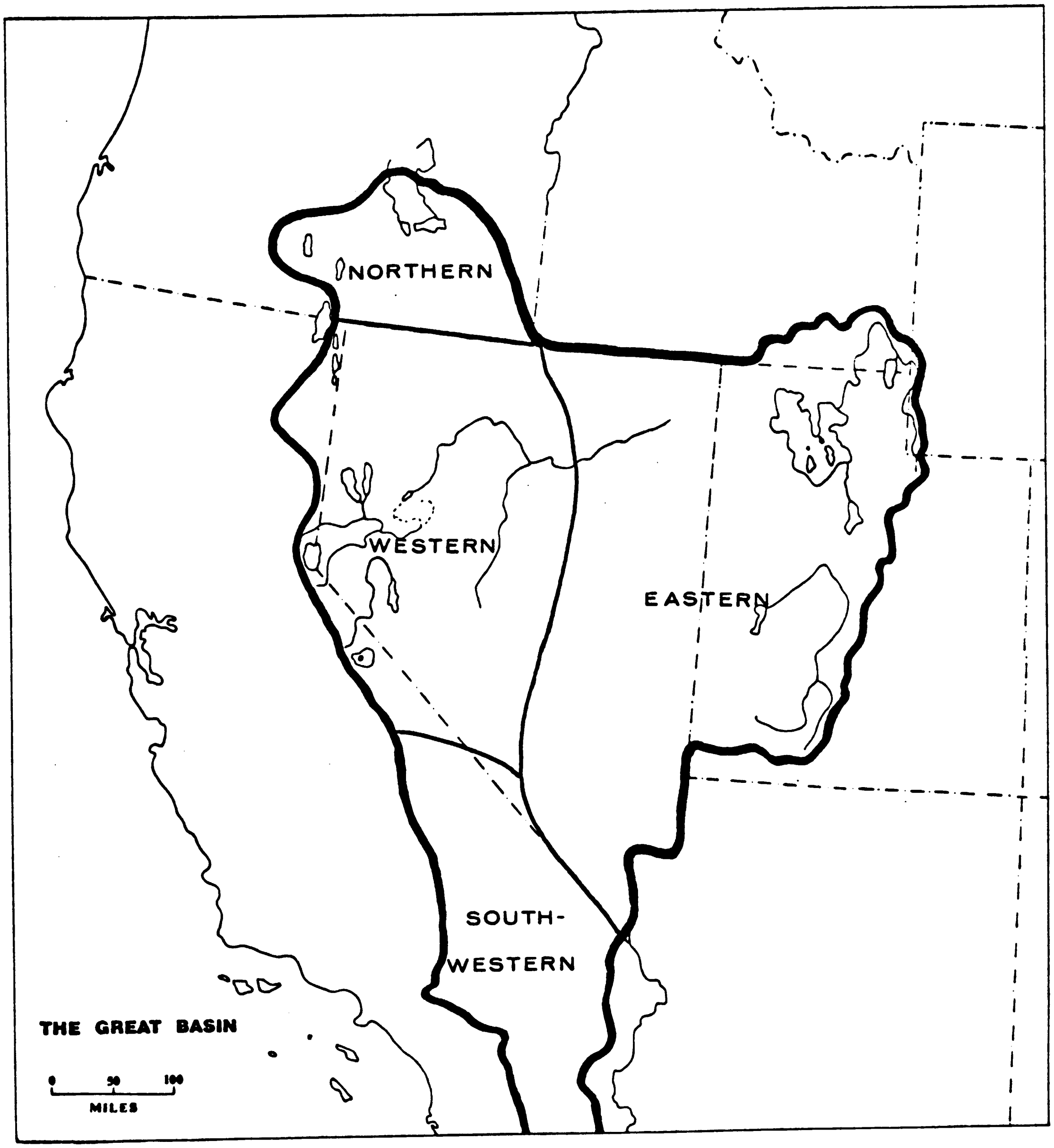


Figure 13. The Four Sectors of the Great Basin

Danger Cave, Lovelock I, Karlo, Roaring Springs, the southeastern Oregon cave sites, Promontory Cave, Etna Cave, Gypsum Cave, Fishbone Cave, and has included as well some of the early complexes in the Southwestern Great Basin, such as Death Valley I, Lake Mohave and San Dieguito (see Jennings 1968). Jennings (1964:153) argued that the Desert Culture is not a functionally integrated cultural complex, but rather is representative of a broad "stage" characterized by "wide exploitation of available species."

It was not long, however, before Jennings' hypothesis began to be questioned. In their report on Humboldt Cave, Heizer and Krieger (1956) record the predominance of lacustrine-oriented cultural items such as fish nets, duck decoys, fish hooks, dried fish in caches, and so forth (additional data on lacustrine subsistence has been provided by coprolite studies; see Napton 1969; Heizer and Napton 1969, 1970a). Meighan (1959a:48) also refused to accept the broad Desert Culture construct:

> "the Desert Culture, despite its underlying uniformity, contains a variety of different kinds of cultures, particularly reflected in the adaptations to local environmental conditions."

Meighan (Ibid.) outlined five localized adaptations in the Great Basin: Basic Seed Gatherer Tradition (Danger Cave, Coville Rockshelter, perhaps Catlow Cave); Big Game Hunters (Roaring Springs, Leonard Rockshelter, Paisley Five-Mile Point Cave No. 3, Lake Mohave, Death Valley I); Specialized Lake Dwellers (especially in the Humboldt sink vicinity); a Coastal Desert Tradition (on the southernmost California coast); and a Horticultural Desert Tradition (represented by the Puebloid or Anasazi incursion in the eastern Great Basin).

Others who have recognized diversity within the so-called Desert Culture include Shutler (1968a), Ranere (1970) and W. A. Davis (1966). Shutler (1968a:24) suggests there were two phases in a "Great Basin Archaic Stage": a "Lakeshore Ecology Phase" (equated with all Nevada, Utah, and Oregon lakeshore sites); and a "Desert Phase" (coeval with the Lakeshore phase, and identified with the Desert Culture). Ranere (1970:54) contends that the Desert Culture concept "stresses the desert pattern over all else, and simply fails to emphasize the importance of the lakeshore and grassland patterns in Great Basin cultural development." W. A. Davis (1966) has hypothesized that the earliest populations in the Great Basin were adapted to a lacustrine lifeway, and that the Desert Culture developed from this, taking full form only in the last two millennia.

Some current assessments of the Desert Culture formulation have been provided by Heizer, Swanson and Steward. Heizer has remarked:

> "For archaeologists working with time and limited evidence of culture, this culture concept is of limited utility . . . I would think, further, that the information which we can get, or have so far gotten, about the earliest cultures, is so limited that it would not be possible to prove even something as general as 'wide exploitation of available species' [Jennings 1964]" (Heizer 1966:240).

Swanson believes that the concept of the Desert Culture has been exhausted, and that its tenets should be reexamined; however, he states:

> "The Desert Culture concept has also made it possible to differentiate other aspects of Western prehistory, both in time and type . . . By any standard, this theoretical concept has been scientifically successful." (Swanson 1966:137).

My own views are more in accord with those of Steward:

> "The concept of the Desert culture has . . . served as an extremely useful provisional hypothesis, but it now needs modification. It is oversimplified in representing the environment as too uniformly arid and the people as too uniformly seed gatherers." (Steward 1968:264).

Those wishing to examine more thorough discussions of the Desert Culture hypothesis should consult Jennings (1964, 1968), Grosscup (1966), Swanson (1966), W. A. Davis (1966) and Aikens (1970a,b).

EARLY MAN IN THE GREAT BASIN

The various rubrics used to designate the earliest identifiable cultural remains in the New World include "Paleo-Indian," "Paleo-American," "Lithic," "Big Game Hunter," and so forth. In general, these terms are used to refer to a period dated roughly between 10,000 B.C. and 7000 B.C. These early cultures included the makers of Clovis and Folsom fluted points, often found at kill-sites in association with mammoth (Clovis) or extinct forms of bison (Folsom). A wide range of slightly later cultural materials characterized by lanceolate or stemmed parallel-flaked points, from sites like Plainview, Hell Gap, Milnesand, Scottsbluff (all in the Midwest or Western United States), and numerous localities in the Eastern United States, are also considered to date from this early period.

From a historical standpoint, there have been suggestions of man's antiquity in the Great Basin since the late 19th century. First, there was the case of the Ophir skull supposedly found deep in a mine shaft at Virginia City, Nevada (Reichlen and Heizer 1966); the whole affair can probably be dismissed as a hoax. Then, in 1882, W J McGee found a chipped stone artifact deeply buried in the Walker River silts of western Nevada. McGee's report, published in 1889, records in great detail the discovery of the subtriangular obsidian biface (not typologically distinctive) eroding from alluvium 25 feet below the rim of the Walker River Canyon, south of Fallon. According to McGee, the alluvium could be attributed to the upper series of Lahontan deposits, apparently of late Pleistocene age (Ibid.:33).

As noted previously, Jennings (various) prefers to group the early peoples of the Great Basin into the Desert Culture. He asserts (cf. Jennings and Norbeck 1955) that these populations were peripheral to the big-game hunting tradition, and had at this early time level already developed a broad-based subsistence pattern geared to an arid landscape.

There are also those who would place man in the Great Basin (and in the New World) at a time level much earlier than 10,000 B.C. Krieger (1964) has been one of the leading proponents of a "Pre-Projectile Point Stage," a hypothetical entity which has proved to have little or no substance. This formulation includes putative sites widely scattered in the New World, including Friesenhahn Cave in Texas, Valsequillo, Mexico, and presumably, the Ayacucho and Paccaicase Complexes of Peru defined by MacNeish (1969, 1971). In the Great Basin, the most vociferous claims of man's great antiquity in the New World have emanated from the deserts of southern California. Supposed early lithic assemblages were reported by Simpson (1956, 1958, 1960) from the Manix Lake area and from sites at Coyote Gulch. At Manix Lake, Simpson obtained radiocarbon dates of 15,390 B.C. and 15,590 B.C. (UCLA-121; LJ-269) on tufa samples collected just below the high stand line of the pluvial lake. But, like almost all such geological dates, there is no sure way to securely link these determinations with surface lithic materials. T. and L. Clements (1953), in a paper published in the Bulletin of the Geological Society of America, asserted their belief in "Pleistocene Man" in the Death Valley area (see also Clements 1954). However, there is very little among their illustrated lithic materials (Clements and Clements 1953:Plates 2-4; Figure 2) which could in any way be construed as the product of human workmanship. In fact, most of the objects are certainly of natural origin.

Since 1964, R. Simpson, in collaboration with L. S. B. Leakey and T. Clements, has been excavating a "site" in the Calico Hills on the western edge of the Mohave Desert. The excavations have cut into a gravelly alluvial fan, probably of middle Pleistocene age, and from this context the investigators have extracted nearly 200 lithic specimens which they interpret as artifacts. The age of this assemblage is estimated between 50,000 and 80,000 years (Leakey, Simpson and Clements 1968:1022-1023). Paleomagnetic dating of a purported "hearth" at the site supports this age estimate. However, most archaeologists remain unconvinced that the cluster of burned rocks is actually a "hearth," just as most do not believe that the lithic objects are pieces which have been deliberately chipped by man (cf. Irwin 1971:45). A large number of archaeologists have examined the Calico specimens and most believe that they are of natural manufacture--fortuitously chipped pieces picked (or better, selected) from among hundreds of thousands of fractured gravels in the alluvial fan. Thus the status of the Calico materials remains in great doubt. If man was actually in this region at such an early time, much better evidence will have to be found.

Carter (1958) has published a lengthy paper detailing what he believes are very ancient cultural materials in the Reno area. In the mélange of data presented by Carter, he includes a mano of supposed Early Wisconsin I age collected from a gravel pit near Washoe Lake, "core tools" and other artifacts from a so-called "Big Knife" culture present in the area more than 20,000 years ago (Ibid.:189), an assemblage of heavily weathered basalt tools from Galena Creek, and crudely chipped artifacts from the northern part of the Winnemucca sink which he believes are 13,000-17,000 years old (however, it seems most likely that the latter materials are the result of workshop activities). In several of his proposed early lithic complexes, he illustrates stemmed projectile points clearly of much later date, such as Elko Eared specimens from the complex on Winnemucca Lake (Carter 1958:180-182).

Tuohy (1970b) has described lithic materials collected at the Coleman site on Lake Winnemucca. The bulk of the specimens in the collection are attributable to quarry-workshop activities, although there are finished pieces which can be correlated with other known early lithic complexes in the western Basin. However, Tuohy (Ibid.:166) thinks that the site is "a good example of a site belonging to MacNeish's [1971] postulated Blade, Burin, and Leaf-Point Tradition, possibly dating back between 30,000 and 11,000 years ago in North America." While I do not wish to sound critical of Tuohy's excellent technological studies of the Coleman materials, I can find little basis for making such a claim for great antiquity based on far-flung lithic comparisons. To my mind, this harkens back to the time in the late 19th century when quarry and workshop materials in the eastern United States were being attributed to the "Paleolithic" because of their morphological similarities to ancient specimens in Europe.

There have also been a number of reported associations of human cultural remains and the bones of extinct fauna at Great Basin sites. At most of these sites, like Gypsum Cave, Tule Springs, and Fishbone Cave, these associations have been proved spurious (Graham and Heizer 1967; Heizer and Berger 1970; Heizer and Baumhoff 1970). For example, at Tule Springs, investigations in the 1930's suggested an association of lithic artifacts with the bones of camel, horse and bison. Subsequent work by Harrington and Simpson (1961) apparently substantiated the earlier findings. However, interdisciplinary studies directed by Shutler (1967, 1968b) have clearly shown that there is no basis for the extreme antiquity claimed for the site. Haynes, Doberenz and Allen (1966) report that there are cultural manifestations at the site as of ca. 11,000 B.C., but not earlier. The date of ca. 22,000 B.C. earlier reported from Tule Springs (Libby 1955) has been completely discounted; in fact, most of the "charcoal" at the site was probably nothing more than lignitized vegetation residues (Cook 1964). Similarly, the "bone tools" from the site could have resulted from natural processes, such as those described by Brain (1967).

At Etna Cave, in southern Nevada, Wheeler (1942) excavated artifacts which he thought to be of the same time period as Pleistocene (?) horse dung. However, the lithic materials in this supposed association included Gypsum dart points, which we now know to date around 1000 B.C. (Heizer and Baumhoff 1970:3). At one of the Falcon Hill sites on Lake Winnemucca, Shutler (1968a:25) reports the finding of a Shrub Ox (Euceratherium) mandible with cultural materials. Heizer and Baumhoff (op. cit.:3) suggest that this bone could have been carried into the cave by carnivores or pack rats. Harrington (1934) found split horse bones and other extinct fauna at the base of Smith Creek Dave near Baker, Nevada. Although no artifacts were associated, Harrington believed that charcoal found deep in the test pits was an indication of man's presence at this early period. Later work at the site (Bryan 1971) has revealed that Lake Mohave materials are the oldest remains there. At Wilson Butte Cave, just outside the northern fringe of the Great Basin, Gruhn (1961a) discovered a crude biface and other lithic materials in association with horse and camel bones. A radiocarbon date of 12,500 B.C. (M-1409) was obtained on a bone from this early occupation; however, Irwin (1971) has urged caution in the interpretation of this date.

A genuine association of obsidian artifacts and hearths with the bones of horse, camel and several other species may be, but is not certainly, represented at the base of Paisley Five-Mile Point Cave No. 3 (Cressman 1942, 1966; Heizer and Baumhoff 1970). Bedwell (1970:76) notes that an amateur archaeologist has since found horse and camel remains at yet another of the Paisley caves. There are several other sites which have been radiocarbon-dated to the period between 10,000 and 6000 B.C.; these include Danger Cave (Levels I-II), Leonard Rockshelter, Fort Rock Cave, Deer Creek Cave, Hogup Cave, and others. In none of these are extinct fauna represented, and this fact alone would seem to discount the contention of Sears and Roosma (1961:78) and Shutler (1968a:25) that certain Pleistocene mammals survived in sections of the Great Basin to ca. 5000 B.C.

Aside from the claims of extreme antiquity, and the possible association of man and extinct fauna at a few sites, the main evidence we have for "Early Man" in the Great Basin is in the span from ca. 10,000-6000 B.C. In the discussions which follow on regional chronologies, the various early manifestations recognized in local cultural sequences will be considered. However, there are two widespread early traditions which have been defined for the Great Basin, and it seems appropriate to review these here. I will not discuss the Old Cordilleran Culture (Butler 1961) or the Intermontane Western Tradition (Daugherty 1962). The former has been greatly disputed in recent years (Cressman 1966; Grosscup 1966; W. A. Davis 1966), while the latter is so generalized in definition that it is difficult to test its validity (W. A. Davis 1966; Warren 1967).

The Fluted Point Tradition. Fluted projectile points so characteristic of the Llano and Folsom complexes are present in considerable numbers in the Great Basin. Detailed reviews of fluted point distribution in the region have been provided by Tuohy (1965b, 1968; and, Tuohy, in Davis and Shutler 1969) and Davis and Shutler (1969). In the Great Basin, fluted points are often found in apparent association with crescents, gravers, borers, and lanceolate and stemmed projectile points. As pointed out later, these materials constitute the Western Pluvial Lakes Tradition and are usually found along post-Pleistocene lake shores (cf. Davis and Shutler 1969:156; Tadlock 1966:664-665).

There are notable concentrations of fluted points in the southern Nevada area (Shutler and Shutler 1959; Perkins 1967, 1968), in eastern Utah (just outside the Great Basin; see Crouse 1954; Gunnerson 1956a; Hunt and Tanner 1960; Tripp and Wintch 1964; Tripp 1966; Anonymous 1967), in the southwestern Basin (Davis and Shutler 1969), around Washoe Lake in western Nevada (Tuohy 1967a; notes of the author), in northern Nevada, especially in the Black Rock Desert (Clewlow 1968a; Richards 1968; Tuohy 1968b), and near Tonopah in the central Great Basin (Campbell and Campbell 1940; Campbell 1949; Tuohy 1968b).

At one site near Tonopah (Campbell 1949) there were Lake Mohave points on the highest beach of pluvial Lake Tonopah, fluted points on the second beach, Lake Mohave points on the third beach, and Pinto points on the lowest beach (Bryan 1965:151-152). Bryan (Ibid.) also notes the presence of fluted points on the third ancient beach of pluvial Owens Lake in the southwestern Great Basin, with Lake Mohave points again on the highest beach, and more recent point styles found in sand hills near the present lake. Bryan (1965: 152) believes the distribution of these point types suggests a sequence of "Lake Mohave-Fluted-Lake Mohave-Pinto." Tuohy (1968b) reports two other localities near Tonopah (Lowengruhn Beach Ridge and Mud Lake) from which were collected Clovis and Borax Lake fluted points, as well as Lake Mohave, Silver Lake, Midland (?), Hell Gap (?) and later types. It is most difficult to interpret such an assemblage, especially since the Lowengruhn locality covers over 20 square miles. Tuohy (Ibid.:33) also describes the Harvey site in the Carson Sink, at an elevation of 4100 feet a. s. l. Here he collected Clovis, Lake Mohave, Hell Gap (?), Pinto and Elko Eared points; Tuohy notes that the Clovis find spot was almost 300 feet below the maximum level of Lake Lahontan.

A fluted point has been excavated from early contexts in the Fort Rock Valley, Oregon (Bedwell 1970:180-181). This specimen, slightly fluted, came from the top of the gravels at Fort Rock Cave and was associated with a radiocarbon date of 11,250 B.C. (GaK-1738). Irwin (1971:46) cautions against accepting this date at face value, noting that two standard deviations would bring the date "within the general range of the Clovis complex."

Thus, we have some contextual data for fluted points. A number of the specimens have been found in assemblages attributable to the Western Pluvial Lakes Tradition, dated at 9000-6000 B.C. (see below), and a single specimen from the Fort Rock Valley has been dated at ca. 11,000 B.C. However, the bulk of the fluted points have been found on the surface, and it remains for future research to firmly establish both their temporal span and cultural association in the Great Basin. Tuohy (1968b:31) expressed his belief that the presence of large numbers of fluted points in the western Basin indicated a "Paleo-Indian, free roaming, big-game hunting" lifeway. Heizer and Baumhoff (1970:1) characterize Tuohy's assumption as a "statement of faith and not of fact." The fact remains that fluted points have not yet been recovered in the Great Basin in association with megafaunal remains. It is likely that most fluted points in the Great Basin are coeval with similar specimens in the Great Plains, but such typological contemporaneity does not necessarily mean that similar subsistence patterns were being followed in both areas.

<u>Western Pluvial Lakes Tradition</u>. As I have mentioned, most of the presumed early lithic assemblages in the Great Basin are associated with shore lines of the many pluvial lakes. There have been a plethora of designations for this early, lacustrine-adapted tradition, such as "Lake Mohave," "San Dieguito," "Western Lithic Co-Tradition," "Hascomat," and "Fallon Phase." Most recently, however, Bedwell (1970:231) has proposed the appellation "Western Pluvial Lakes Tradition" to refer to "a general way of life directed toward the . . . exploitation of a lake environment." He dates this tradition between 9000 and 6000 B.C., based on data from the Fort Rock Valley. Others, notably Rozaire (1963), Heizer (1966), W. A. Davis (1966), Browman and Munsell (1969), and Heizer and Baumhoff (1970) have also suggested that there was an early lacustrine adaptation in the Great Basin.

The Lake Mohave complex was initially described by Campbell et al. (1937) and has been the subject of much debate since that time. Antevs (in Campbell et al. 1937) dated the complex to ca. 15,000 years ago, although he later revised the figure to ca. 7000 B.C. (Antevs 1952). A radiocarbon date of 7690 B.C. (LJ-200) was later obtained by Warren and DeCosta (1964) on Anodonta shells from beach levels (with Lake Mohave artifacts on the surface) between 925-930 feet. They believe this date is applicable to the temporal problems surrounding the Lake Mohave materials, and cite as further evidence the water-worn nature of the artifacts (Warren and DeCosta 1964:208). Heizer (1965) questioned their findings, first by suggesting that the artifacts were sandblasted, not water-worn (a proposal later verified by E. L. Davis 1967), and noting that the artifacts at Lake Mohave cannot be definitely linked to the C-14 date from the 925-930 foot levels. However, Woodward and Woodward (1966:101) carried out geological research which to them suggested that the Lake Mohave campsites were directly related to a high water period of Lake Mohave dated between 11,500-4500 B.C. Heizer (1965) also pointed out that the Campbells had not conducted systematic recording of artifacts according to elevation when doing their work at Lake Mohave, and thus it was difficult, if not impossible, to link artifacts found by them to specific beach lines. Warren (1970:12) put forth a stout defense of the Campbells' techniques, asserting unequivocally that these "cultures" were found associated with ancient beaches. Late occupation of the area, Warren contended, is associated with springs and mesquite trees, all found at the southern end of the Lake Mohave basin. More recent geological dates from Lake Mohave are provided by Ore and Warren (1971). They describe findings at the Bench Mark Bay site, including four man-made flakes and a "possible artifact" at one-half to one and one-half feet below the surface. A date of 8720 B.C. (Y-2406) obtained on shells is purportedly related to this meagre assemblage.

Warren (1967) has defined the "San Dieguito Complex" (into which he groups Rogers' Playa and San Dieguito I-III complexes, along with the Lake Mohave materials) as a "generalized hunting tradition." He lists the following sites and localities within the complex: C. W. Harris (type site), Lake Mohave, Death Valley I, Panamint Basin, Owens Lake, Tonopah, Mono Lake and Carson Sink. Distinctive traits of the San Dieguito complex include Lake Mohave and Silver Lake points, crescents, and lanceolate bifaces. Irwin-Williams (1968:49) notes that artifacts of the San Dieguito and Lake Mohave complexes "commonly occur near playa edges, and may have been deposited during a period of relatively greater effective moisture."

E. L. Davis (1967), and Davis, Brott and Weide (1969) have proposed the "Western Lithic Co-Tradition" of ca. 7000 B.C. This co-tradition (existing alongside the fluted tradition) is conceived by Davis as an expression of the technological characteristics inherent in the stone-flaking activities of these early peoples (i.e., the San Dieguito complex, and the Lake Mohave "pattern"). Tuohy (1971b:418) believes this co-tradition "lacks solid supportive evidence," and wonders if Davis would have been able to define this entity if she had not had the data from her particular study area, the Panamint Basin.

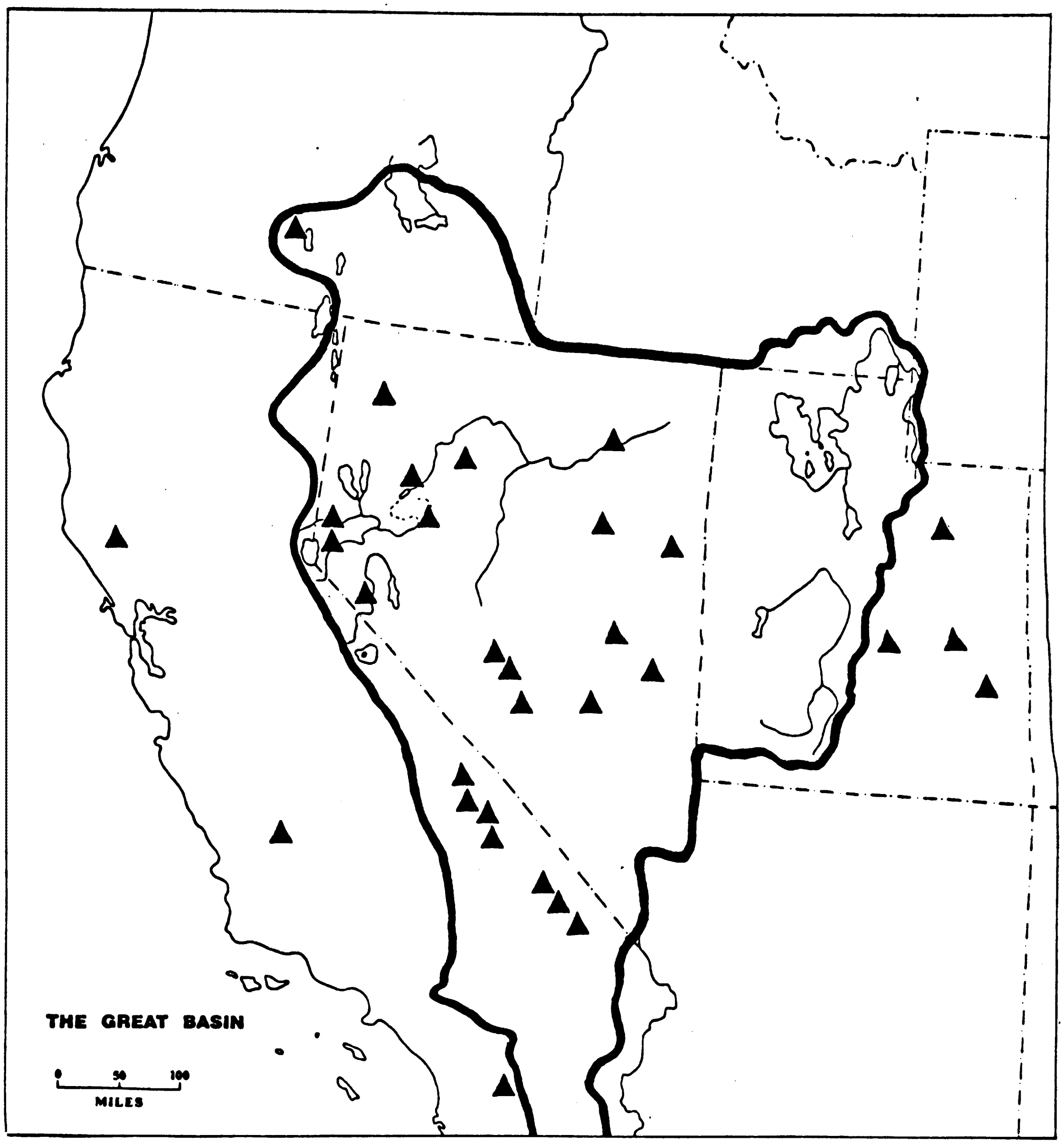


Figure 14. Distribution of Fluted Points in the Great Basin.

Published sources include Crouse (1954); Tuohy (1965b; 1968b), Tuohy (in Davis and Shutler 1969); Davis and Shutler (1969); Tripp (1966); Bedwell (1970).

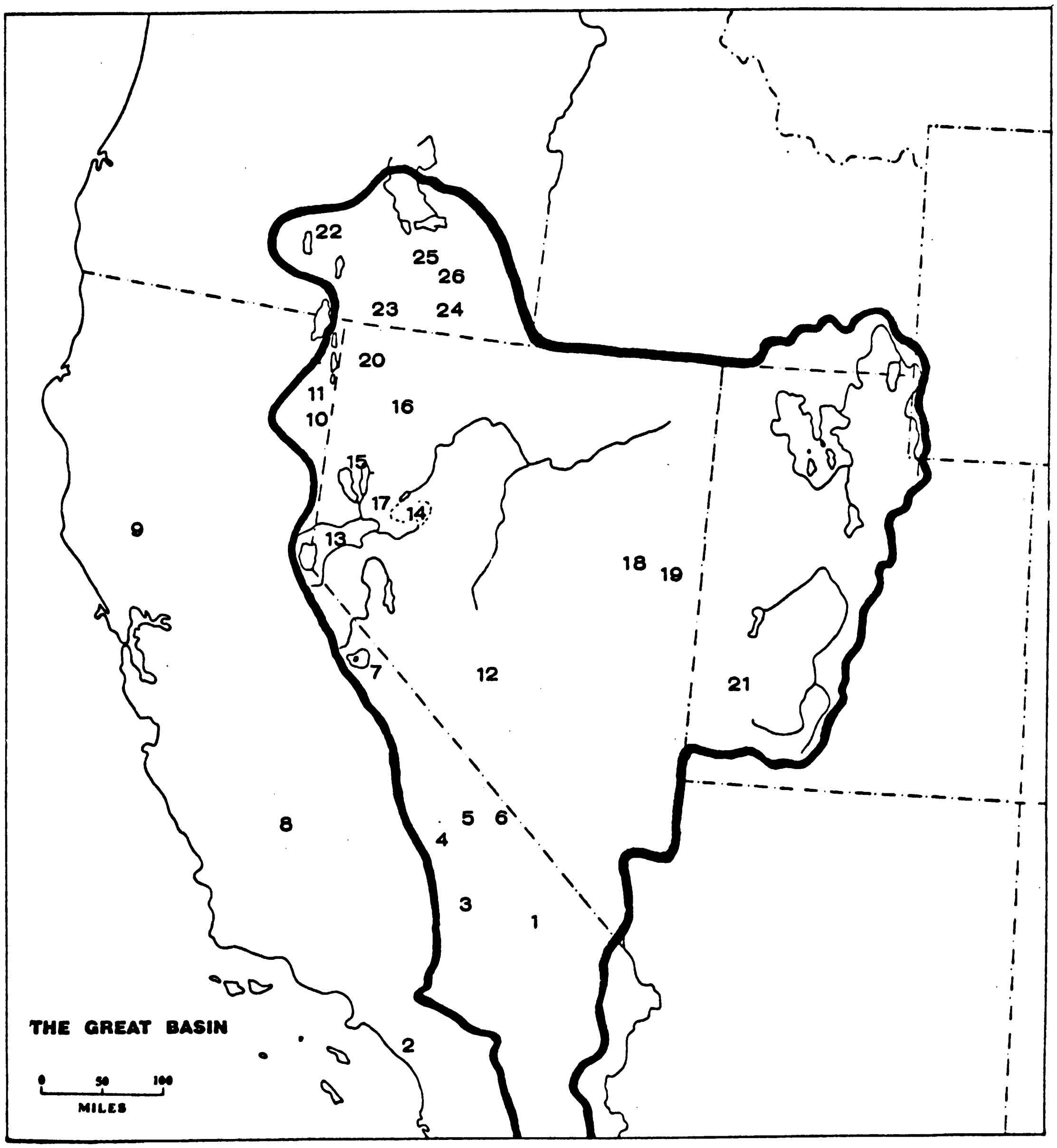
The "Hascomat" complex has been outlined in Warren and Ranere (1968). Included in it are the presumably early materials from Cougar Mountain Cave, the Sadmat site, and the Haskett type locality (Butler 1964, 1967). The major site is Sadmat, on a 3990-foot beach of Lake Lahontan near Hazen, Nevada. Artifacts collected from the site's surface include Haskett and Lake Mohave points and crescents. Other sites of the "Hascomat" are Big Spring (Cressman 1936), Fort Rock Cave, Cougar Mountain Cave, the Connley Caves, and Cougar Mountain Cave No. 2 (Bedwell 1970) in Oregon.

The "Fallon Phase" was defined by Grosscup (1956) based on lithic materials from high beach lines on the edge of Carson Sink. Some of these sites contain large flakes and crude bifaces which some believe to date as early as 40,000 years ago (for example, this claim is made on a display label in the Nevada State Museum, Carson City). However, much of the material is of a more distinct form, including Haskett, Lake Mohave, Silver Lake, and possibly Black Rock Concave Base points (from sites NV Ch 77, NV Ch 61; see Tuohy 1970b). Warren and Ranere (1968) have grouped these sites into their Hascomat complex. The Coleman quarry-workshop (Tuohy 1970b) also has elements which link it with the Fallon Phase, as well as the Hascomat complex and the San Dieguito complex. In fact, the lithic traits for all of these complexes are practically identical, and this is one of the main reasons why I believe that all should be grouped into the Western Pluvial Lakes Tradition.

The Western Pluvial Lakes Tradition can be defined to include lacustrine-oriented sites of the early time span between ca. 9000-6000 B.C. Lithic traits consist of Lake Mohave, Haskett (and "Haskett-like"), Cougar Mountain, and related lanceolate points, lanceolate points with concave bases (cf. Black Rock Concave Base), probably also fluted points, long-stemmed points similar to Lind Coulee, crescents (Great Basin Transverse specimens), and possibly, core-blade and burin technologies. Sites of the Western Pluvial Lakes Tradition cover a wide area, including the San Dieguito component at the C. W. Harris site, Death Valley I, Lake Mohave, Panamint Valley I (E. L. Davis 1967), Escalante Valley, Utah (Keller and Hunt 1967), the Coleman site (Tuohy 1970b), Hathaway Beach, Sadmat and similar Carson Sink sites (Warren and Ranere 1968), the Lake Parman materials of northern Nevada (Layton 1970), the Fort Rock Valley sites (Bedwell 1970), Borax Lake, California (Harrington 1948), sites in the Black Rock Desert (Clewlow 1968a), the Tonopah Lake localities (Tuohy 1968b, 1969b), Washoe Lake (notes of the author), the Dansie site (Tuohy 1968), Big Spring (Cressman 1936), Coyote Flats (Butler 1970), Long Valley and Spring Valley, Nevada (Tadlock 1966), Owens Lake materials (cf. Bryan 1965), and the Witt site in the San Joaquin Valley of California (Riddell and Olsen 1969). Crescents are one of the distinctive traits of the Western Pluvial Lakes Tradition (Tadlock 1966; Browman and Munsell 1969). Their occurrence at the following sites and localities may also indicate the presence of the tradition: Harney Lake, Silver Lake (Oregon), China Lake, the southern San Joaquin Valley, including Buena Vista and Tulare Lakes (cf. Gifford and Schenck 1926: Plate 26), Honey Lake and the Karlo site (all in California) and there is even a crescent from Danger Cave (Tadlock 1966:665).

Figure 15. Sites and Localities of the Western Pluvial Lakes Tradition

1. Lake Mohave
2. C. W. Harris Site
3. China Lake
4. Owens Lake and Rose Valley
5. Panamint Basin
6. Death Valley
7. Mono Lake
8. Southern San Joaquin Valley (including the Witt Site, Tulare Lake, Buena Vista Lake)
9. Borax Lake
10. Honey Lake
11. Karlo Site
12. Tonopah
13. Washoe Lake
14. Carson Sink (Sadmat Site; Hathaway Beach)
15. Coleman Site
16. Black Rock Desert
17. Dansie Site
18. Long Valley
19. Spring Valley
20. Lake Parman
21. Escalante Valley
22. Fort Rock Valley
23. Big Spring
24. Coyote Flat
25. Harney Lake
26. Silver Lake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The Lind Coulee site in Washington also has lithic materials which link it to the Western Pluvial Lakes Tradition (Daugherty 1956). The site has been estimated to date at ca. 7000 B.C. or older (cf. Meighan 1963:79) Radiocarbon dates of 7450 B.C. and 6568 B.C. (both C-827; Libby 1955) are available for the Lind Coulee materials. For some reason, Daugherty feels these dates are too young (Warren 1967:183). However, given all the evidence for this site's close linkage to the Western Pluvial Lakes Tradition, the dates would seem to be perfectly acceptable.

To summarize, there is evidence for a widespread lacustrine-oriented cultural manifestation in the Great Basin between ca. 9000 B.C. and ca. 6000 B.C. I prefer to group the various sites and localities exhibiting lacustrine orientation (as manifested by their location and the traits in their respective lithic assemblages) into the Western Pluvial Lakes Tradition initially defined by Bedwell (1970). This would eliminate the confusing array of other designations, all of which seem to refer to similar early cultural expressions. I think that as research progresses, we shall find that there are localized developments within the Western Pluvial Lakes Tradition, but the data are not now available which would allow us to discern these. I also think that there may have been a separate, co-existing or possibly earlier, "fluted point tradition" influenced by cultural developments in the Great Plains and the American Southwest. However, we do not have enough controlled information to do more than guess about the nature (or even the existence) of this tradition. Certainly there are no data which support the "big-game hunting" hypothesis. Similarly, there may have been an early desert-oriented lifeway, perhaps exemplified by remains from the basal levels of Danger Cave. Again I think the data are insufficient for more than speculation.

THE SOUTHWESTERN GREAT BASIN

The area which I have designated as the southwestern sector of the Great Basin is outlined in Figure 13. In general, it encompasses the deserts of southeastern California and a small portion of adjacent Nevada; Baja California is omitted.

Any student of western prehistory is no doubt aware of the chaotic state of culture definition and sequence which has characterized the southwest Basin (cf. Warren 1967:169-172). It was in this area that some of the first claims of man's great antiquity in the New World were heard, and continue to be heard even at the present. These presumed early manifestations have already been discussed in an earlier section. Much of the early material has been grouped under Warren's San Dieguito complex. The traits, which include Lake Mohave and Silver Lake points, crescents, leaf-shaped points and knives, and a variety of scraping tools, are all apparently linked to an early lacustrine adaptation which is part of the Western Pluvial Lakes Tradition of Bedwell (1970).

I believe that it will lead to less confusion if we examine the various proposed chronological sequences according to the geographic area in which they occur.

Lower Colorado River Valley. Harner (1958) has defined a chronological sequence for the area of the lower Colorado River and the Colorado River desert lying just outside the eastern fringe of the southwestern Great Basin. The earliest of his phases is termed Bouse, and is dated (solely on speculation) between A.D. 800-1000. Harner believes there may be some relationship between the Bouse phase and the Mogollon/Hohokam developments in the Southwestern United States. The succeeding Bouse II phase covers the time span between A.D. 1000-1300. After A.D. 1300 and continuing up to A.D. 1700, there is the Moon Mountain phase, for which several radiocarbon dates are available (see Appendix 1). Harner characterizes the sequence as "Lowland Patayan."

Earlier occupation of this region has been suggested by Rogers (1939). He defined the Malpais Industry, a lithic complex found on the surface of the lowest terrace of the Colorado River. He originally estimated the date of this industry at ca. 2000 B.C. (Rogers 1939:Plate 21), though in later years (see Haury 1950), he equated it with artifacts from a volcanic debris layer at Ventana Cave, Arizona, dated to earlier than 8000 B.C. Further complicating this situation is the fact that Malpais materials may not even be artifacts. This possibility was tested in thermal-fracture experiments by Harner (1955). In certain instances, fire-fracturing did reproduce Malpais-like specimens. However, Harner (Ibid.:42) points out that not all of the characteristics of Malpais pieces could be replicated in this manner. Harner comments that much of the Malpais material is in fact indistinguishable from waste materials in other lithic industries. It is apparent that the Malpais Industry is of no chronological significance (based on the present evidence) in the lower Colorado River area.

Providence and New York Mountains. Several surveys and excavations have been carried out in the Providence and New York mountains on the southeastern fringe of the Mohave Desert (see Figure 16). Davis (1962:45) has defined the "Providence Complex of the Western Upland Patayan" for the Providence Mountains. The complex includes three unnamed phases which correlate with the chronology devised by Harner (1958) for the lowland Patayan. This local "Patayan folk-tradition" appears also to be represented at the Indian Hill rockshelter in the Borrego Desert (Wallace and Taylor 1960). Donnan (1964) presents a slightly different assessment of culture sequence in the area. His earliest phase is termed the "Pre-Yuman Horizon," in which he lumps Tule Springs, Lake Mohave, the Playa complex, Pinto Basin, and Amargosa. This horizon ends around A.D. 700, and is followed by the "Non-Ceramic Yuman Horizon," recognized by Donnan at Rustler's Rockshelter (Davis 1962) and Southcott Cave. The succeeding "Yuman Horizon" begins ca. A.D. 800, characterized by a variety of ceramics. Donnan correlates this unit with Harner's Lowland Patayan sequence, and indicates that it is also equivalent to J. T. Davis' (1962) Providence Complex. The "Yuman Horizon" ceases around A.D. 1400, marked by abrupt population shifts involving considerable numbers of people. This apparently represents the intrusion of southern Paiute from the east; Donnan calls this the "Shoshonean Horizon" (A.D. 1400-1850). Between A.D. 1790-1815, some Desert Mohave groups are said to have occupied part of the region.

True, Davis and Sterud (1966) have published the results of their survey in this area, with particular emphasis on the New York Mountains. The earliest materials found by them include points resembling the Humboldt Concave Base and Silver Lake and Elko types. They note the absence of the Pinto series. The later sites contain ceramics, and Desert Side-Notched and Cottonwood Triangular points; it is suggested (Ibid.:269) that the peoples who occupied these sites were Yuman, rather than Shoshonean. Some of the traits in these late sites seem similar to the Willow Beach phase (Schroeder 1961) on the Arizona side of the Colorado River (True, Davis and Sterud 1966:270).

Death Valley. Prehistoric cultural development in Death Valley (Figure 16) has been outlined in papers by Wallace (1958, 1962) and Hunt (1960). They propose a sequence consisting of four stages, Death Valley I-IV. Death Valley I is believed to be quite early; Hunt attributes to it several sites found on gravel beaches near springs, and from which she has collected artifacts heavily stained with desert varnish. Wallace (1958) relates Death Valley I to the Lake Mohave lithic complex. Neither investigator has advanced a firm temporal span for this stage. Death Valley II, according to Hunt and Wallace, lasted from 3000 B.C. to A.D. 0 (or perhaps as late as A.D. 500). Pinto points dominate the early part of this stage, while in later times, Amargosa complex projectile points are present. In a later paper, Wallace (1962:176) equates Death Valley II with his Period II: Pinto Basin, a unit which he defines for the southern California deserts. Jennings (1964:158) believes that Death Valley I and II should be combined into a single unit; however, I think that both are sufficiently distinct, and warrant continued separation.

Death Valley III and IV both lie within the Christian era. Death Valley III lasts from A.D. 500-1000, during which time the bow and arrow, as well as ceramics, are introduced. A number of cultural traits are shared with Basketmaker II and Pueblo III. Projectile points in Death Valley III appear to be almost exclusively of the Rose Spring series. Death Valley IV is marked by a proliferation of occupation sites, containing arrow points (usually Cottonwood Triangular) and pottery; its time span is estimated at A.D. 1000 to the historic period.

The Death Valley sequence has been correlated by Wallace and Hunt with the Neothermal climatic divisions proposed by Antevs (various). Death Valley I would fall within the Anathermal. There seems to have been an abandonment of the area during the Altithermal (cf. Willey 1966:353), but intensive occupation began again during a moist interval of ca. 3000 B.C. (Death Valley II). The later stages, III and IV, encompass the Medithermal.

The "stone mound" sites in the Death Valley National Monument are believed to date from the close of Death Valley III, and are apparently contemporary with the Nevada Puebloid intrusion (Wallace, Hunt and Redwine 1959).

Owens Valley. Undoubtedly the best chronological data for the southwest Basin (data which also are applicable to other parts of the Great Basin) have been obtained through excavations in the Owens Valley (Figure 16). The historic Paiute occupation of the valley has been defined through excavations of the Cottonwood site (Iny 2) by Harry S. Riddell (1951). Projectile point types included Cottonwood, Desert Side-Notched and Rose Spring. Ceramics were primarily Owens Valley Brown Ware (cf. Steward 1933). However, survey work in the area by H. S. and F. A. Riddell (1956) indicated much earlier occupations, as represented by Silver Lake and Humboldt Concave points, the Pinto and Elko series, and large side-notched points (Northern Side-Notched?). Subsequent excavations were undertaken at the Rose Spring site (Iny 372) by F. A. Riddell, and provided a wealth of chronological data which were analyzed and published by E. P. Lanning (1963). Lanning's analysis helped to ascertain the specific temporal niches of several widespread projectile point forms, thus making them useful as "time markers" elsewhere in the Great Basin. The chronological sequence, as developed by Lanning (1963:281) is shown below (Table 2), and diagnostic projectile point forms are listed.

Radiocarbon dates obtained after the publication of Lanning's paper have provided a better indication of the actual age of some of the phases (Clewlow, Heizer and Berger 1970:Table 2). The middle part of the Rose Spring phase dates around 290 B.C. (UCLA-1093A), while the early part of the phase is dated at ca. 950 B.C. (UCLA-1093B). Dates from pre-Rose Spring phase deposits, and possibly applicable to the Little Lake (Pinto) phase are 1570, 1630 and 1950 B.C. (UCLA-1093C-E).

Another key site in Owens Valley is the Stahl site, excavated by Harrington (1957). The site was dominated by points of the Pinto series, but there were also examples of the Silver Lake, Lake Mohave, and Rose Spring types. All projectile points were contained in deposits no more than 30 inches in depth. On the basis of Harrington's "depth charts," it seems that Pinto Shoulderless and Pinto One-Shoulder points appear earlier than the rest of the variants in the Pinto series. Silver Lake and Lake Mohave points occurred early in the sequence, but in small numbers, and most were seemingly associated with the Pinto series. Harrington (1957:72) estimated the age of the Pinto occupation at 3000-4000 B.C., which with present data, is surely too early. Historic Paiute occupation of the site was indicated by Owens Valley Brown Ware sherds collected from the surface. Adjacent to the site was a tiny cave, dubbed Stahl Site Cave, which contained mixed deposits with Pinto, Gypsum Cave-like, Elko-like, Rose Spring, Cottonwood, and Desert Side-Notched points.

Panamint Basin. Work in this area in Inyo County (Figure 16) has largely been done by E. L. Davis and her associates. A chronological sequence has been developed, the dating of which has been based on several methods, including radiocarbon dating, lake level fluctuations (cf. Hubbs, Bien and Suess 1965), and the rate of soil formation. In her major paper dealing with the area, Davis (1970:Table 11) outlines the following chronological scheme: (1) a hypothetical early stage dated between 10,000 and 40,000 B.P. (see Clements 1956); (2) the Paleo-Indian period, with the Western Lithic Co-Tradition (Davis, Brott and Weide 1969) represented by the occurrence of a Lake Mohave lithic pattern (including crescents), and a Fluting Co-Tradition suggested by the finding of two Clovis-like points. She believes that the Fluting Co-Tradition dates between 6000-8000 B.C., (3) a "Terminal Paleo-Indian" phase of 4000-6000 B.C., the content of which is not known;

Phase		Age	Projectile Point Types
COTTONWOOD	Late	A.D. 1840-1900	Cottonwood Triangular
	Early	A.D. 1300-1840	Cottonwood Triangular
ROSE SPRING	Late	A.D. 500-1300	Cottonwood Triangular, Rose Spring Corner Notched, Eastgate Expanding Stem
	Middle	500 B.C. - A.D. 500	Elko series, Gypsum Cave
	Early	1500 B.C. - 500 B.C.	Elko series, Gypsum Cave, Humboldt Concave Base A
LITTLE LAKE		3000 B.C. - 1500 B.C.	Pinto, Lake Mohave (?)
HYPOTHETICAL	II.	(Lake Mohave, ca. 5000 B.C.)	
	I.	(Lanceolate points, ca. 7000 B.C.)	

Table 2. Chronology at the Rose Spring Site, Southwest Basin. After Lanning (1963), Clewlow, Berger and Heizer (1970).

(4) several poorly understood lithic complexes, beginning around 4000 B.C., including Pinto, Gypsum Cave, and Silver Lake "lithic patterns"; (5) at the beginning of the Christian era, there is a Shoshonean-Yuman tradition, exemplified by what she terms a "Milling Archaic" (with origins as early as 2000 B.C., but continuing to A.D. 1000); (6) subsequently, there is a Shoshonean cultural tradition ("Pottery Archaic") lasting from 1000 B.C. (?) to A.D. 1550; and (7) lastly, there is a Paiute-Shoshonean tradition which she designates as the "Post-Contact Archaic" encompassing the period from A.D. 1550-1900.

There are two geologic radiocarbon dates from the Panamint Basin that are possibly applicable to Lake Mohave and Silver Lake manifestations. These are UCLA-989 and UCLA-990 (Appendix 2), both of which presumably date a late high stand of pluvial Lake Panamint.

Davis' latest two chronological units, the Shoshonean cultural tradition, and the Paiute-Shoshonean tradition are represented by a number of sites. In the Indian Ranch area True, Sterud and Davis (1967) found a number of dune sites characterized by the presence of Desert Side-Notched points.

Meighan (1953) found similarly late materials in his excavation of the Coville Rock Shelter. He believes that this site was occupied for perhaps 300 years, with the last occupation just prior to A.D. 1750 (Ibid.: 189). Evidence from Coville Rock Shelter indicates that Southern Paiute Utility Ware predates Owens Valley Brown Ware in this region, and that there was no pottery in the Panamint Basin prior to A.D. 1700 (cf. Riddell 1951:23-24).

Mohave Desert. So many cultural-chronological sequences have been proposed for the Mohave Desert (Figure 16) that it is difficult to know just where to begin to sort them out. There are a number of claims of extreme antiquity for man's presence in the Mohave region. Simpson (1958, 1960) proposed a Manix Lake Lithic Industry which she placed in excess of 20,000 years of age. However, more recent finds by Simpson (in association with L. S. B. Leakey) have been made in the Calico Hills area. Although there have been claims that these finds date back more than 100,000 years (Leakey, Simpson and Clements 1968), most archaeologists remain unconvinced that the lithic materials found at the site are indeed the result of human manufacture.

Perhaps the best defined "early" occupation in the area is the San Dieguito complex of Warren (1967). Included in it are the Lake Mohave materials reported by Campbell et al. (1967), as well as the Playa and San Dieguito complexes of Rogers (1939, 1966). It is clear from Rogers' illustrations in his 1939 report that the Playa complex contains Lake Mohave and Silver Lake points, as well as crescents, all of which are diagnostic of Warren's broader construct. There has been a controversy of sorts as to the exact definition of the San Dieguito complex, and its relationship to Rogers' earlier, three-phase San Dieguito complex. If the reader dares, he may consult further discussions of the problem in Hayden (1966), Warrn (1967) and Rogers (1966; for a particularly confusing chronological chart relevant to this problem, see Brott, in Rogers 1966).

The San Dieguito Complex probably ended sometime between 6000-7000 B.C. It was followed by a complex which is called "Pinto Basin" by most workers (Wallace 1962), although it was originally termed "Pinto-Gypsum" by Rogers (1939). The first sites to be reported for the complex were in the Pinto Basin area, east of the Little San Bernardino Mountains. These include the type site at Eagle Mountain (Campbell 1934). The characteristic trait of the complex is the Pinto point (although some of the points illustrated by Campbell and Campbell 1935, appear to be of the Silver Lake or related types). Wallace (1962) believes that the Pinto Basin period begins around 3000 B.C.; however, given the currently available radiocarbon dates for the Pinto projectile point type, it is more likely that the beginning date is ca. 2000 B.C., although there is one date from northern Nevada (Layton 1970) which places Pinto-like points at ca. 3350 B.C. (WSU-994).

The Amargosa complex follows, but is so poorly known that its temporal boundaries remain obscured. Estimates of its beginning range for A.D. 0 to A.D. 500 (Rogers 1939; Meighan 1959b; Wallace 1962). Bennyhoff (1958) felt that so little of substance was known that he omitted the complex from his chronological chart.

Rogers (1939) divided the Amargosa complex into two parts, with large corner and side-notched points in the earlier part and smaller points in later times (Phase II). Wallace (1962:176-177) contends that Phase II is the best known. He cites the association of Anasazi sherds with materials of the phase, and believes that it was during this period that the turquoise deposits in the Mohave were heavily exploited. Sites characteristic of Amargosa Phase II are Fossil Falls (Harrington 1952) and Saratoga Springs (Wallace and Taylor 1959).

Sometime after A.D. 1000, it is thought that Yuman and Shoshonean populations entered the Mohave Desert. Rogers (1945) has proposed a sequence for the Yuman occupation (Yuman I-III) which extends into the historic period. Arrow points, especially Desert Side-Notched, were common. Ceramics were of two distinct traditions, manifested by Owens Valley Brown Ware (from the north) and Tizon Brown, a coiled and paddle-anvil thinned ware from the south. Sites of this period are reported by Campbell (1931) and Wallace and Desautels (1960).

In the Troy Lake area, Simpson (1965) has found sites which she links to stages II and III in the Death Valley sequence; Humboldt and Elko series points are present. Also in the Mohave Desert is Newberry Cave, excavated by Smith et al. (1957). Three "cultures" were defined on the basis of the excavations: the earliest was termed "Pinto," followed by "Basketmaker" (with Gypsum Cave points), and finally, the "Mohave River Vanyume" phase, representing post-A.D. 1000 occupations. On reviewing the data for the first two "cultures," I would suspect they can be included in the Pinto Basin complex, while the last one is clearly part of the late Yuman-Shoshonean period.

THE NORTHERN GREAT BASIN

For the purposes of this study, I have arbitrarily defined the northern sector of the Great Basin as that area of southeastern Oregon indicated in Figure 13. This area includes those major sites which are directly related to cultural development in the Great Basin. I have excluded from consideration here the archaeological remains found in the Klamath Lakes region (for a synthesis of the prehistory of that area, see Cressman 1956b). A different interpretation of the boundaries of the northern Great Basin has been offered by Cressman (in Meighan 1955:309).

The early work in southeastern Oregon archaeology by Cressman (1936, 1942, 1943) served to delimit the nature of the cultural remains found there, and clearly established the relationship between this area and other parts of the Great Basin. It was apparent from the initiation of research in this region that there were manifestations of "Early Man" associated with the pluvial lake systems, and much of Cressman's attention was directed to the definition of these. He also recognized a "late Oregon cave culture," which he correlated with "Early and Middle Lovelock" of the western Basin (see Cressman 1943:244).

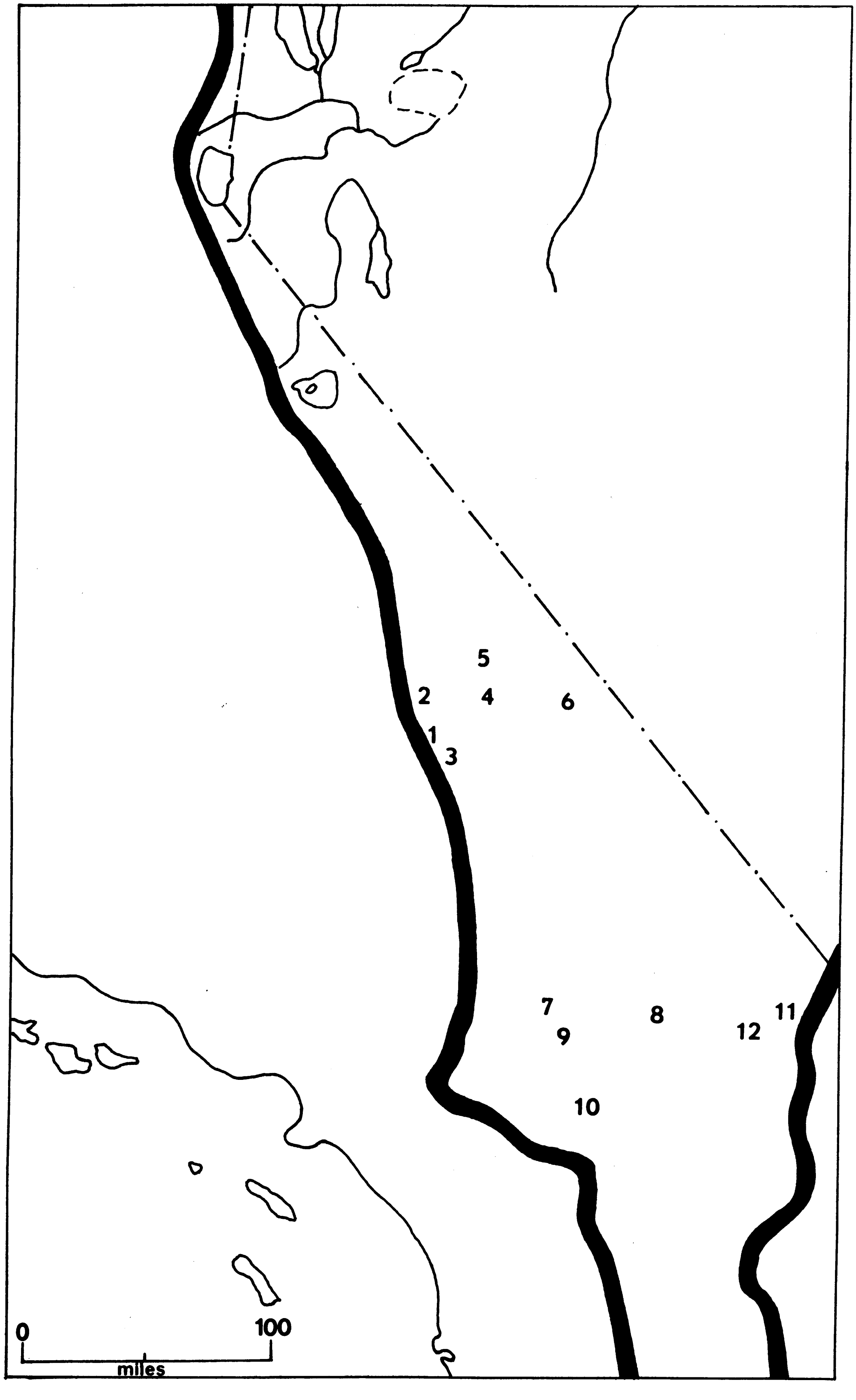
Cressman's first investigations were in the Guano Lake area, between Warner Valley and Catlow Valley (Cressman 1936). He dug a test trench at Guano Lake Cave, but no stratification of the deposits was observed. Unfortunately, the highly stylized projectile point outlines which he published for this site are wholly inadequate for modern typological analysis. He made a surface collection at Guano Lake Beach; photographic illustrations provided in his report (Cressman 1936) indicate the presence of Humboldt series points, along with stemmed and notched specimens reminiscent of the Elko series, and some points similar to the Rose Spring series. At the Desert Lake site, another surface collection also yielded Humboldt and Elko (?) series points. The most significant site reported by Cressman in 1936 is at Big Spring. At this locality (just inside the Nevada border), he collected a variety of early artifactual materials, including Great Basin Transverse specimen (crescents), a fluted point (Clovis?), points similar to the Haskett type, and some long-stemmed points similar to those from the Black Rock Desert which Clewlow (1968a) has called "Lind Coulee ". The assemblage from Big Spring is clearly of Bedwell's (1970) Western Pluvial Lakes Tradition. Later remains at the site included stemmed and side-notched projectile points.

Since the 1940's, there have been excavations at a number of important cave sites, and there have been surveys and surface collections made in other areas:

<u>Catlow Cave No. 1</u> (Cressman 1942). This site is located in the Steen Mountains overlooking Catlow Valley (Figure 18). Cressman noted two distinct cultural levels in the cave deposits. The upper level contained basketry (with sherds near the surface) and is comparable to materials from Lovelock Cave and upper levels at Danger Cave (cf. Goss 1964). Desert Side-Notched points may represent the most recent occupations at the site

Figure 16. Major Archaeological Sites and Localities in the Southwestern Great Basin.

1. Rose Spring
2. Cottonwood Site (Iny 2)
3. Stahl Site (Little Lake)
4. Panamint Basin
5. Coville Rockshelter
6. Death Valley
7. Manix Lake Area
8. Area of Pluvial Lake Mohave
9. Troy Lake
10. Pinto Basin
11. New York Mountains
12. Providence Mountains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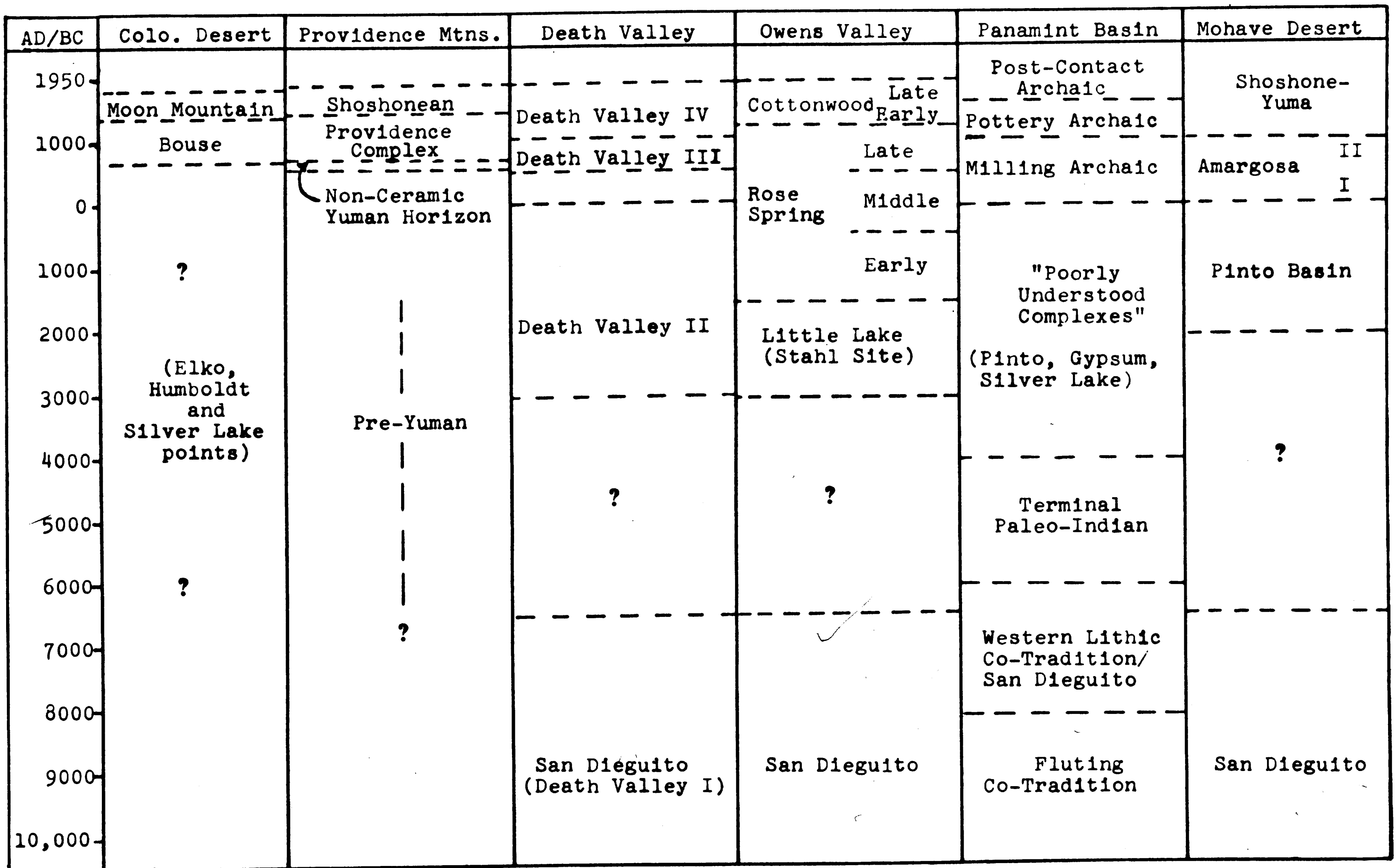

Figure 17. Prehistoric Chronological Sequence in the Southwestern Great Basin.

(Cressman 1942:81; Figure 38, 4). The lower level is without textiles and yielded large triangular notched and unnotched projectile points (including the Elko series ?; cf. Cressman 1942:Figure 38, 7-9). A radiocarbon date of A.D. 991 (C-430) was obtained from the middle of the seven-foot deposits (Heizer 1951b). In gravels at the base of the cave, there were cultural materials in possible association with bones of Pleistocene horse.

Roaring Springs Cave. This site is located on the northeastern side of the Catlow Valley (Steens Mountain area) about 75 miles south of Burns. The site (there are actually two adjacent caves at the site) were investigated in 1938 and the results published by Cressman and Krieger (1940). Systematic excavations were carried out in the northernmost of the two caves, and two distinct "beds" were recognized. The lower bed ("dirt bed") represented the earliest habitation at the site and contained a variety of lithic materials, including scrapers, knives, drills, and large projectile points. The latter are probably specimens of the Northern Side-Notched and Elko series (see Cressman and Krieger 1940:Figure 10). The upper occupational deposits were termed the "straw bed" because of the large quantities of vegetal materials contained in it (grasses, bark and fiber, sticks, sagebrush and so forth). There were a variety of other cultural remains in the upper bed, including projectile points, scrapers, digging sticks, bone awls, and atlatls. The projectile points are probably of the Elko, Rose Spring, Eastgate and Desert Side-Notched series (Cressman and Krieger 1940: Figure 10). The final occupations are marked by the introduction of four "culture traits," a sinew-backed bow, bison-hide moccasins, coiled basketry and wicker basketry (Cressman and Krieger 1940:21).

Paisley Five Mile Point Caves (Cressman 1942, 1966). These sites are on the east rim of Summer Lake (Figure 18). Cave No. 1 has a sterile stratum of Mazama pumice (identified as Newberry by Cressman 1942) separating two occupations. Cave No. 2 is said to be contemporaneous with Cave No. 1. This site has stratified deposits near the front, but is badly mixed at the rear. Cave No. 3 has received most of the attention. It, too, had a layer of Mazama ash, under which was a sterile zone. In strata 6-7, at the base of the deposits, there were obsidian artifacts and hearths associated with camel and horse bones. This presumed early occupation has not been dated directly, although a radiocarbon date of 5669 B.C. (Y-109) was obtained from just below the ash zone.

Fort Rock Valley. There are a number of important archaeological sites in the Fort Rock Valley (Figure 18), although most of the investigations have been centered at Fort Rock Cave (Cressman 1942, 1970; Bedwell 1970; Bedwell and Cressman 1971). The site was initially excavated by Cressman in 1938. He noted a large amount of cultural debris below a layer of Newberry pumice. From beneath this zone, he collected a wealth of perishables, including a sandal later radiocarbon-dated at 7103 B.C. (C-428).

Cressman and Bedwell resumed work at the cave in 1966 and 1967, and at the same time investigated caves and shelters in the Connley Hills, two sites at Table Rock, and the site of Cougar Mountain Cave No. 2 (Bedwell 1970:20 ff). All of these sites are within the Fort Rock Valley, and are in a radius of 20 miles of Fort Rock Cave.

Based on these investigations, Bedwell (1970) and Bedwell and Cressman (1971) have proposed a chronological sequence for the region. The earliest unit is termed Period 4 and dates roughly between 12,000-9000 B.C. Key radiocarbon dates for the period are from Fort Rock Cave (GaK-1738) and from Cougar Mountain Cave No. 2 (GaK-1751). Most of the small array of cultural materials are from the base of Fort Rock Cave, and include a Lake Mohave point and a small fluted point. Cougar Mountain Cave No. 1 (Cowles 1960) probably also contained a component of Period 4, but the site was so poorly excavated that the concrete evidence was lost.

Period 3 (ca. 9000-6000 B.C.) is known most from the Connley caves. Distinctive elements in the cultural assemblage attributed to this period are Haskett-like points, a fluted point resembling those from Borax Lake (Harrington 1948), specimens reminiscent of Clewlow's (1968a) Black Rock Concave Base specimens, and Great Basin Transverse points (crescents). Also reported from this period is a core-blade technology and fine twined basketry. Bedwell links this period to the Western Pluvial Lakes Tradition.

According to Bedwell (1970:193), the greatest changes in the cultural sequence occur in Period 2 (6000-5000 B.C.), represented primarily by Unit 2 of the Connley caves (see Bedwell 1970:Figure 21). Haskett points and other forms continue from Period 3, but there is the introduction of stemmed and corner-notched points resembling the Elko series. This occupational unit was terminated by the Mt. Mazama eruption.

After a 2000-year break in the cultural sequence, a span correlated with the Altithermal (during which Bedwell 1970:216, suggests that the populations left the caves because of a lack of nearby water and took up residence at spring-side sites), occupation is noted again in the Connley caves (Unit I) in Period I (3000-1000 B.C.). The distinctive element of the cultural assemblage of this period is the high frequency (ca. 70%) of corner-notched projectile points, some of which resemble the Elko series.

In his summary of work in the Fort Rock area, Cressman (1942:140) contended that the cave sites were abandoned at the beginning of the Christian era because of the desiccation of the nearby lakes. Bedwell's subsequent research supports Cressman's hypothesis, though it appears that the final abandonment may have come about 1000 years earlier.

Another important site in the Fort Rock Valley is Cougar Mountain Cave (called Cougar Mountain Cave No. 1 by Bedwell 1970). The site was excavated by a relic-collector who subsequently published an illustrated pamphlet on his work (Cowles 1960). The site is a wave-cut cave which contained two feet of deposit overlying a zone of Newberry pumice, and four feet of stratified deposits below the pumice. According to Butler (1966a:303), the site contained "a basal deposit of terrace gravel marking a former stand of the pluvial lake that once occupied Fort Rock Valley." Cowles (1960:50) describes his excavation "techniques":

> "To systematize the digging, I made nine separate cuts while excavating the cave and constantly measured the depths of items as they were uncovered. <u>However, after the first two or three</u>

cuts, I became so familiar with the typical items found at each level that had someone brought an artifact to me I could have told its depth in the cut." (emphasis added)

The earliest remains in the cave date from ca. 6560 B.C. (UCLA-112; radiocarbon date obtained on a sandal from Cowles' "one-foot" level directly above the basal gravels). Using Cowles' illustrations, supplemented by a confusing text, a rough idea of the sequence at the site can be reconstructed. In the lowest level (within one foot of the floor of the cave), Cowles found bipointed lanceolate projectile points (the "Cougar Mountain" type of Layton 1970), some points resembling the Haskett type, and specimens reminiscent of the Angostura and Agate Basin types of the Plains. In "levels" between one and one-half and two and one-half feet from the cave's base were specimens which to me resemble Haskett, Lake Mohave, Silver Lake, and Lind Coulee types. Next in the sequence are triangular points, along with stemmed and side-notched (Northern Side-Notched?) projectile points. Some of these notched and stemmed points (including the Elko series) were found just beneath the pumice mantle. Above the pumice, in the upper two feet of the cave deposits, were more stemmed and notched points, with long-stemmed arrow points near the surface.

Warner Valley. The Warner Valley area of southern Oregon (Figure 18) has been investigated through surface reconnaissance by Weide (1968). Although she was primarily interested in developing information on lacustrine adaptations in this area, she has presented a brief chronological overview. Her chronology is based on diagnostic projectile point types, which she felt was the only way to introduce temporal control in the study of surface collections from the valley. Her "Early" period in the Warner Valley contains Cascade, Bitterroot, Humboldt Concave Base, and Pinto (?) points. The "Middle" period is dominated by the Elko series, while the "Late" period includes points of the Rose Spring, Eastgate, Desert Side-Notched, and Cottonwood series. Weide (1968:22) felt that other types of lithic artifacts could be used as chronological indicators, and attempted to seriate obsidian scrapers in her collections (Ibid.:197). Other obsidian specimens were submitted for obsidian hydration measurement, but results were not available when her study was written. Weide (1968:303) concluded that sites in the Warner Valley were characteristic of lacustrine adaptations between 1500 B.C. and A.D. 500, but notes evidence of occupation in the valley throughout the past 4500 years. However, given the occurrence of Cascade and Bitterroot (cf. Northern Side-Notched) points in her collections, it is highly likely that occupation of the valley began somewhat earlier. O'Connell (1971:329) feels that her point types are the same as those represented in Surprise Valley, and suggests that "the span of occupation is in fact co-terminous, beginning about 7000 B.P., in each valley." Weide (1968) also assumed that the frequency of projectile point types collected from the surface of a site reflected the intensity of the occupation at the site. Such a thesis is untenable (for a similar opinion, see O'Connell 1971:331).

Cressman (1944) reports brief work at Plush Cave, on the east side of Warner Valley. This site had been badly vandalized. Cressman (Ibid.) believed it represented "transitory" occupation. Artifacts included an atlatl and Catlow Twined basketry.

Coyote Flat. Butler (1970) has reported a surface collection of lithic materials from Coyote Flat. The area was a pluvial lake in late glacial times. It lies east of the Steen Mountains and the Alvord Desert (Figure 18). Early projectile points include Folsom, Clovis, and Haskett points, as well as points which he relates to the Alberta and Scottsbluff types. He also describes and illustrates two fluted points which he places within the Humboldt series, a placement which I seriously doubt. There are large numbers of Humboldt and Pinto series points in the Coyote Flat collections. Butler lumps these into a "McKean-Humboldt Concave Base A-Pinto series," a ponderous amalgam of dubious typological value. Other point types in the collection are Elko Eared and Elko Corner-Notched, Northern Side-Notched (also called Bitterroot Side-Notched), and a very few Desert Side-Notched and Cottonwood Triangular points. There are a number of Great Basin Transverse specimens in the collection, although Butler (Ibid.:39) hypothesizes their use as knives, scrapers and gravers rather than transverse projectile tips. He also illustrates a series of seven projectile points which he calls "Parallel and Tapered Stem" points (Butler 1970: Figure 3), but which I find to be identical in shape and size to Lake Mohave points, especially those specimens illustrated by Warren and Ranere 1968: Figures 2, 3) and Warren (1967:Figure 4). Non-projectile point tools in the collection include gravers and perforators, and include the distinctive steep-bitted gravers of the type found in the Black Rock Desert (Clewlow 1968a: Plate 6, h, i; Mudge Collection on deposit in the Archaeological Research Facility, Berkeley).

It is apparent from a review of this collection that a component of the Western Pluvial Lakes Tradition is represented by an assemblage of points and tools which includes fluted points, Haskett points, Alberta-Scottsbluff points, Lake Mohave points and crescents. I suggest that the steep-bitted gravers may also be an element in this assemblage. These materials probably represent a lacustrine adaptation around the now-extinct pluvial lake at Coyote Flat. Occupations between 4000 B.C. and A.D. 0 are represented by Pinto, Humboldt, and Northern Side-Notched, and Elko series points. There may have then been a gap in occupation until late prehistoric times, since Rose Spring and Eastgate series points are absent, but the Desert Side-Notched and Cottonwood types are present.

The northern fringe of the Great Basin. There are several sites along the northern edge of the Great Basin in southern Idaho which are relevant to the problems of the regional chronology. Most important of these is Wilson Butte cave (Gruhn 1961a, 1965). Gruhn has defined five occupations at the site. Wilson Butte I is found near the base of Stratum C, and contains meager cultural remains in apparent association with megafauna. Gruhn (1961a) originally dated this occupation to the beginning of the Anathermal, though later radiocarbon determinations pushed its age back to ca. 12,000 B.C. (M-1409; Gruhn 1965). Possible cut bones are present in a lower deposit (Stratum E) dated to ca. 13,000 B.C., and contains lanceolate points and the remains of modern bison. Wilson Butte III is found in the upper part of Stratum C and dates to 4890 B.C. (M-1087). There are a number of projectile points in this occupation which resemble the Pinto type of the Great Basin. Wilson Butte IV is at the top of Stratum C, and is considered to date from ca. 4500 B.C. Northern Side-Notched points are the distinctive trait.

Wilson Butte V may date between 2000 B.C. and 500 B.C. There are a variety of points, many of which show affinities with the Northwestern Plains. Gruhn (1961a) remarks that there was sparse occupation of the site during the Altithermal. Wilson Butte VI (also known as the Dietrich Phase) is found in Stratum A. There is a radiocarbon date of A.D. 1535 (M-1088) for the top of the stratum, with the middle part thought to date between A.D. 1300 - A.D. 1750. During this occupation, the bow and arrow was introduced, along with ceramics, and shells from the Pacific Coast were brought in through trade. Gruhn (1961a) infers occupation by parties on bison-hunting expeditions. She also sees similarities between this phase and the Dune Springs phase of the Carson Sink area (Grosscup 1956) and Danger Cave level IV.

Jennings (1963:163) has summarized the sequence at Wilson Butte Cave as "an interesting succession of occupations showing, successively, Plano types, strong Basin influences, and finally, historic Plains affiliations." He believes (Ibid.) that Wilson Butte III and IV represent the Desert Culture.

Other Idaho sites which have produced information relevant to Great Basin chronology are: (1) Mecham rockshelter (Gruhn 1960), containing Eastgate-like points and Desert Side-Notched points, as well as type la marine shell beads (Bennyhoff and Heizer 1958:Figure 1, 1); (2) Pence-Duerig Cave (Gruhn 1961b) representing a late prehistoric phase similar to that in the Great Basin; eleven of the points are Desert Side-Notched, and Gruhn (Ibid.) attributes most of the occupation to Shoshoneans; (3) Columbet Creek Rockshelter (Lynch and Olsen 1964), in Owyhee County, in whose lower deposits there are lanceolate, parallel-flaked points, with later types including Pinto and Humboldt Concave Base A; subsequent occupations at the site are marked by an infusion of Columbia Plateau traits, such as Columbia Basal Notched and Wallula Rectangular-Stemmed projectile points.

For additional data on sites along the northern fringes of the Great Basin, see Swanson, Powers and Bryan (1964), Tuohy (1963), and Gruhn (1964). A summary of Idaho chronology appears in Butler (1966b).

THE WESTERN GREAT BASIN

Perhaps the greatest amount of archaeological work in the Great Basin has been carried out in western Nevada and other sections of the Western Great Basin. In Figure 13 is outlined the area which I have termed the western Great Basin. Roughly, it covers the western two-thirds of Nevada, and a narrow strip along the eastern California border. Chronology has been a major concern of investigations in this sector, and there are numerous data to consider.

East-Central Sierra Nevada and Reno Area. This region consists primarily of the territory of the ethnographic Washo (Freed 1966; Price 1963). Two cultural complexes were recognized in this area (particularly the central Sierra Nevada) by Heizer and Elsasser (1953). The earlier of these, named the Martis complex, is characterized by a basalt-working

Figure 18. Major Archaeological Sites and Localities in the Northern Great Basin

1. Fort Rock Cave
2. Connley Caves, Table Rock Caves
3. Cougar Mountain Caves, Nos. 1 and 2
4. Paisley Five-Mile Point Caves, Nos. 1-3
5. Catlow Cave No. 1; Roaring Springs Cave
6. Coyote Flat
7. Guano Valley*
8. Warner Valley

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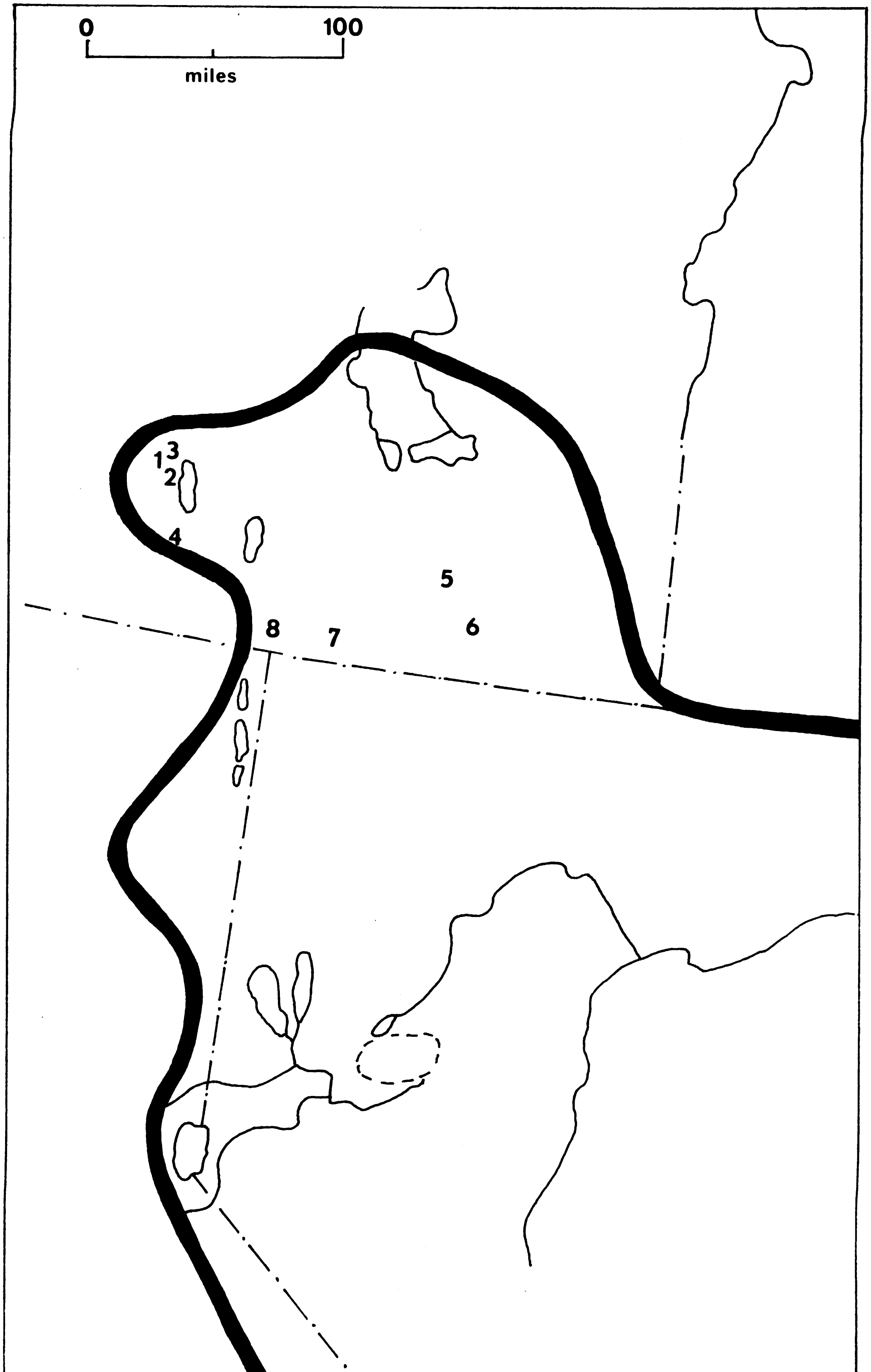
* The Big Spring site (Cressman 1936) is in the southern part of Guano Valley, just below the Nevada boundary.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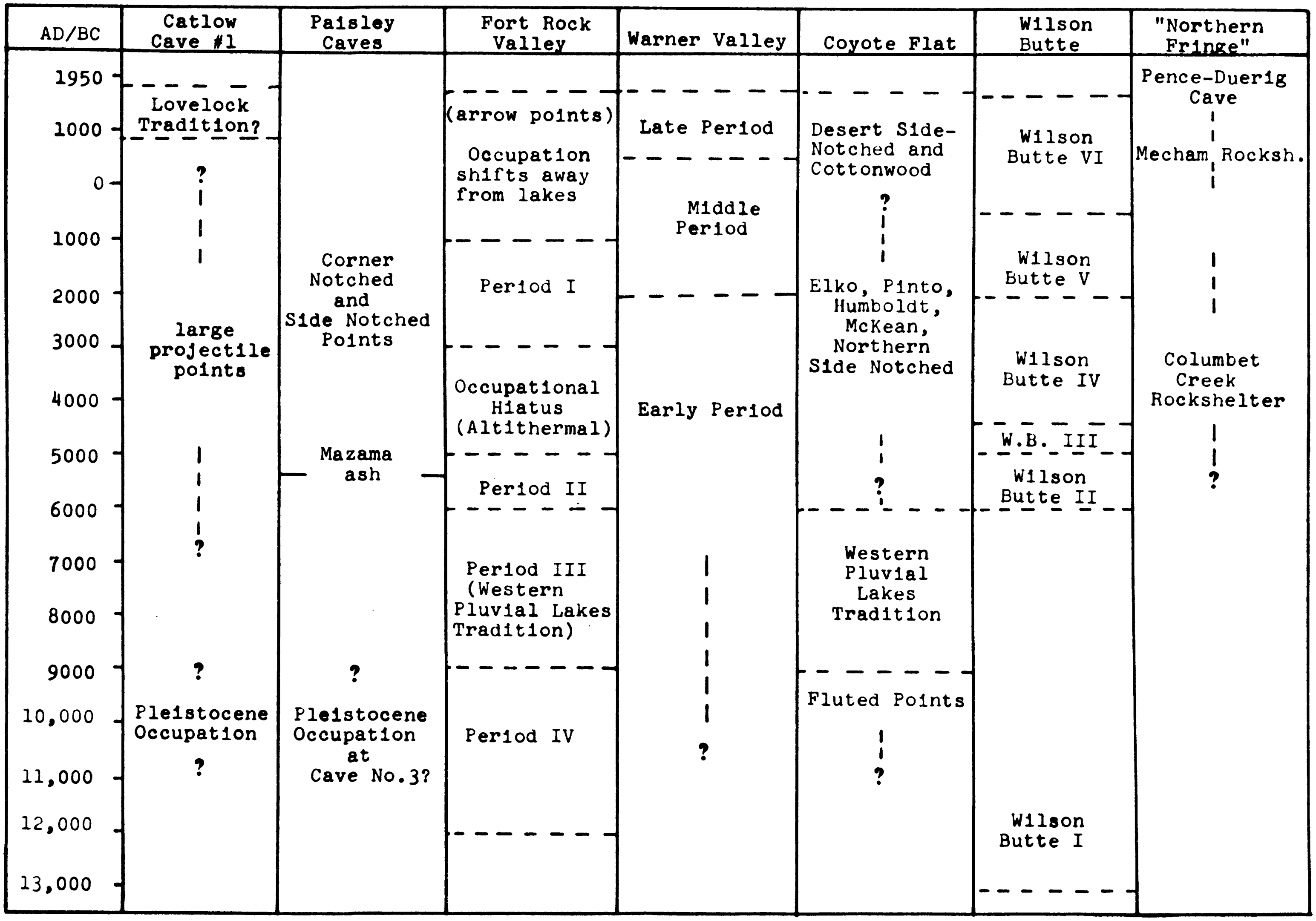


Figure 19. Prehistoric Chronological Sequence in the Northern Great Basin.

industry, dominated by large heavy points with a wide range in form. Sites are located with reference to good hunting and gathering locales. The later complex (the latter stages of which can be identified with the Washo) is called Kings Beach. The stone-flaking technology is based largely on obsidian and flint, and light, side-notched (Desert Side-Notched) arrow points are common. Kings Beach sites are fishing-oriented. Later studies were carried out in this area by Elsasser (1960), and largely confirmed this proposed sequence. However, Elston (1971) has proposed some revisions in the chronology. His excavations at the Spooner Lake and Daphne Creek sites in Douglas County (Figure 20) have indicated that there is an early manifestation represented, which he dates at 5000-1000 B.C. He terms this the "Spooner Complex" and notes that it is "extremely hypothetical" (Ibid.:135). Traits assigned to the Spooner complex are Humboldt Concave Base and Pinto projectile points and the mano and metate. While Elston accepts the existence of the Martin complex, he divides it into two phases. Phase I (1000 B.C. to A.D. 1) marks the first intensive occupation of the central Sierra Nevada. Elko and Martis series projectile points are dominant, and Sierra Stemmed Triangular points also occur. Phase II (dubbed "transitional"), has a span of around 500 years, beginning ca. A.D. 1. The bedrock mortar is introduced for the first time, along with the bow and arrow. Projectile point types include Rose Spring and Eastgate, and the continued use of Sierra Stemmed Triangular points. Elston's data from the Daphne Creek site confirms the presence of the Kings Beach Complex in the area, beginning around A.D. 500 and continuing into the ethnographic present. Eastgate and Rose Spring points were carried over from the second phase of the Martis complex, and in the latter part of this complex, Desert Side-Notched points were introduced. Radiocarbon dates from the site are inconsistent, a problem discussed by Elston (1971:Table 5, 86-89).

Additional excavations and surveys in the Washo area which have revealed evidence of the Martis complex include work at the site of Cave Rock on the east shore of Lake Tahoe (Smith and Elsasser 1962), sites 26 Wa 1027 and 1029 in the Virginia Range (hunting-related sites with Martis projectile points; Matley and Turner 1967), and reconnaissance in the Pine Nut Mountains of Douglas, Ormsby and Lyon counties (Hagerty 1969).

Excavations at Dangberg Hot Springs (26 Do 1) in Douglas County (Figure 20) produced evidence of a sporadic early occupation (marked by Humboldt Concave Base and Pinto points), followed by a more intensive occupation characterized by Elko and Martis series points, and a final period, with Eastgate and Rose Spring points as distinctive traits (Elston 1970; Fowler 1971:503). Charcoal from a feature at the site (related to a Martis complex occupation) has been radiocarbon-dated at 1770 B.C. (GaK-3358).

Elston and Turner (ms.) have carried out an archaeological survey in the Truckee Meadows south of Reno. They recorded numerous sites, with the full range of Western Great Basin point styles, including the Elko, Martis, Eastgate, Rose Spring, Humboldt, and Desert Side-Notched series. Points reminiscent of Lake Mohave were also found (Ibid.:Plate 2). Elston has also carried out excavations at the Steamboat Springs locality (Figure 20) in this same area (Elston and Davis 1972). The Towne site at this locality is a sandy loam midden with mixed Kings Beach and Martis materials. Another site, Thompson, lies 200 feet above the highest level of pluvial Lake Lahontan. Basal sands are capped by Soil I, containing small flakes and a possible biface. Above this, lying on top of Soil II, is a midden six inches thick containing an assemblage of lanceolate points and other lithic material. Overlying the midden is a sandy loam which Elston and Davis (Ibid.) believe is eolian in origin, and on which has developed Soil III. In the lower part of this soil, artifacts identical to those in the underlying midden area were found. This material (and that from the midden) is termed the "Steamboat Component." There is a radiocarbon date of 1530 B.C. (Tx-1391) from the midden and parts of the sandy loam. A Desert Side-Notched point was found near the surface of the site; a radiocarbon date of A.D. 1620 (Tx-1390) is thought to be applicable.

Just to the north of Reno, archaeological investigations have been conducted in the Spanish Springs Canyon area, and at the Black Springs site (Figure 20). Stephenson (1968) and Rusco (1969) reported a series of stone circles at site 26 Wa 1604. Although Rusco (1969:5) believes the site to date from "early Rose Spring period up to protohistoric and historic times," a Pinto series point is also known from the locality (Stephenson 1968:Figure 3). At the Black Springs site, to the northwest of Reno, excavations revealed mixed, shallow deposits (C. Fowler 1969). The upper 40 cm. of deposit contained projectile points of the Pinto, Humboldt, Elko, Rose Spring, Cottonwood and Desert Side-Notched series. Fowler (Ibid.:13) places the site in the "general Great Basin and Martis-Kings Beach sequences."

<u>Mono Lake area</u>. The Mono Lake basin of east-central California (Figure 20) was occupied by Northern Paiutes in ethnographic times (cf. E. L. Davis 1961) and these ties with the Great Basin extend throughout the prehistoric period. Meighan (1955b) was not able to define the cultural position of archaeological materials in the area, and noted "no clear evidence of 'early man'" (Ibid.:17). His illustrations indicate the presence of the following projectile point styles in the area: Pinto, Desert Side-Notched, Elko, Eastgate, Rose Spring, Cottonwood, Humboldt Basal Notched, and possibly Northern Side-Notched. All of these types indicate occupation after 4000 B.C. Beginning in the late 1950's, E. L. Davis carried out several years of investigations in the Mono Lake Basin (E. L. Davis 1959, 1961, 1963, 1964). Although her discussion of cultural chronology in the area is confusing (she places a heavy reliance on comparisons with developments in the southwestern Great Basin), she used projectile point typology to formulate the following sequence (E. L. Davis 1964:271):

A. Generalized Paleolithic, hunting-gathering culture, without stone points; hypothetical.

B. Hunting Tradition I and II; begins with large lanceolate points and then large points with stems or concave bases ("influence from Great Plains").

C. Modified Desert Culture I-IV, with a sequence of large points with elaborate bases, Elko series, smaller, side-notched points, and finally Desert Side-Notched and Cottonwood Series (during IV, the "True Desert Culture").

In Table 7 (E. L. Davis 1964), a "tentative sequence of weapon points from the Sierra Piedmont" is presented. It runs generally from Sandia, Lake Mohave, Folsom and lanceolate styles at the bottom, to Pinto, Humboldt and Elko series near the middle, and Rose Spring, Desert Side-Notched and Cottonwood series points near the end of the sequence. I must warn the reader that this sequence is my own interpretation of Davis' abstruse illustrations (Table 7). The possible presence of Sandia points in the Mono basin is based on a paper by Dixon (1953). In another paper, Davis (1963) mentions the occurrence of Pinto and Gypsum points along old shorelines of Mono Lake, and Pinto, Silver Lake, "Folsom-derived," and Gypsum points at high-altitude sites overlooking the basin. In Figure 7 of Davis (1963), a chart is presented showing possible interrelationships of projectile point designs in the Great Basin.

Other reported sites from the Mono Basin include a child burial near Mono Lake (E. L. Davis 1959; Desert Side-Notched, Pinto-like, and lanceolate, parallel-flaked projectile points are illustrated); Mammoth Creek Cave, in the Sierra Nevada of Mono County, containing a late complex of historic and protohistoric materials (including Desert Side-Notched points and Owens Valley Brown Ware) and an earlier occupation with expanding stem, triangular and Gypsum-like points, none of which are illustrated (Enfield and Enfield 1964); and, two wooden houses near Masonic in Mono County (Tuohy 1968c) attributable to historic Kuzedika Paiute occupation. The houses contained glass trade beads and Desert Side-Notched, Cottonwood Triangular, and Rose Spring Contracting Stem points. Elko and Pinto points were collected in the vicinity.

The Tonopah area. This section of southwest Nevada has already been mentioned in connection with the numerous "Early Man" finds in the area (cf. Campbell 1949; Tuohy 1968b). Later materials are represented in Lowe Cave excavated by Elston and Tuohy in 1970. As of the present, only a brief notice of this work has appeared (D. Fowler 1971:503), indicating that artifacts from "late Desert Archaic and Shoshonean stages" were recovered. It is believed that occupation of the site began around 2000 B.C.

The Humboldt Sink. The scene of the greatest activity in western Great Basin archaeology has been the Humboldt Sink area south of Lovelock (for a lengthy description of this general area, see Napton 1970). The major site is Lovelock Cave (Figure 20), first excavated in 1912 by L. L. Loud (see Heizer and Napton 1970a), and later by Loud and Harrington (1929). The cave was rich in perishable materials, and a stratigraphic section dug by Harrington in 1924 provided a generalized sequence for ordering the remains: Early Lovelock, Transitional Lovelock, and Late Lovelock. Later studies at the site by Heizer (1956) produced two radiocarbon dates from "preoccupation bat guano" deposits at the base of the cave. These dates (2498 B.C. and 4054 B.C.; C-277, 278) provided an indication of the maximum age to be expected of human occupation of the site. A third radiocarbon date, on vegetal material from the earliest occupation level, was ca. 500 B.C. (C-276), a date which has proved to be much too late (cf. Cressman 1956:312). Another evaluation of the Lovelock Cave chronological sequence was published by Grosscup (1960). He assigned Early Lovelock to a period between 2000-1000 B.C., Transitional Lovelock, 1000 B.C. to 1 B.C., and

Late Lovelock, from 1 B.C. to A.D. 900. Later investigations by R. Heizer and L. Napton have cleared up the chronological uncertainties to a large extent. Heizer and Napton (1970a:38 ff) observe that the earliest evidence for human occupation of the site is in the "Old Guano Layer," dated to ca. 2700 B.C. Occupation intensified at the site after 1500 B.C., and Heizer and Napton (Ibid.:40) note that "the fluctuations of human occupation of the cave and lakeside sites probably coincided with the oscillations of Humboldt Lake." The intensive occupations at the site continued until a massive rockfall radiocarbon-dated at ca. A.D. 440 (I-4629). This rockfall (Event IV of Heizer and Napton 1970a) virtually closed the cave portal. Between A.D. 700 and abandonment of the site in the historic era, there was infrequent use of the interior cave, and greater use of outer rockshelters associated with the site. Radiocarbon dates of 300 B.C. (UCLA-1459B) and A.D. 100 (UCLA-1459A) have been obtained on coprolites from one of these rockshelters, the "West Alcove" (Heizer 1969). Occupation probably continued at Lovelock Cave to around A.D. 1829. Grosscup (1960:12) had earlier suggested that the cave was abandoned about A.D. 900, but excavations in the dump in front of the cave (debris thrown out of the cave by guano miners in the early 20th century) revealed Desert Side-Notched and Cottonwood Triangular points all of which appear after A.D. 900 (Clewlow and Napton 1970). Few projectile points were found within the cave, but the following types (in addition to the above) have been recovered from excavations in the dump: Humboldt, Pinto, Rose Spring, Eastgate and Elko (Clewlow 1968b).

A considerable number of radiocarbon dates from Lovelock Cave are reported by Heizer and Napton (1970a:Table 4; see Appendix 1 of this study). The lower levels at the site (between 48 and 66 inches below the surface) date to between 2500-2700 B.C., middle deposits (30 to 48 inches), 2000-2300 B.C., and the upper levels (surface to 30 inches), to A.D. 440 (Heizer and Napton 1970a:Figures 13, 14).

On the shore of Humboldt Lake, below Lovelock Cave, is the large open occupation site known as NV Ch 15 (Humboldt Lakebed Site). Cowan and Clewlow (1968:211) indicate that this site was occupied as early as 2000 B.C. According to Heizer and Clewlow (1968), the following projectile point "time markers" are present: Humboldt, Pinto, Elko, Eastgate, Rose Spring, Cottonwood, Desert Side-Notched, and Martis series, and Gypsum points. Their "Type C" (Ibid.: Figure 1) seems to fall within the Northern Side-Notched type. In addition, they report a lanceolate specimen (Figure 9, b) reminiscent of the Angostura type of the Plains. A radiocarbon date of 733 B.C. (M-649) was obtained on carbonized material recovered with a burial at the site. A storage pit at the site yielded a radiocarbon date of A.D. 1400 (UCLA-1071A). Heizer and Napton (1970a:46) are reluctant to accept the former date (733 B.C.), but state no reason for this reluctance except for the existence of a late date similar to UCLA 1071A (A.D. 1400) from NV Pe 67 in the general vicinity. The earlier date seems to fall well within the occupation indicated by diagnostic point types at the site.

Leonard Rockshelter (Figure 20) was excavated in 1950 by Heizer and a student class from the University of California, Berkeley (Heizer 1951a). This open rockshelter site yielded a long cultural sequence, a sequence upon which most chronological correlations in the Humboldt sink area have since been made. The earliest cultural remains (not represented in the site) were hypothesized to be a complex of basalt core and heavy flake tools from the nearby 3950-foot shoreline of Lake Lahontan. However, further work has not substantiated the hypothesis and it has been discarded. The Humboldt culture of ca. 5000-6000 B.C. was found at the base of the cave deposits in a deep guano layer. A lanceolate biface (somewhat reminiscent of the so-called Cougar Mountain type) was among the artifacts recovered. Radiocarbon dates for this early occupation are 5088 B.C. (C-298) and 6710 B.C. (C-281). A bat guano sample obtained directly above the Pleistocene gravels at the site was radiocarbon-dated to ca. 9250 B.C. (C-599).

In the middle of the Leonard Rockshelter sequence is the Leonard culture, apparently representing occupation of the Humboldt Sink during the Altithermal (there is a radiocarbon date of 3786 B.C. [C-554] from carbonized basketry associated with an infant burial). From the end of the Leonard culture, at ca. 2500 B.C. (?), to the beginning of the Lovelock culture deposits (ca. 500 B.C.?) there is a hiatus in the occupation at the site (see Heizer 1951a:Figure 43).

Another of the major cave sites in the Humboldt sink area is Humboldt Cave (Figure 20; Heizer and Krieger 1956). The site was an occupation and cache cave, from which the excavators obtained a wealth of perishable materials during investigations in 1936. There was no natural stratification in the Humboldt Cave (Ibid.:89), and the chronology of the site was based on comparisons with Lovelock Cave. Occupation began about 3 B.C. (C-587) and lasted throughout Transitional and Late Lovelock times (Heizer 1956:51), and saw use by historic Northern Paiute peoples. Projectile points from the site are primarily of the Eastgate and Rose Spring series (Heizer and Krieger 1956:Plate 14, a-k), although a couple of larger, stemmed points are also present. Basketry types include Lovelock Wicker and Catlow Twined.

One of the major problems at Humboldt Cave and similar cave sites in the Humboldt Sink was the relationship between the late cultural materials and the historic Northern Paiute:

> "Our inability to prove the late archaeological-Northern Paiute equation is due to the fact that a number of late archaeological types are not known to the recent Northern Paiute and, conversely; that some important Northern Paiute culture elements are unrepresented in the upper . . . cave strata" (Heizer and Krieger 1956:87).

Chronological data from other investigated sites in the Humboldt Sink are summarized as follows:

<u>NV Pe 5</u> (open occupation and workshop site). Primarily Elko series points, with Humboldt Concave Base A and Rose Spring Corner-Notched also represented (Elsasser 1958; Cowan and Clewlow 1968).

NV Pe 67 (open occupation site with 10 house pits). Occupation began ca. A.D. 600 and lasted until at least protohistoric times. Projectile point types include Cottonwood, Desert Side-Notched, Rose Spring, Humboldt, and Elko series. Shell beads of the Middle and Late Horizons of central California are present (Cowan and Clewlow 1968).

Granite Point Shelter and Granite Point Cave. The shelter and the cave both contained Lovelock Wicker, and in the cave, a Desert Side-Notched point was found (Roust 1966).

NV Pe 8 (cache cave). This site has been attributed to "Middle Lovelock" by Baumhoff (1958). Lovelock Wicker and Catlow Twined basketry were found, along with a Cottonwood series projectile point (Ibid.:Plate 1, d).

Cocanour Site (open occupation site with two "house" rings). This site is located on the south side of the Humboldt Sink, at an elevation of 4,050 feet (Figure 20). The projectile point assemblage is almost entirely of the Pinto series, and a minimum date for the site of 2000 B.C. is suggested for the site (Stanley, Page and Shutler 1970:17).

The Carson Sink. Just to the south of the Humboldt sink is another valley also once a part of the Lake Lahontan system. The valley contains now-dry Carson Lake, the Stillwater Lakes, and the sink of the Carson River; the whole area is usually referred to as the Carson sink. The archaeology of this area was studied by Grosscup (1956) and Roust and Grosscup (1957). Based on surface survey and excavations at Hidden Cave they developed a culture sequence for the region. The earliest chronological unit is the postulated Fallon Phase, which, as mentioned earlier, is represented primarily by surface artifacts from Hathaway Beach and other high terrace sites (the bulk of these materials, along with those from the Sadmat site in the same area, can now be assigned to the Western Pluvial Lakes Tradition). The following Hidden Phase is assigned to the Anathermal climatic episode, and was defined by Grosscup (1956) on the basis of meagre cultural remains (primarily Humboldt Concave Base A projectile points) from the Mud Flow Gravels at the bottom of Hidden Cave. It is significant to note that these basal deposits contained a sizable amount of fauna, including 15 specimens of mammals and 21 species of birds (Roust and Grosscup 1957). The next unit in the sequence is the Carson Phase, believed to be of Altithermal age (Morrison 1964 presents a discussion of the geological evidence for the Altithermal in this area). At Hidden Cave, the Carson Phase is attributed to the laminated Aeolian Silts, from which two point fragments (probably of the Pinto series) were recovered. There is an ash layer at the base of these silts; Grosscup (1956:59) links the ash-fall to an eruption of Mono Crater. The Lovelock Phase (or culture) is well represented in the Carson Sink. At Hidden Cave, the 32-inch midden contains a variety of perishables (cf. Grosscup 1956:61; Ambro 1966), and is assigned to the "Early Phase" of Lovelock Culture. Projectile points from this midden deposit include the Pinto, Elko, and Gypsum types (Roust and Clewlow 1968). The Surface or Top midden at the site contains the "Later Phase" of Lovelock Culture, with Humboldt Basal Notched, Gypsum, Elko and Pinto projectile points. The latest cultural remains in the Carson Sink come from open occupation sites around the surviving water sources. These occupations have been grouped into the Dune Springs Phase (Desert Side-Notched points are particularly characteristic), and Grosscup (1956:62) links the phase to historic Northern Paiute populations.

Hidden Cave is located in the Grimes Point area of the Carson sink, 15 miles east of Fallon (Figure 20). Grimes Point sites have been badly looted by relic-collectors, although there has been considerable attention given the 26 cave sites by professional archaeologists. Several large petroglyph sites (cf. Nissen 1972) are present, and there are a number of open occupation sites nearby, but these have been stripped of lithic artifacts by local collectors. In the early 1940's, Wheeler and Wheeler (1969) excavated several burials from Fish and Spirit Caves, but no chronological data were obtained. Tuohy (1969a) carried out test excavations at Hanging Rock Cave, in an attempt to date a unique wooden owl effigy found by collectors at the site. Projectile points from Hanging Rock Cave (the deposits of which were badly mixed) included the Elko, Rose Spring and Humboldt series. Tuohy (Ibid.) believes occupancy of the cave was sporadic and discontinuous, and that the bulk of the cultural remains can be assigned to Late Lovelock (a radiocarbon date of A.D. 250 [GaK-2391] was obtained for this period at the site). However, the projectile points are adumbrative of possible Early and Transitional Lovelock components.

Napton (1971) tested eight cave sites in the Grimes Point area, and carried out some fairly extensive excavations at Burnt Cave. However, little cultural material was disclosed by these investigations. Napton observes:

> "these caves were not much used during the prehistoric period. . . . Perhaps the Carson Sink area actually provided a much less suitable habitat for man than might be indicated by the protohistoric and historic occupation of the area" (Napton 1971:6).

However, I believe that there was indeed a substantial occupation of the area in the prehistoric period (cf. Morrison 1964), but that the bulk of habitations were at open lakeshore sites, while the caves were used for caches, burials and occasional temporary occupancy. For example, there are several very large collections of lithic artifacts from these open sites (Churchill County Museum, Fallon; Luke Brothers, Fallon; Nicolarsen Collection, Reno; Jameson Collection, Reno) and they reveal a very wide assortment of projectile point types, including the Humboldt, Elko, Eastgate, Rose Spring, Pinto, Cottonwood and Desert Side-Notched series and at least one Great Basin Transverse specimen (see also Parker 1963).

Morrison (1964:105-106) offers this model for the changing settlement patterns in the Carson sink:

> "The density of occupation seems to have fluctuated with lake levels, being greatest when the lakes were highest and least when they were desiccated, although sparse temporary occupation may have persisted along the Carson River and perennial springs through some of the dry intervals."

Morrison (Ibid.) believes that occupation in the Carson sink reached its "all-time climax" during the time of the second Fallon Lake (within the last 2000 years). Because of the severe depredations of relic-collectors in this region, it is probable that the cultural sequence here will never be clearly defined.

Central Nevada. At least two major archaeological programs have been carried out in central Nevada, one in Grass Valley and the other in the Reese River Valley. No stratified sites or sites with deep deposits have yet been excavated, but some chronological information is available.

Work in the Grass Valley vicinity (Figure 20) has been done by C. Clewlow and R. Ambro. On the basis of site survey (Clewlow and Pastron 1972), and investigations at the Horse Pasture Village (Clewlow, Ambro and Pastron 1972) and at Ridge Valley North (Ambro 1972), a general chronology has been worked out. The earliest phase ("Early Prehistoric") is supposed to date from the Anathermal; projectile points include "large concave-base," Angostura-like, and Humboldt Concave Base A. The "Middle Prehistoric" occurs during the Medithermal, roughly 2500 B.C. to A.D. 1200. Elko, Eastgate, Rose Spring and Humboldt series points are found. The Horse Pasture Village site (Clewlow, Ambro and Pastron 1972) is of this period. The "Late Prehistoric" or "Protohistoric" phase in Grass Valley lasts from A.D. 100 to A.D. 1860, with Shoshone Ware sherds as the most distinctive trait. Other objects probably dating from this period have been published by Magee (1964, 1966, 1967). The "Historic Period" is marked by the introduction of Caucasian trade goods (ca. 1860) and by the acculturation of local Shoshonean peoples, up to 1910-1920 (cf. Ambro 1972).

Investigations in the Reese River Valley (and the adjoining Monitor Valley; Figure 20) have been directed by D. H. Thomas (various). Again, sites with thick deposits have not been found, and the local chronology is based on cross-dating through the use of projectile point "time-markers." The cultural sequence advanced by Thomas (1971a:98) is as follows:

PHASE	PROJECTILE POINTS
Yankee Blade Phase (A.D. 1300-1859)	Desert Side-Notched, Cottonwood Triangular, (also Shoshoni Ware)
Underdown Phase (A.D. 500-1300)	Eastgate-Rose Spring series
Reveille Phase (A.D. 500-1000 B.C.)	Elko series
Devils Gate Phase (1000 B.C.-ca. 3000 B.C.)	Pinto and Humboldt series

Thomas (1971a, 1971d) has presented some interesting data on settlement and exploitative systems in this area. However, temporal control is practically nonexistent and we are thus unable to examine the development of, or changes in, these systems through time. Economic patterns of the local historic Shoshoni populations are examined in these papers, and in Thomas (1971c). In Monitor Valley, Thomas and Thomas (1972) have carried out studies of rock art chronology, discussed earlier. Two major sites are present in the Monitor Valley, Gatecliff Cave and Toquima Cave. At Gatecliff Cave (Thomas 1971e:5), a four-meter cut was made into the deposits. Elko series points were present in the lowest cultural stratum (the base of the deposits was not reached by these excavations). Above this were "artifacts . . . in nearly perfect stratigraphic order" (Ibid.). At the top of the deposits was a component of the Yankee Blade Phase (with Desert Side-Notched points) apparently representing the remains of a communal antelope drive. A series of radiocarbon dates has recently been obtained from Gatecliff and are listed in Appendix 1 (D. Thomas, letter, 1972). The earliest occupations are included in the Reveille Phase (characterized by the presence of Elko points), dating from 1740 B.C. to A.D. 370 (GaK-3618, 3615, 3617, 3609, 3610). A single radiocarbon date of A.D. 950 (GaK-3608) is available from the succeeding Underdown Phase (with Eastgate and Rose Spring points). The final occupations (Yankee Blade Phase) have Desert Side-Notched points and ceramics; four radiocarbon dates indicate a temporal span of A.D. 1200 to A.D. 1480 (GaK-3606, 3607, 3614, 3613).

At Toquima Cave (Thomas 1970b), upper levels contain "projectile points diagnostic of the Shoshoni-speaking peoples . . . and probably date post-A.D. 1300" (Ibid.:8). Intermediate levels at the site were characterized by projectile points (no types given) of the period from ca. A.D. 600 to A.D. 1300, while the basal deposits yielded "projectile points dating 1500 B.C. to A.D. 600" (op. cit.).

Two significant sites have been excavated near Eastgate in the Edwards Creek Valley of west-central Nevada (Figure 20). Wagon Jack Shelter (Heizer and Baumhoff 1961) is an occupation site at which the earliest occupations took place around 980 B.C. (LJ-203). Although there is no clear-cut projectile point sequence at the site, the Elko series is said to be "stratigraphically inferior" to Rose Spring, Eastgate, Desert Side-Notched and Cottonwood Triangular points. Nearby Eastgate Cave was excavated by Elsasser and Prince (1961). The site was probably a cache cave rather than a habitation spot, and there was no evidence that it was used at the same time as Wagon Jack. A pendant of _Haliotis_ type Z2a (Gifford 1947) was found, and can be correlated with the Middle and Late Horizons of central California. A "Fremont" moccasin was also found; similar mocassins are known from Lovelock Cave (Loud and Harrington 1929:Plate 22, e), Etna Cave in Lincoln County, and Owl Cave in White Pine County (both in the eastern Great Basin; Wheeler 1942:30).

Pyramid and Winnemucca Lakes. Pyramid and Winnemucca Lakes (the latter is now dry) are located to the northeast of Reno. The area around Pyramid Lake (Figure 20) is a part of a Northern Paiute reservation, and is generally off-limits for archaeological research. However, R. Shutler and D. Tuohy have worked there in recent years, though no final report of their investigations has yet appeared. Earlier investigations in this vicinity, like those of Harrington at Thea Heye Cave, are also unpublished. Tuohy (1967b) has published a brief note on a large shelter (26 Wa 25) located in a tufa formation on the northeast shore of Pyramid Lake. The site had deposits four to five feet deep, and these were excavated in three-inch levels. Six burials were found, along with 28 cache pits. Most of the cultural material from the cave is said to date from Transitional and Late Lovelock. A historic cache at the site (containing

200 quarts of Mentzelia sp. seeds between burlap bags) had associated with it a large, indented-base projectile point. Tuohy and Stein (1969) excavated a burial (possibly that of a "shaman") at site 26 Wa 1016. There were a variety of grave goods with the burial, especially zoomorphic rock carvings, bone artifacts, shell ornaments, a Haliotis disc bead, and an Elko Eared point. The burial was radiocarbon-dated to A.D. 130 (I-2846), and assigned by Tuohy to Late Lovelock.

An amateur archaeologist, P. Ting (1967), has reported an assemblage of lithic artifacts collected from the 3800-foot elevation around Pyramid Lake. On the basis of distinctive projectile point styles, Tuohy (in Ting 1967:7) has assigned the collections to Early Lovelock. Aside from points, the materials include primarily fishing-related objects, such as stone sinkers, and bone fishhooks and harpoons.

A number of radiocarbon dates have been obtained from sites on Pyramid Lake, but most of these have not been published (D. R. Tuohy, personal communication to R. F. Heizer; see Appendix 1: GaK-2385, 2386, 2388, 2389, 2390, 2804, 2805, 2806, 2808, 2809, 2810, 3361). Catlow Twined basketry excavated at site 26 Wa 528 was dated to A.D. 610 (GaK-2809). Lovelock Wicker basketry was dated at two different sites. At site 26 Wa 315, a date of 1320 B.C. (GaK-2805) was obtained, with a later date of A.D. 120 (GaK-2806) coming from site 26 Wa 385.

The Winnemucca Lake area (Figure 20) has been the scene of intensive activity, both by professionals and relic-collectors, the latter of whom have destroyed innumerable sites along the borders of the lake. Shutler (1968a) carried out an extensive project at the Falcon Hill cave sites situated at the northwest end of the lake (Figure 20). Although a comprehensive report of these investigations has not yet appeared, Shutler (1968a:24) believes the sites represent a "Lakeshore Ecology Phase" beginning as early as 7590 B.C. The Falcon Hill sites have yielded artifacts characteristic of the Lovelock Culture, and Shutler (Ibid.:24-26) contends that there may not be a break between the latter part of his Lakeshore Ecology Phase (Late Lovelock) and historic Northern Paiute occupancy in the area.

Additional data on Falcon Hill can be obtained in Berger, Fergusson and Libby (1965) and in Berger and Libby (1966), both of which report radiocarbon dates from the sites. These papers note that the relative dating of materials at Falcon Hill is difficult because of the mixed Lovelock Culture deposits (mixing results both from cache excavations by the aboriginal inhabitants and from rodent burrowing). Thus, radiocarbon dates have largely been on specific artifacts, such as basketry and matting (cf. Rozaire 1969), a fisherman's kit from 26 Wa 200 (2080 B.C., UCLA-978), and an atlatl shaft with an attached "Bare Creek Eared" (Pinto) point (1880 B.C., GaK-2389). The latest date for the Falcon Hill occupations is A.D. 1560 (UCLA-982).

A quarry-workshop site, Coleman, is located near Falcon Hill (Tuohy 1970b). This site, apparently dating from the Western Pluvial Lakes Tradition of 6000-9000 B.C., has been discussed in a previous section.

P. C. Orr has carried out a number of excavations in Lake Winnemucca caves. In most cases, these sites have never been fully published. The two exceptions (Orr 1952, 1956) are reports on Fishbone and Guano Caves, both of which are useless for comparative purposes. Nevertheless, these two sites are said to have been occupied over a long period, ending perhaps 2000 years ago (Sears and Roosma 1961). At Fishbone Cave, Orr (1956) believed that he had discovered an association of human cultural remains and extinct fauna. However, Sears and Roosma (1961:676) suggest that the horse and camel bones may have been dug up by later Indians from underlying non-human deposits. Orr (1972) claims that a charred human burial from Fishbone Cave dates from the "11,200 level" (9250 B.C.; L-245). Crypt Cave (Orr 1972) had four major occupation levels, but Orr does not discuss them. He does note "mummies" and sickles made of mountain sheep horn (typical of Lovelock Culture). Cowbone Cave (Orr 1972) yielded a desiccated burial wearing a juniper bark robe and a string of Olivella beads, radiocarbon-dated to 4020 B.C. (L-289FF). Chimney Cave is a burial site on Lake Winnemucca from which Orr (see Orr and Berger 1965) excavated a desiccated female burial radiocarbon-dated between 550-460 B.C. (UCLA-689, 690, and 692; an earlier date was obtained previously, see M-437).

Two sites at the south end of Lake Winnemucca have yielded limited chronological information. Tuohy (personal communication) has obtained a radiocarbon date of A.D. 1040 (GaK-3360) on a cache of feathered baskets from site 26 Pe 00. Another cache of feathered, fine-coiled baskets (age unknown) were recovered from Nicolarsen-Jameson Cave in the same vicinity (Figure 20). This site is a small shaft in a tufa stack, used for burials, caches, and intermittent occupation. Deposits in the cave were over 16 feet deep. An atlatl (with an attached "boatstone" weight) was found near the base of the deposits, while a pouch containing Eastgate projectile points was found at a depth of ca. 13 feet. The bulk of the cultural material (now under analysis) appears to be attributable to the Lovelock Culture.

<u>Northern Nevada</u>. In northwestern Nevada, Layton (1968, 1970) has carried out survey and excavation in the High Rock county (Figure 20; see Ragir and Lancaster 1966 for a description of large obsidian workshops in this area). One of the major sites investigated by Layton is Hanging Rock Shelter (26 Wa 1502). The basal deposits in the site are termed the "Yellow Stratum" and are believed to date from sometime before 8000 B.C. and up to ca. 6000 B.C. Overlying this is the "Suborganic Stratum" marking the beginning of intense occupation at the site. Both the "Yellow" and "Suborganic" strata share the same diagnostic projectile point types, including Black Rock Concave Base, "Cougar Mountain," Layton's "Lake Parman" series, Humboldt series, Elko Eared, and "Bare Creek Single-Shoulder" (Pinto). The "Suborganic Stratum" is dated by Layton (Ibid.: 77) at ca. 6000 B.C. to A.D. 0; no stratification was apparent. Obsidian hydration analyses of artifacts from the stratum suggest a period of abandonment equated with the Altithermal maximum. A radiocarbon date obtained from the base of the stratum is 1190 B.C. (GX-1629). However, because of the location of the date (in a thin section of the stratum), and taking into account the vast time span during which the stratum accumulated, it is Layton's opinion (p. 80) that "this date tells us

nothing." In the interface between the "Suborganic Stratum" and the overlying "Organic Stratum" is a unit called the "White Fleck Zone." It contained a Humboldt series point, a point of the Northern Side-Notched type, a considerable number of Pinto points ("Silent Snake" and "Bare Creek" in Layton's typology), and points of the Eastgate, Elko, Rose Spring, Cottonwood and Desert Side-Notched series. This mixed assemblage continues in large part (with the exception of Humboldt and Pinto points) into the "Organic Stratum" which dates from the beginning of the Christian era to ca. A.D. 1920. During this time, there was an abandonment of the site between ca. A.D. 200 and A.D. 1300. Dates for this late occupation are based on correlations of shell ornaments with the central California sequence (cf. Bennyhoff and Heizer 1958), and on cross-dating of the major point types in the stratum, Desert Side-Notched and Cottonwood. Layton (1970:82) believes that the bulk of the remains in the "Organic Stratum" can be linked to the Northern Paiute.

Another site investigated by Layton (1970) is Silent Snake Spring (26 Hu 201). He attributes this site to an occupation occurring during the Altithermal, beginning around 3350 B.C. (WSU-994). Dominant point types are "Silent Snake Bifurcate Stem" (Pinto) and Elko Eared; other points represented at the site are Humboldt, "Bare Creek" (Pinto), Elko Corner-Notched, Northern Side-Notched, Rose Spring Split Stem, and "Willowleaf-shaped." Layton proposes that the following projectile point sequence occurred at the site: Humboldt series, earliest; followed by "Silent Snake" and "Bare Creek (both within the Pinto series); and finally, the Elko Eared type. Layton's obsidian hydration analysis of points from the site supports this postulated sequence. It is apparent, given the presence of Rose Spring points, that the site was occupied well after Altithermal times.

Layton (1970) also made surface collections around the fringes of the ancient Lake Parman shoreline. As discussed earlier, he reports finding evidence of an early lacustrine adaptation (Western Pluvial Lakes Tradition). However, occupation continued around the lake into much later times, as evidenced by the occurrence of certain point styles, particularly the Humboldt series, Northern Side-Notched, Elko Eared, Eastgate series, and Desert Side-Notched.

Last Supper Cave (26 Hu 102) was minimally tested by Layton (1970). Points recovered from the tests included Pinto, Northern Side-Notched, Elko Eared and the Rose Spring, Eastgate and Desert Side-Notched series. However, Layton was primarily interested in surface features indicative of historic Indian utilization of the site. These materials consisted largely of the remains of butchered domestic cattle with which a Desert Side-Notched point was associated.

Layton (1970) made surface collections at the Calico site (26 Hu 202). This locality covered a wide area, and yielded a variety of projectile points, including Black Rock Concave Base, "Cougar Mountain," "Lake Parman" series, Humboldt series, Northern Side-Notched, Elko series and Rose Spring-Eastgate series.

The Smoky Creek Cave site (26 Hu 46; Layton 1966; Thomas 1969) was dominated by Elko series points (46%), Eastgate and Rose Spring points (20%), and contained lesser numbers of Desert Side-Notched, Cottonwood Triangular, Pinto, Humboldt and "Lake Parman" series points. Little Smoky Shelter (26 Wa 1501) is four miles to the northwest. Two test pits were excavated at the site, yielding point styles in frequencies closely duplicating those from Smoky Creek Cave, except for an increase in the numbers of "Lake Parman" series and Cottonwood Triangular points. Layton (1970) also tested Swallow Marsh Shelter (26 Wa 1503), and again the point styles were similar to those from Smoky Creek Cave and Little Smoky Shelter.

On the basis of his extensive research in the High Rock Area, Layton (1970) has developed the chronological sequence presented in Table 3.

Heizer (1942) has reported archaeological materials from Massacre Lake Cave, in Long Valley, just to the north of the High Rock country (Figure 20). Catlow Twined basketry is among the artifacts recovered from the site.

The archaeology of the Black Rock Desert (Figure 20) has been summarized by Clewlow (1968a). Seven major surface sites were located, and two of these (NV Hu 17 and Hu 22) yielded an abundance of lithic artifacts attributable in large part to the Western Pluvial Lakes Tradition. Six separate localities were recorded at Hu 17; early materials include Great Basin Transverse (crescents), Black Rock Concave points, and Clovis and Borax Lake fluted points. Later point styles include Northern Side-Notched, Pinto, Humboldt Concave Base A, Rose Spring and Eastgate series, and Gunther Barbed. The latter type is more common in northern California and Oregon, and is equivalent in time to Desert Side-Notched. At Hu 22, seven distinct localities were collected, and again a number of early projectile point styles were collected. especially forms reminiscent of Lind Coulee, and basal fragments termed "Milnesand-like" (a tenuous classification, as admitted by Clewlow, Ibid.:29). Later point types duplicate those from Hu 17. Projectile point types found at sites Hu 16, Hu 20, Hu 21, Hu 23, and Hu 25 are all indicative of occupation between ca. 4000 B.C. and A.D. 1500. Late prehistoric time markers, such as Desert Side-Notched and Cottonwood points are missing, though Gunther Barbed points do occasionally occur.

Clewlow's (1968a:53) suggestion that man entered the Black Rock Desert after 7700 B.C. may be a bit on the cautious side, given the dates for the Western Pluvial Lakes Tradition which is well-represented in the area.

Lithic materials from another site in the Black Rock Desert are under analysis by the author. The outstanding feature in the collection is the presence of over 80 Great Basin Transverse specimens. A fluted point is also in the collection, along with a variety of later materials including Humboldt Concave Base A and Humboldt Basal Notched, Pinto series, Northern Side-Notched, Rose Spring series, and Desert Side-Notched.

Cowan (1972) has published the results of excavations at the Barrel Springs quarry-workshop site in the Black Rock Desert. Cowan's investigations of buried deposits at the site revealed that it is primarily an Elko component. The occurrence of two points of the Rose Spring-Eastgate series suggests a later occupation, which Cowan (Ibid.:10) believes ended

	PHASE	DATE	SITES
VI.	Last Supper Phase	A.D. 1843-A.D. 1920	1) Last Supper Cave; 2) Hanging Rock Shelter
V.	Hanging Rock Phase	A.D. 1300-A.D. 1843	1) "Organic Stratum" at Hanging Rock; 2) Arrival of Northern Paiute
IV.	Smoky Creek Phase*	1500 B.C.-A.D. 500	1) "Suborganic stratum" at Hanging Rock; 2) Smoky Creek Cave; 3) Little Smoky Shelter; 4) Swallow Marsh Shelter
III.	Silent Snake Phase	4000-1500 B.C.	1) Silent Snake Springs; 2) "Suborganic Stratum" at Hanging Rock?
II.	Calico Phase	6000-5000 B.C.	1) Calico surface site; 2) "Suborganic Stratum" at Hanging Rock Shelter
I.	Parman Phase (Western Pluvial Lakes Tradition)	8000-6000 B.C.	1) Lake Parman sites; 2) "Yellow Stratum" at Hanging Rock Shelter
"Earliest times"		? to ca. 8000 B.C.	Isolated Clovis point finds

Table 3. Chronology in the High Rock Area of Northern Nevada. Based on Layton (1970).

* Introduction of bow and arrow during this phase.

ca. A.D. 700. Desert Side-Notched points were collected at other nearby spring-side sites.

In north-central Nevada, an archaeological reconnaissance has been conducted in Paradise, Eden, Kelley Creek, Evans and Squaw Valleys to the north and northeast of the town of Winnemucca (Figure 20; Stephenson and Wilkinson 1969). A total of 91 sites was recorded. The presence of Humboldt, Elko, Eastgate and Cottonwood series points at these sites suggests an occupation of the area beginning around 4000 B.C. and continuing up to or after ca. A.D. 1500.

Northeastern California. Archaeological investigations in the northeastern California sector of the western Great Basin have produced some very useful chronological data. At Tommy Tucker Cave (Fenenga and Riddell 1949; Riddell 1956b; Riddell 1957) near Honey Lake (Figure 15), cultural remains attributed to a late phase of Lovelock Culture were discovered. Point types are primarily Elko Eared and the Eastgate series, although a hafted Desert Side-Notched specimen was found. The Karlo site (Riddell 1956a, 1960) is assigned to the full time span of Lovelock Culture (ca. 2000 B.C. to A.D. 1200 in Riddell 1956:Figure 14). There is a radiocarbon date of 400 B.C. (LJ-76) for "Transitional Lovelock" deposits at this site (Riddell 1961).

The most useful information on northeastern California chronology comes from Surprise Valley (O'Connell 1971; O'Connell and Hayward 1972). Excavated sites include Rodriguez (O'Connell and Ambro 1967), Menlo Baths, and King's Dog (Figure 20). Through the use of radiocarbon dates from these sites and the occurrence of projectile point "time markers" a chronological scheme has been developed, and is shown in Table 4.

O'Connell and Ericson (ms.) have presented some interesting data concerning early earth lodges at the King's Dog site. These semi-subterranean structures are attributed by them to the "Altithermal" period (roughly 5000-6000 years ago). The structures are represented at the King's Dog site by a series of five superimposed floors. The lowest of these floors (A) was radiocarbon-dated (using bone collagen) to 2050 B.C. (UCLA-1732). Two radiocarbon dates were obtained from the next floor (B), one of 5480 B.C. (GaK-2876; using carbon-stained soil), and the other, 3690 B.C. (UCLA-1770; on bone collagen). A house floor at the site of Menlo Baths was also radiocarbon-dated through the use of bone collagen, yielding an assay of 3300 B.C. (I-4782). O'Connell and Ericson (Ibid.) have discounted UCLA-1732 (2050 B.C.) as "too young," due largely to its stratigraphic position(inferior to GaK-2876 and UCLA 1770). The date (a bone collagen assay) was run on a composite sample comprised of a wide series of animal bones, including rodents. The date for GaK-2876 is also considered doubtful by O'Connell and Ericson since the analyzed organic fraction of floor B soil may include a mixture of subsoils. UCLA-1770 and I-4782 are acceptable, and have been corrected by O'Connell and Ericson (using the Suess [1970] curve) to 4450 B.C. and 4025/4225 B.C., respectively.

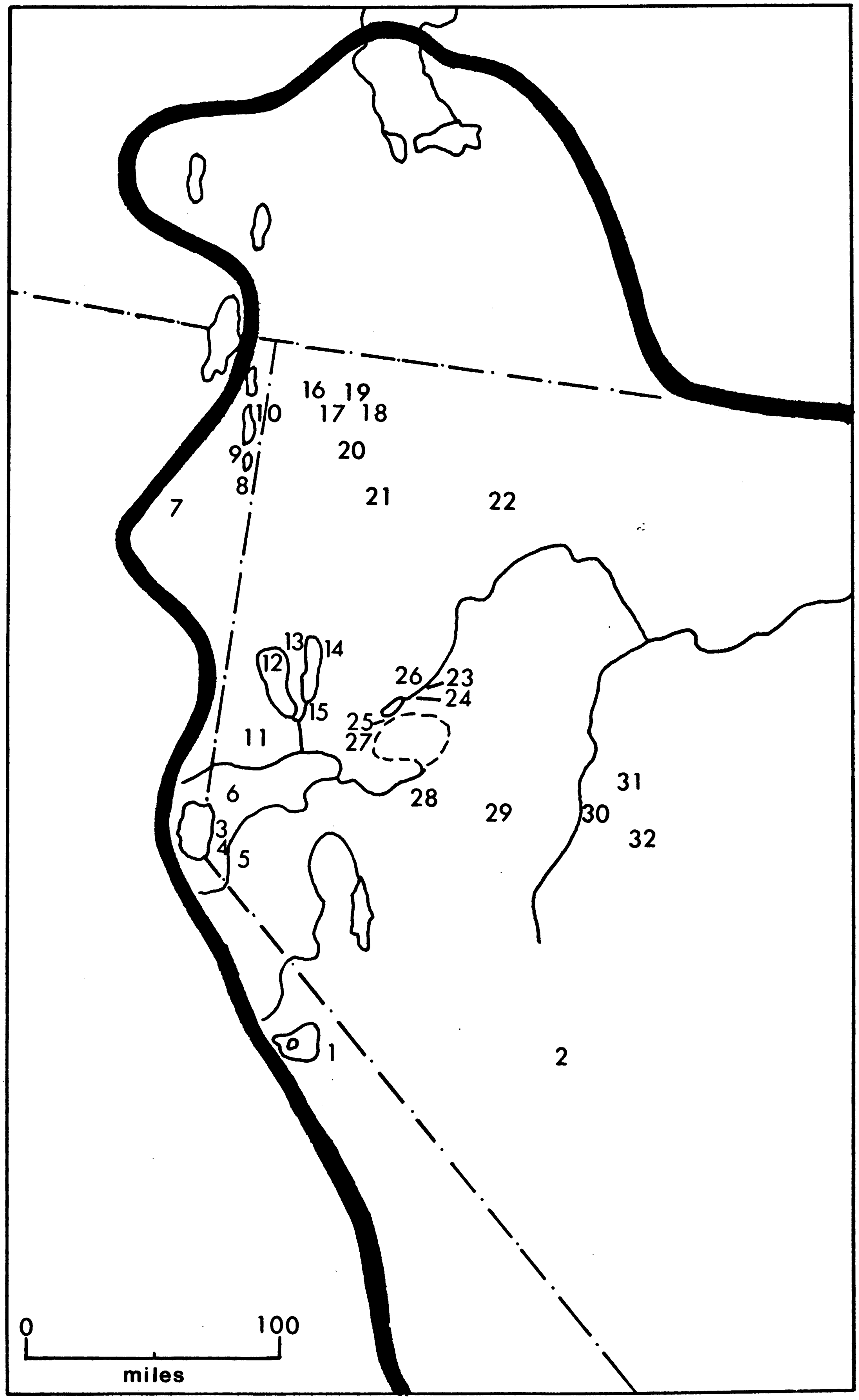
O'Connell and Hayward (1972) have discussed "Altithermal" and "Medithermal" cultural adaptations in Surprise Valley, and have further refined the cultural sequence offered by O'Connell (1971). The chronological data are integrated with information on settlement and subsistence activities.

	PHASE	DATE	POINT STYLES	APPLICABLE C-14 DATES
V.	Bidwell Phase	A.D. 1350-historic times	Desert Side-Notched	
IV.	Alkali Phase	A.D. 600-1350	Rose Spring-Eastgate series; "Surprise Valley" and "Alkali" points; Humboldt Concave Base B	GaK-2580; I-3208
III.	Emerson Phase	900 B.C.-A.D. 600	Elko, Humboldt series (?)	I-3209
II.	Bare Creek Phase	2000-900 B.C.	Pinto ("Bare Creek") series; possibly Humboldt series	UCLA-1222; UCLA-1732
I.	Menlo Phase	4500-2000 B.C.	Northern Side-Notched; large lanceolate bifaces	I-4604; I-4782; GaK-2876; UCLA-1770

Table 4. Chronology of the Surprise Valley, Northeastern California. Based on data from O'Connell (1971), O'Connell and Ericson (ms.), and O'Connell and Hayward (1972).

Figure 20. Major Archaeological Sites and Localities in the Western Great Basin.

1. Mono Lake Area
2. Tonopah Locality
3. Spooner Lake Site
4. Daphne Creek Site
5. NV Do 1 (Dangberg Hot Springs)
6. Steamboat Springs (Thompson Site)
7. Karlo Site
8. Rodriguez Site
9. Menlo Baths Site
10. King's Dog Site
11. Spanish Springs/Black Springs Area
12. Pyramid Lake Locality (numerous sites)
13. Falcon Hill and Coleman Sites
14. Fishbone Cave and other Winnemucca Lake Sites
15. Nicolarsen Cave
16. Massacre Lake Cave
17. Hanging Rock Shelter
18. Lake Parman Area
19. Last Supper Cave
20. Smoky Creek Cave
21. Black Rock Desert
22. Paradise Valley
23. Leonard Rockshelter
24. Lovelock Cave and NV Ch 15
25. Humboldt Cave
26. NV Pe 67 (Hesterlee Site)
27. Cocanour Site
28. Grimes Point Area (includes Hidden Cave, Burnt Cave; Hanging Rock Cave)
29. Eastgate Cave and Wagon Jack Shelter
30. Reese River Locality
31. Grass Valley
32. Monitor Valley



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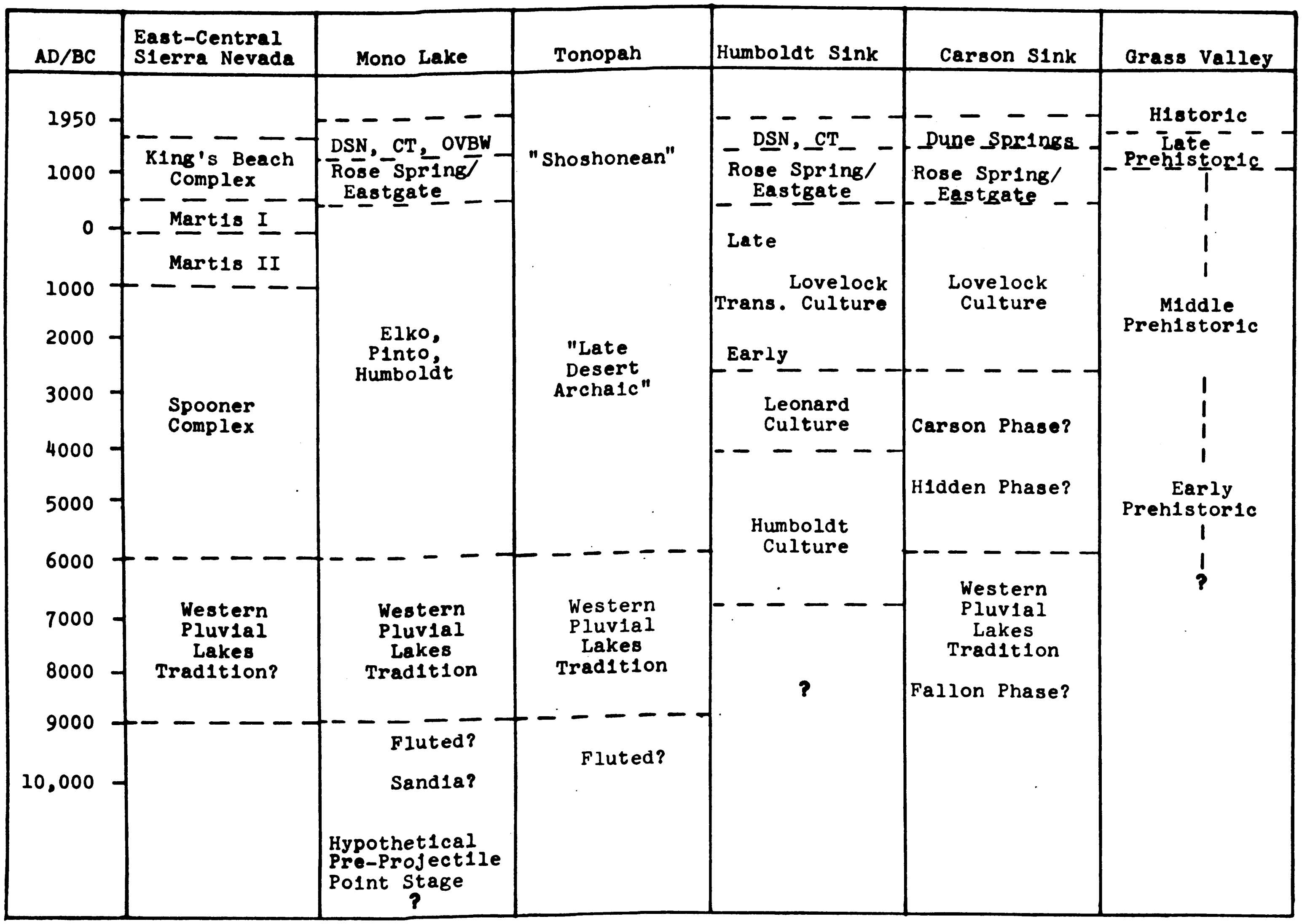


Figure 21. Prehistoric Chronological Sequence in the Western Great Basin: Sheet 1.

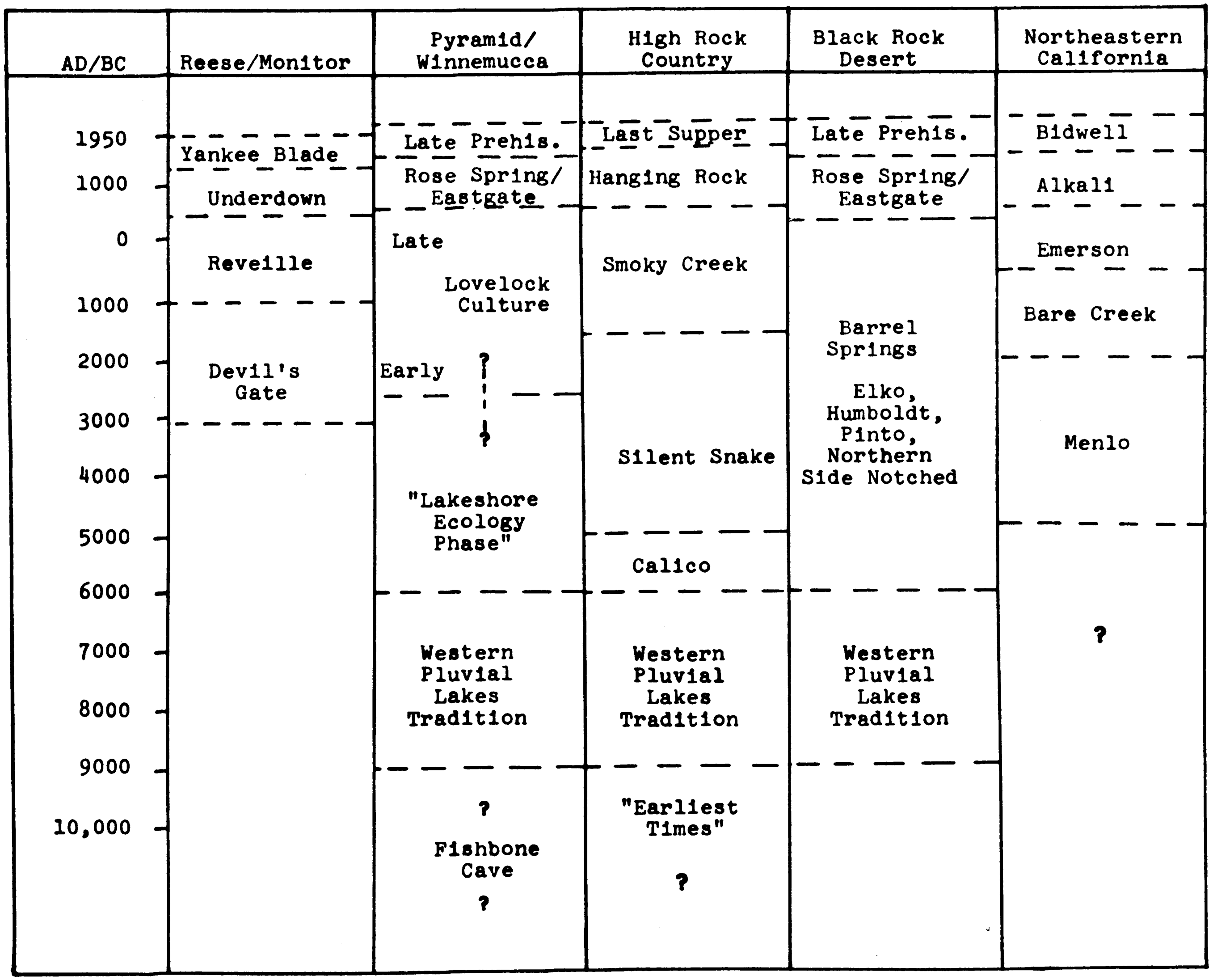


Figure 22. Prehistoric Chronological Sequence in the Western Great Basin: Sheet 2.

THE EASTERN GREAT BASIN

The region which is termed here the eastern Great Basin encompasses the eastern one-third of Nevada (Elko, White Pine, eastern Nye, Lincoln and Clark Counties) and that portion of Utah west of the Wasatch Mountains (see Figure 13). A small area in southeastern Idaho, just to the north of the Great Salt Lake, Utah, is also included.

Although several cave sites, such as Danger Cave, Hogup Cave, and those sites around the Great Salt Lake, have provided long chronological records for this region, much of the archaeological interest has centered on later cultural manifestations characterized by the presence of ceramics and stone architecture. In much of eastern and southern Nevada, there is abundant evidence of an influx of pottery-making horticulturalists (Puebloid or Anasazi) from the American Southwest during the period between A.D. 500/700 to A.D. 1150. The presence of the Puebloid style ceramics and architecture attracted the attention of early workers in the area, and Harrington (1926, 1928) carried out extensive reconnaissance in an effort to trace the so-called "pottery boundary" (for later attempts, see Shutler 1961a; Tuohy 1965b; Fowler 1968a). Based on current data, the maximum extent of the Puebloid intrusion is indicated in Figure 12. As Harrington (1928:240) pointed out, Puebloid materials have been found as far west as the deserts of San Bernardino County, California.

In Utah, and along the Nevada-Utah boundary, additional evidence of another Southwestern incursion was recognized, and has come to be known as the Fremont culture (for early work at Fremont sites, see Judd 1917a, 1917b, 1919). In the eastern Great Basin, investigators have defined the "western" or "Sevier" variant of the Fremont, thought to date between A.D. 500 and A.D. 1400/1600 (Aikens 1966:1). There is an extensive literature on Fremont remains in western Utah (cf. Morss 1931; Gunnerson 1956b, 1960; Steward 1936; Rudy and Stirland 1950; Aikens 1966, 1972; Green 1964). Major sites in the western Fremont area include Garrison (Taylor 1954), Evans' Mound (Alexander and Ruby 1963), the Bear River sites (Pendergast 1961; Aikens 1967), Injun Creek (Aikens 1965), Paragonah (Judd 1917a, 1917b, 1919), Black Rock Cave No. 3 (Enger 1942), Kanosh, and Ephraim (see Aikens 1966). There are numerous radiocarbon determinations from Fremont sites in Utah. These are not given in the present study, but are to be published by J. P. Marwitt and G. Fry in a forthcoming issue of Southwestern Lore. A review of the current status of Fremont culture studies, and an examination of the various hypotheses proposed regarding the origin of this culture, appears in Aiken (1970b:202-204).

For convenience in discussing the chronology of the eastern Great Basin, the region has been subdivided into five sectors: eastern Nevada, southern Nevada, the Great Salt Lake area, western Utah, and southeastern Idaho.

Eastern Nevada. As mentioned above, late prehistoric, ceramic-bearing sites are common in eastern Nevada. However, some data are available on the sequence of earlier, perceramic occupations. Recently, investigations have been resumed in the Smith Creek Canyon area near Baker in White Pine County (Figure 23). It was in this same area that Harrington conducted excavations in the early 1930's. At Smith Creek Cave, Bryan (1972) has discerned three occupations. The earliest is termed a "Lake Mohave period living floor", with an assemblage of small chipped stone tools. In Harrington's (1934) brief test excavation at this site, the remains of Pleistocene horse were collected from the base of the cave deposits. Harrington noted that the horse bones were split, and he attributed the fractures to human agencies. Apparently, Bryan's more recent work has not produced any additional evidence of the association of man and extinct fauna. Following Bryan's "Lake Mohave" occupation, there was a considerable hiatus in occupation of Smith Creek Cave. The next occupation is characterized by the presence of the Rose Spring Corner-Notched projectile points. The last aboriginal use of the site was by Puebloid peoples.

Also in Smith Creek Canyon is Amy's Shelter (Gruhn 1972), containing a complex cultural sequence. The base of the cave contains stream-laid deposits, with occasional flint flakes and bone fragments. The earliest definite human occupation occurs in "Brown IX," alluvial fan deposit. A Lake Mohave point was found in the lower levels of this unit, while in the upper portions, there were two lanceolate points similar to Humboldt Concave Base, along with an assemblage of small obsidian flake tools (cf. Bryan 1972). In the overlying "Brown VIII," Gruhn (1972) found Humboldt series points and a large square-based lanceolate projectile point form. Next in the sequence is an occupation (or perhaps a series of occupations) characterized by Gypsum Cave points (in units "Yellow VII, VI and Brown VI"). Large corner notched projectile points were found in the succeeding "Yellow V" unit, followed by Elko Corner-Notched points and large amounts of cultural debris in "Brown V." Gruhn (Ibid.) notes the presence of smaller corner notched or basal notched and barbed points (the Rose Spring-Eastgate series?) in "Brown V." Puebloid ceramics occur in "Brown II," while the upper 10 cm. of the deposits are attributed to historic aboriginal occupation. Artifacts from this final occupation include a scraper and a graver fashioned from glass.

At nearby Kachina Cave (originally excavated by Harrington 1932), Tuohy (1971a) has discerned at least eleven clearly separated occupations ending with the Historic period. Tuohy believes that the first occupation at Kachina Cave was probably more than two or three thousand years ago, and is marked by the presence of large corner-notched points of the style found in the "Yellow V" unit at Amy's Shelter (Gruhn 1972). Puebloid occupational materials are abundant at the site and include ceramics (Snake Valley Gray Ware) and projectile points typologically similar to the Rose Spring and Eastgate series. The last occupation of Kachina Cave is attributed to Shoshonean groups.

D. Fowler (1968a, 1968b) has directed a program of archaeological survey and excavation in Elko, Eureka and White Pine Counties. Eighty-six sites were recorded; Shoshoni ware was observed at five of the sites, and Puebloid ceramics were collected at several others. Projectile point types recorded by Fowler (1968a) include Desert Side-Notched, Humboldt Concave Base, the Rose Spring and Eastgate series, Cottonwood Triangular, and the Elko series. It is interesting that projectile point forms earlier than the Humboldt series are apparently not represented at sites in this area. However, Tadlock (1966) has found evidence of the Western Pluvial Lakes Tradition in Spring Valley in eastern White Pine County.

The major site excavated by Fowler (1968b) was Newark Cave in White Pine County (Figure 23). Projectile points included the Desert Side-Notched, Eastgate, Rose Spring, Cottonwood, Elko and Humboldt series. These were found in a stratigraphic sequence approximating that postulated by Clewlow (1967) and O'Connell (1967). A number of radiocarbon dates were obtained for the site. The earliest date secured from the site is 3520 B.C. (WSU-511), and is applicable to Humboldt Concave Base points. Another date, 85 B.C. (WSU-538), is linked by Fowler (1968b:30) to Elko series projectile points. A third date at the site, A.D. 1110 (WSU-463), is loosely applied to the Rose Spring, Eastgate, Cottonwood, and Desert Side-Notched series, though as Fowler notes (Ibid.), the date has a substantial range of error (±340 years). The date of A.D. 1110 is also considered by Fowler to indicate an age for the occurrence of Shoshonean ceramics in eastern Nevada.

The data suggest that Newark Cave was occupied seasonally or intermittently from ca. 3500 B.C. to A.D. 1100. Shoshoni ware was collected from the upper levels, probably representing occupations by "western Shoshoni" in historic times (D. Fowler 1968b:30). In addition, a Fremont culture potsherd (Snake Valley Black on Gray) was collected from the top level at the site.

In Elko County in northeastern Nevada, important chronological data have been obtained at several sites. Radiocarbon dates indicate that Deer Creek Cave (Figure 23; Shutler and Shutler 1963) was first occupied around 8000 B.C. (I-1028; I-1029). Subsequent occupations are not clearly defined, due to the mixing of cave deposits and contaminated radiocarbon samples. Projectile points (which did not occur in a clearly defined sequence) from the site are Northern Side-Notched, Humboldt Concave Base, Pinto-like, Elko Eared, Cottonwood Triangular, Desert Side-Notched, and the Eastgate-Rose Spring series. The Desert Side-Notched points were found with Shoshoni ware ceramics in the upper levels. A radiocarbon date of A.D. 500 (WSU-245) for this late occupation is considered aberrant, as there is no other evidence of Shoshoni or Paiute ceramics in the Desert West prior to A.D. 1150 (Shutler and Shutler 1963:52). Deer Creek Cave was used for temporary habitation through protohistoric and early historic times.

Heizer, Baumhoff and Clewlow (1968) have published the archaeology of South Fork Shelter (Figure 23), also in Elko County (see also Ranere 1971: 51-52). The lower midden at the site was dominated by Elko series points. At a depth of about 30 inches below the surface, this series is replaced by Eastgate Expanding Stem and Elko Side-Notched points (this replacement is guess-dated at A.D. 575). Although not clear-cut, Humboldt and Pinto points from South Fork Shelter appear to be stratigraphically inferior to the Elko series (Heizer, Baumhoff and Clewlow 1968:10). Desert Side-Notched and Cottonwood Triangular points were found in the upper levels at the site.

Three radiocarbon dates are available for the South Fork Shelter occupations. The earliest (a sample obtained at a depth of 120 inches) is 2410 B.C. (UCLA-295). However, this date cannot be linked to any diagnostic cultural materials. Somewhat later dates are 2360 B.C. (UCLA-296) at a depth of 94-100 inches, and 1370 B.C. (LJ-212), from a depth of 72 inches. These two dates can be loosely linked with Pinto and Humboldt series points found at this general depth.

At nearby Upper Shelter, Heizer, Baumhoff and Clewlow (Ibid.) found nine projectile points, including specimens of the Elko series, Eastgate Expanding Stem, Pinto Sloping Shoulder and Cottonwood Triangular. It has been inferred that Upper Shelter was used at a date later than the major occupation of South Fork Shelter; the site probably functioned as a cache cave or temporary shelter (Heizer, Baumhoff and Clewlow 1968:34).

A brief notice has been published regarding the excavation of a rock shelter and open campsite in Elko County near the Utah border (Rusco 1971). A maximum depth of 14 inches was reached in the deposits. Elko series points were found in the lower portions of the rock shelter, while "Shoshonean" pottery was collected from the surface of the shelter and the adjacent open camp site.

Southern Nevada. Archaeological research in the southern portion of Nevada has largely focused on two areas of concern: the problem of Early Man occupations, and the nature and extent of the Puebloid intrusion. It was believed that an association of human cultural materials and the remains of the extinct ground sloth had been discovered in excavations at Gypsum Cave (Figure 23; Harrington 1933). Harrington (Ibid.:161ff) defined four occupations at the site: 1. "Sloth Period" (believed by him to date around 8500 B.C.); 2. "Basketmaker"; 3. "Pueblo"; and 4. "Paiute." More recent radiocarbon analyses (Berger and Libby 1967; Heizer and Berger 1970) have shown that the earliest archaeological remains ("Sloth Period") actually date around 450-950 B.C. Jennings (1968) is of the opinion that the material culture from Gypsum Cave aligns it with the lacustrine-oriented sites typical of the Humboldt Sink area.

In the Caliente area, another touted Early Man find was reported from Etna Cave (Figure 23; Wheeler 1942; Roberts 1944). Here, the dung of extinct (?) horse was purportedly found in association with cultural remains. Jennings (1968) accepts this association, noting that Wheeler's excavations were carried out under good control. The dung from Etna Cave has never been radiocarbon-dated, and as stated by Heizer and Baumhoff (1970:3), "nothing in the way of artifacts from Etna Cave suggests that the culture is very old." In fact, in reported association with the horse dung was a Gypsum Cave point. This would indicate, based on the radiocarbon assays of Berger and Libby (1967), that the context in which the dung occurred was probably not earlier than 950 B.C. From a review of Wheeler's (1942) monograph, it would appear that the earliest occupation at Etna Cave was located at 60 to 75 inches below the surface (under Wheeler's "Third Floor"). Associated with this occupation was a lanceolate, concave-base point similar to the Humboldt (or possibly Pinto) series. Next in Wheeler's sequence was an occupation with two Gypsum Cave points (under the "Second Floor"). In the succeeding "Basketmaker II" and "Basketmaker III" layers were seven stemmed points, including specimens of the Gypsum Cave type, Elko Eared (?) and expanding stem points (possibly Elko Corner-Notched). Two complete arrowpoints were found near the surface of the site, and one of these is probably of the Eastgate type (Wheeler 1942:Figure 35, c).

The other cultural remains from Etna Cave include a variety of perishables (sandals, cordage, basketry, woven textiles, wooden artifacts; see Wheeler 1935), a "Fremont" moccasin (Wheeler 1938), and split-twig figurines of a form dated to ca. 1500 B.C. in the Grand Canyon area of Arizona (cf. Euler and Olson 1965).

In the section on Early Man, the site of Tule Springs (Figure 23) was briefly mentioned. The claims of very great antiquity for this site have not been substantiated. However, there does appear to be reliable evidence of human occupation at Tule Springs at the 11,000 B.C. time level (Haynes, Doberenz and Allen 1966; Haynes 1968). Other evidence of Early Man in southern Nevada comes primarily from scattered surface finds. For example, in the Nuclear Test Site area near Las Vegas, Worman (1969) collected fragments of fluted points. Near Tule Springs, Peck (1957) found Lake Mohave and Silver Lake points along now-dry streams and lakebeds on the valley floor.

Preceding the appearance of Puebloid horticulturalists in southern Nevada, there are manifestations of hunter-gatherer occupations of the Desert Archaic tradition. One major surface site is McKinnis on Timber Mountain in southwestern Nye County (Figure 23; Worman 1969). Several discrete areas have been recognized at this site, and collections have been made from each. Pinto series points are very common at McKinnis, and there are other specimens which resemble the Silver Lake type (Townley 1968).

At Stuart Rockshelter (Figure 23; Shutler, Shutler and Griffith 1960) Pinto series points occurred in an "early hunters and gatherers" occupation at the base of the cultural deposits. This occupation (or occupations) is dated at around 2000 B.C. (M-376, M-377). Succeeding occupations at Stuart Rockshelter were by Basketmaker II and III peoples, estimated to date at ca. A.D. 300-700 (Shutler, Shutler and Griffith 1960:14). Puebloid remains were found to overlie the Basketmaker occupations and were guess-dated at A.D. 700-1150. Mixed southern Paiute and Puebloan occupational debris occurred in the top foot of the deposits.

A series of seven radiocarbon dates (Appendix 1) are available from the Corn Creek Dunes sites in Clark County (Figure 23; Williams and Orlins 1963). This open occupation site was surface-collected under controlled conditions and some minor excavations were carried out. The radiocarbon assays from the site are on charcoal collected from both surface and subsurface hearths and the dates range from 2080 to 3250 B.C. Unfortunately, no diagnostic artifacts were found at Corn Creek Dunes, probably due to the earlier zealous activities of local relic-collectors. For some reason, the authors (Ibid.:35) attribute the site to a "Pinto occupation," and Layton (1970:318) describes the site as "late Altithermal."

Other preceramic occupations in southern Nevada have been noted at a site near Boulder Dam (Harrington 1937), and at several sites in the Meadow Valley area near Caliente (D. Fowler 1969). The Conway shelter, five miles south of Caliente (Figure 23), had five meters of deposit with seven distinct cultural levels interleaved between seven strata of sterile alluvium. Elko series points were found at the base of the deposits (in strata 6 and

7), followed by a mixed Fremont occupation (in strata 4 and 5), and then by a Shoshonean occupation (Strata 1) with ceramics and Rose Spring projectile points (D. Fowler, letter to R. F. Heizer, 1971).

The O'Malley shelter (D. Fowler 1970; Madsen 1971) lies 16 miles east of Caliente (Figure 23). Several sequential occupational "units" have been defined. The earliest, Unit I, contains abundant Elko points. Unit II is described as "Desert Archaic," containing both Humboldt and Pinto series points. Fifty Gypsum Cave points, dated to ca. 1790 B.C. (RL-93), were recovered from Unit III. Unit IV yielded Gypsum Cave and Elko points, while in Units V and VI, mixed Fremont, Anasazi, and southern Paiute cultural materials were found (including ceramics and points of the Rose Spring and Eastgate series). Historic Anglo refuse occurred in Unit VII.

Beginning sometime around A.D. 500, there was an intrusion of Puebloid (Anasazi) horticulturalists into southern Nevada. The archaeological manifestations of this influx include architecture and ceramics reminiscent of the Southwestern United States. It is difficult to explain the causes for this intrusion, although Aschmann (1958) believes that fluctuations in rainfall patterns in the Southwest may have contributed to the movement of these horticulturalists into southern Nevada. Many of the Puebloid sites are concentrated in the Virgin and Muddy Rivers area, in Meadow Valley (see D. Fowler 1969 for data on five sites in this region), and in adjacent locales (Shutler and Shutler 1962 report such sites from the Valley of Fire and Red Rock Canyon). However, most of the archaeological emphasis has been on sites in the Moapa Valley, surveyed originally by Harrington (1929). Harrington and others (cf. Amsden 1930) continued to work in the Moapa area for a number of years, focusing their excavations in the area of the "Lost City" or Pueblo Grande de Nevada (Figure 23). Additional reconnaissance and excavation was conducted in southern Nevada in the 1940's and 1950's (Osborne 1941; McGregor 1945; Colton 1945; Schroeder 1953; Shutler 1956). However, the definitive study of the Puebloid manifestations was done by Shutler (1961a). He carried out investigations at the "Lost City" and analyzed the mass of information collected earlier by Harrington. Shutler (Ibid.) defined the "Virgin Branch" within which he recognized a four-phase cultural sequence:

I.	MOAPA PHASE	? - A.D. 500	(Basketmaker II)
II.	MUDDY RIVER PHASE	A.D. 500-700	(Basketmaker III)
III.	LOST CITY PHASE	A.D. 700-1100	
IV.	MESA HOUSE PHASE	A.D. 1100-1150	(Pueblo III)

More recent work, briefly reported by Barre (1970) reviews the broad range of pottery types in southern Nevada and suggests that the Puebloid intrusion began in Basketmaker III times and lasted into the early part of the Pueblo III period, or roughly A.D. 700 to A.D. 1100. This is a somewhat shorter occupational span than that postulated by Shutler (1961a).

There is also some evidence of "Western Fremont" occupations in part of southern Nevada, especially in eastern Lincoln County (Virgin Branch materials are also present here; see D. Fowler 1969:4). A major site is Scott, 22 miles east-northeast of Caliente. It is an open midden adjacent to a spring, and has cultural deposits varying in depth from 25 to 100 cm. A radiocarbon date of A.D. 980 (RL-47) was obtained from 70 cm. below the surface. The artifacts at the Scott site include "Western Fremont" ceramics and projectile points of the Rose Spring and Cottonwood series.

Shutler (1961a:69) believes that southern Paiute peoples entered southern Nevada between A.D. 700 and A.D. 1100. Artifacts attributable to them, primarily brownware ceramics (Southern Paiute Utility Ware) and Desert Side-Notched and triangular arrow points, occur at many sites (for example, Worman 1966, 1969; Tuohy 1965a). The southern Paiute occupation of southern Nevada continued into the Historic era.

Great Salt Lake area. The first substantial attempt to develop a chronological framework for the Great Salt Lake area was by Steward (1937). Major sites investigated by him were Caves No. 1 and No. 2 at Promontory Point and Black Rock Cave (Figure 23). At Cave No. 2 at Promontory Point, the deposits were over six feet deep. A broad, leaf-shaped point was found at the bottom of the cave, about six inches above the basal Bonneville gravels. Pinto-like and other stemmed projectile points were found in the overlying deposits, and Steward (Ibid.:103, 106) correlated the site with "earliest Basketmaker," stating that it was occupied "at least 3000 years ago." Cave No. 1 at Promontory Point contained ceramics and Desert Side-Notched points, and Steward used these materials to define the "Promontory Culture" (now included in the Fremont culture by Aikens 1970b:203, 204).

At Black Rock Cave, on the south shore of the Great Salt Lake, Steward (1937) recognized three separate cultural levels. The oldest was dubbed the "Early Period" (at a depth of 36 to 72 inches) and was characterized by the presence of small dart points. This was followed by the "Black Rock Culture" (with expanded stem dart points fashioned of quartzite), and the subsequent "Promontory Culture."

Later work in the Great Salt Lake area by Malouf (1940, 1944, 1946) provided additional details on the local chronology. Malouf (1944:322) placed Steward's "Early Period" into the "Bonneville Culture," the earliest human occupation in the region. This was followed by Steward's "Black Rock Culture," and by the "Deadman Culture," the latter defined on the basis of excavations at Deadman Cave by Smith (1941). According to Malouf (1944), the "Deadman Culture" was distinguished by the presence of "Yuma-like" and "constructed base" projectile points, while the "Black Rock Culture" contained corner-notched points. "Puebloid," and "Promontory" cultures (both now equated with Fremont), and "Early" and "Recent" Shoshoni completed Malouf's chronological framework.

Cave No. 3 in the Black Rock area was excavated by Enger (1942). He reported that "Shoshoni, Promontory and Puebloid peoples inhabited this cave" (Ibid.:24). Two caves on the Stansbury Island peninsula of the Great Salt Lake were investigated by Jameson (1958). The cultural materials found there were fitted into Malouf's (1944) sequence, although Jameson recognized considerable overlap between the Black Rock and Deadman complexes.

Subsequent work at Sandwich Shelter, on the west side of Stansbury Island (Figure 23), has been done by Marwitt, Fry, and Adovasio (1971). A hearth on the shelter floor was radiocarbon-dated to 5090 B.C. (RL-55). Points of the Pinto, Eastgate, Rose Spring, Cottonwood and Desert Side-Notched series were recovered at the site, and an Elko Eared point was found imbedded in a human vertebra. The top layer at Sandwich Shelter is attributed to a Fremont occupation dated through associated ceramics to ca. A.D. 900 to A.D. 1300.

A revision of the Deadman Cave data published by Smith (1952) provided more information on Great Salt Lake archaeological chronology. Smith defines the following complexes: (1) "Generalized Bonneville Cultural Complex," beginning after 8000 B.C. and surviving in some areas into the Christian era (this preceramic tradition approximates the Desert Culture concept of Jennings); (2) the "Deadman Complex," lasting from 1000 B.C. to A.D. 900; (3) the "Puebloid Complex," spanning the period from A.D. 900 to A.D. 1300; (4) the "Promontory Complex," beginning around A.D. 1200 and surviving into the historic period; and, (5) the "General Shoshonean Complex," starting after A.D. 1300.

The earliest projectile points found at Deadman Cave are stemmed or side-notched (some resemble the Elko series). Points probably of the Humboldt series occur in similar frequencies in levels 2 to 4 at the site, along with expanded stem points characteristic of Steward's (1937) "Black Rock Culture." A good example of a Gypsum Cave dart point is illustrated by Smith (1952: Figure 5, D-3). Upper levels at the site produced Desert Side-Notched points and several specimens reminiscent of the Rose Spring series.

Several major sites of the Western Fremont have been investigated on the eastern side of the Great Salt Lake. These include the Bear River sites (Pendergast 1961; Aikens 1967) and the Injun Creek sites (Aikens 1965).

Western Utah. A number of archaeological investigations have been conducted in the western part of Utah. These include several surveys, notably by Rudy (1953), Malouf, Dibble and Smith (1940) and Keller and Hunt (1967). In this same area, two major cave sites, Danger and Hogup, have been excavated and provide us with a long chronological sequence.

Danger Cave (Jennings 1953, 1957) has received widespread attention from North American archaeologists. The site is located in the Wendover vicinity on the west edge of the Great Salt Lake Desert (Figure 23). Excavations of the 13 feet of cultural deposits produced a sequence divided by Jennings (1957) into five levels. The earliest, Danger I, contained scarce cultural remains and yielded a single lanceolate projectile point similar to the Agate Basin type (Aikens 1970b). Radiocarbon dates for Danger I range from roughly 9500 B.C. to ca. 8000 B.C. (see Appendix 1). Danger II is dated between 8000 B.C. and 5000 B.C., and contained Elko, "Bitterroot" (Northern) Side-Notched, Pinto, Humboldt, Black Rock Concave Base, Lake Mohave and Silver Lake projectile points, according to Aikens (1970b:Table 6). Danger III was a thick, complex unit, undated by radiocarbon means. Elko points seem to have been dominant (cf. Fry and Adovasio 1970), with Pinto, "Bitterroot" Side-Notched, Humboldt, Lake Mohave, Silver Lake, Gypsum Cave, and Black Rock Concave Base points also present. The Danger IV level was similar to Danger III, and was capped by a roof fall. A radiocarbon date of 1869 B.C. (C-636) is available for the level.* Again, there is a wide variety of point types, including the Elko series, "Bitterroot" Side-Notched, Pinto Shoulderless, Humboldt Concave Base and Black Rock Concave Base. Since we know from radiocarbon assays in other parts of the Great Basin that the Desert Side-Notched form appears around A.D. 1500 (see Figure 8), the A.D. 20 date from Danger V must either be in error, or, as Aikens (1970b:55) suggests, a "Danger VI" stratum may have been present, but was not recognized. The vertical distribution of projectile points at Danger Cave (as well as at Hogup Cave) raise some important problems, and these will be discussed later.

Hogup Cave (Aikens, Harper and Fry 1968; Aikens 1969; Aikens 1970b) lies on the east edge of the Great Salt Desert, about 50 miles northeast of Danger Cave (Figure 23). The site is a limestone solution cavern left dry by the recession of Lake Bonneville sometime between 6000 and 7000 B.C. The deposit in the cave varied from 11 to 14 feet in depth.

Aikens (1970b) has formulated a sequence comprised of four units in an effort to chronologically order the occupations at Hogup Cave. Unit I (the oldest) encompasses strata 1 through 8 at the site, and covers a 5000-year time span between 6400 and 1250 B.C. Several types of projectile points co-occur in these strata, including the Elko series (first occurring in stratum 1, and predominant in stratum 5), "Bitterroot" Side-Notched, Humboldt Concave Base and Black Rock Concave Base, and the Pinto series (mostly in strata 3-9; as pointed out earlier, the identification of a "Pinto" specimen in stratum 1 is highly suspect). L-shaped awls are also present in Unit I.

Data from coprolites collected in Unit I (Fry 1970; Aikens 1970b:188) suggest "a heavy dependence on wild seed foods," supplemented by hunting. Harper and Adler (1970) hypothesize that a marshland habitat was present to the west of the cave during Unit I times. Aikens (1970b:188, 190) believes that Unit I approximates the "Desert Culture" and that "relatively homogenous cultural patterns" persisted throughout the period, without any major shift in economic activities or adaptations.

Unit II incorporates strata 9, 10 and 11. There are no chronometric dates for strata 9 and 11, and thus the age for this unit is derived from the upper radiocarbon date for Unit I (1250 B.C.; GaK-1564) and the beginning date of Unit III (A.D. 400; GaK-1561). A date of 650 B.C. (GaK-2081) from stratum 10 serves to confirm this interpretation of the unit's time span.

Projectile point types found in Unit II include Rose Spring Corner-Notched, Eastgate Expanding Stem (both of these types are believed to have begun as early as strata 7 and 8 times), and Elko Corner-Notched. Humboldt Concave Base and Black Rock Concave Base types terminate in strata 9 and 10. In addition, Aikens (1970b) contends that the Desert Side-Notched type appears as early as strata 9. Aikens (Ibid.:191) hypothesizes the overlap of the bow and arrow with the atlatl during Unit II times, suggesting that the bow and arrow was introduced as early as 1250 B.C. (Aikens 1970b:200).

Unit III consists of strata 12-14. The earliest radiocarbon date is A.D. 400 (GaK-1561) from stratum 12. Two other radiocarbon dates from stratum 12 have been dismissed by Aikens as unacceptable (GaK-1560, 2079). There is also a date of A.D. 740 (GaK-2078) from stratum 14, and a later date from the same stratum of A.D. 1350 (GaK-2080). The cave during this period seems to have been used as a "hunting outpost of the horticulturally based Fremont culture" (Aikens 1970b:194). Fremont ceramics (and "Fremont moccasins") are present, along with points of the Rose Spring Corner-Notched, and Side-Notched types, Eastgate Expanding Stem, Cottonwood Triangular, Elko Corner-Notched, and Desert Side-Notched.

Hogup Unit IV consists of the uppermost strata, 15 and 16. A radiocarbon date of A.D. 1470 (GaK-1566) is available from stratum 16. This unit is correlated with historic Shoshoni occupations, during which the site functioned as a "seasonal station for hunting and gathering activities. Shoshoni ware is present, as are points of the Desert Side-Notched, Rose Spring Side-Notched and Corner-Notched, and Eastgate Expanding Stem types.

Earlier, references have been made to the presence of the Western Fremont in the eastern Great Basin, as well as the existence of the so-called "Promontory Culture" in the Great Salt Lake area. Although Hogup Cave lies just outside the Great Salt Lake basin, archaeological remains there have provided new insight into the problems surrounding the relationships of these two cultural constructs. According to Aikens (1970b:204) there are data from Unit III at Hogup Cave which indicate a substantial link between Fremont and "Promontory." In fact, Aikens (Ibid.) equates these two entities and proposes that the materials from Promontory Cave No. 1 (used by Steward 1937 to define the "Promontory Culture") are indeed a "distinctive northern Utah variant of the Fremont culture."

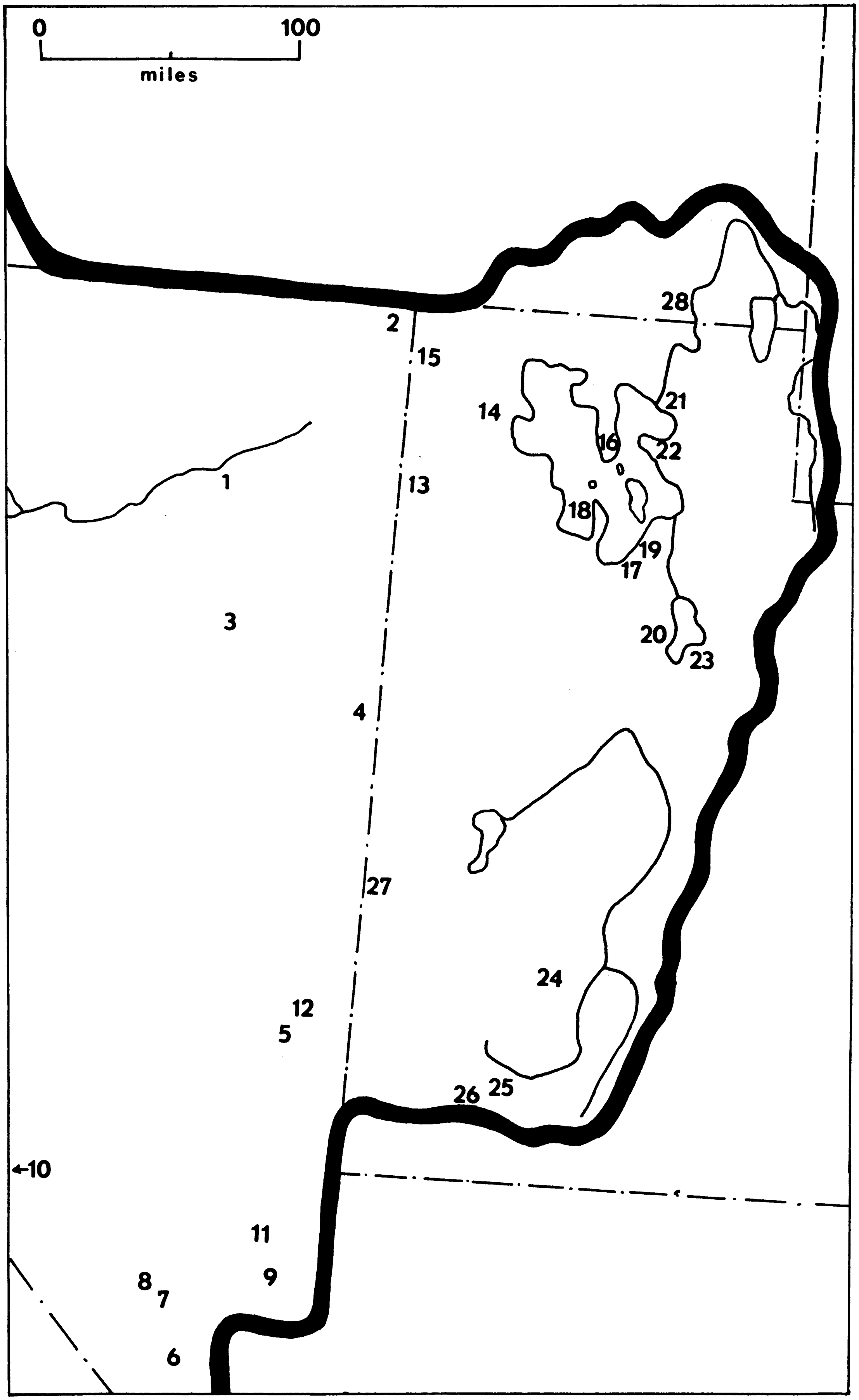
In an earlier, unpublished paper on Hogup Cave, Aikens (1969) proposed five "phases" correlating the occupations at Danger and Hogup Caves. The earliest phase, Bonneville (9500-8000 B.C.), was postulated as a "big-game hunting phase" (Ibid.:8). The Wendover Phase (8000-1500 B.C.) was equated with the Desert Culture, representing Hogup strata 1-8 and Danger Cave II-IV and part of Danger V. The Elko Phase (1500 B.C.-A.D. 400) was defined on the basis of work at South Fork Shelter, Nevada (Heizer, Baumhoff and Clewlow 1968); strata 9-11 at Hogup Cave were linked to this phase. Aikens noted a "clear thread of continuity" from the Wendover Phase into the Elko Phase. The fourth phase, Hogup (A.D. 400-1350), was defined for strata 12-14 at Hogup Cave, and represented a local manifestation of the Fremont, incorporating Steward's (1937) Promontory Culture. The Kelton Phase (A.D. 1350-1850) is marked by the appearance of Shoshoni ware (as in Hogup strata 15-16) and was characterized by Aikens (1969:12) as "depauperate" in nature. These defined phases were not incorporated in Aikens' (1970b) final summary of Hogup Cave archaeology and one must assume that they have been discarded.

Southeastern Idaho. As noted earlier, a portion of southeastern Idaho, to the north and northeast of the Great Salt Lake, Utah, is included within the eastern Great Basin. At present, we have only sketchy chronological data for this particular area, this from Weston Canyon Rockshelter located 65 miles south of Pocatello, Idaho, and 10 miles north of the Utah border (Figure 23;

Delisio 1971). The lower layers of Weston Canyon rockshelter contain Northern Side-Notched and Bitterroot Side-Notched projectile points. Delisio (Ibid.: 52) includes these occupations in his "Early Complex," the age of which is estimated at between 5250-1300 B.C. The upper part of the deposits contained Delisio's "Late Complex" (1550 B.C. to A.D. 600/1150), with a mixture of McKean, Humboldt Concave Base and Elko Corner-Notched points. The last occupation of the site was marked by Desert Side-Notched points.

Figure 23. Major Archaeological Sites and Localities in the Eastern Great Basin.

1. South Fork Shelter and Upper Shelter
2. Deer Creek Cave
3. Newark Cave
4. Smith Creek Canyon (including the sites of Smith Creek Cave, Amy's Shelter, Kachina Cave)
5. Etna Cave
6. Gypsum Cave
7. Tule Springs Site
8. Corn Creek Dunes Site
9. "Lost City" and Moapa River Area
10. McKinnis Site (off map to the west)
11. Stuart Rockshelter
12. Caliente Area (including sites of Conway Shelter, O'Malley Shelter and Scott Site)
13. Danger Cave
14. Hogup Cave
15. Swallow Shelter
16. Promontory Point Locality (Caves No. 1 and No. 2)
17. Black Rock Locality (Black Rock Caves Nos. 1-3)
18. Sandwich Shelter and Stansbury Island
19. Deadman Cave
20. Spotten Cave
21. Bear River Sites (Fremont)
22. Injun Creek Site (Fremont)
23. Nephi Mounds (Fremont)
24. Beaver Site (Fremont)
25. Paragonah Site (Fremont)
26. Median Village Site, Evans Mound (Fremont)
27. Garrison Locality (Fremont)
28. Weston Canyon Rockshelter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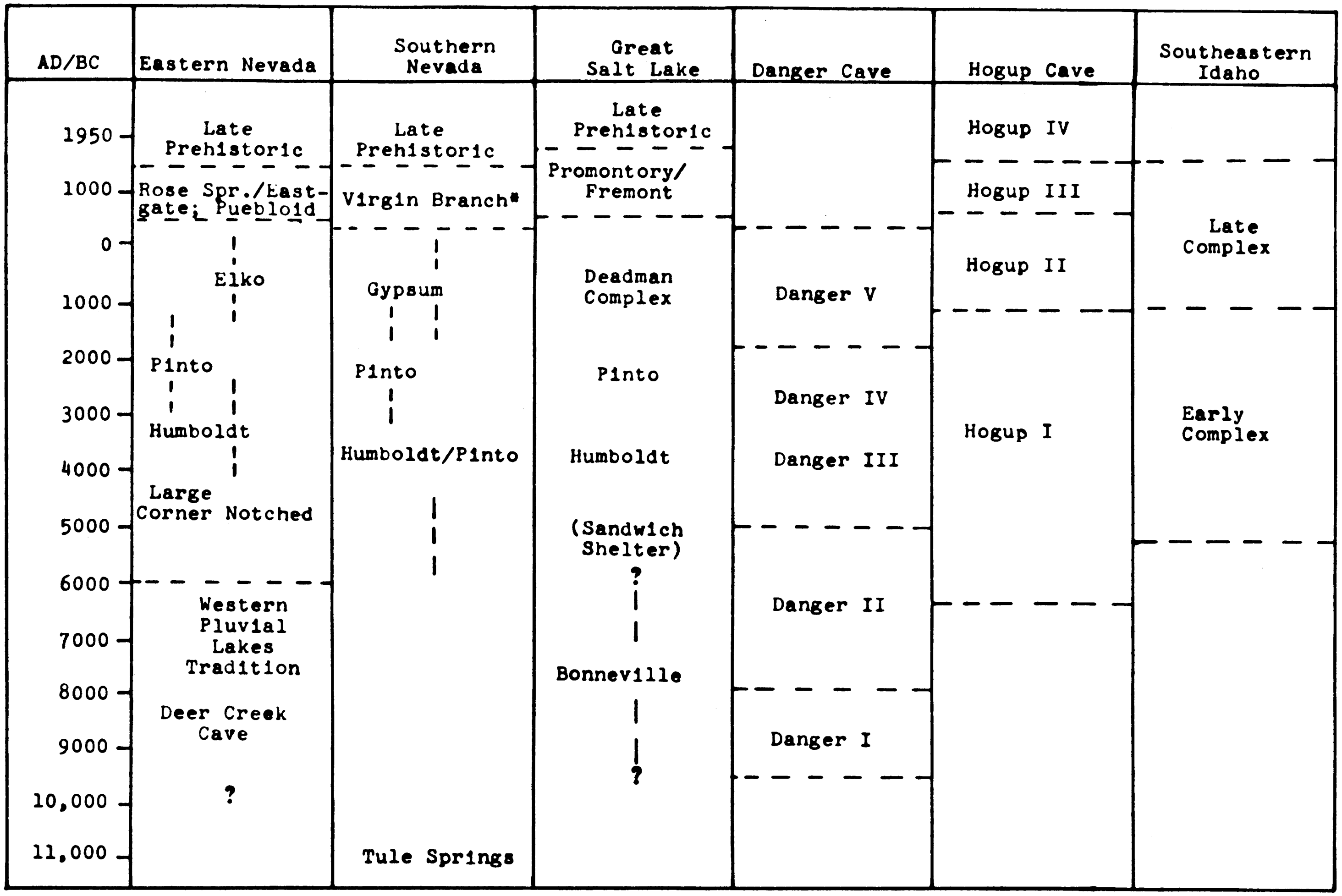

Figure 24. Prehistoric Chronological Sequence in the Eastern Great Basin.

The Virgin Branch (listed under Southern Nevada) includes, from earliest to latest, the Moapa, Muddy River, Lost City and Mesa House Phases.

CHAPTER V

PREHISTORIC CHRONOLOGY IN THE GREAT BASIN: A SUMMARY

The broad range of chronological data currently available for the Great Basin have been described. These data vary greatly in quality, ranging from largely speculative interpretations derived from the analysis of surface collections to more useful inferences based on the study of archaeologic materials from excavated and dated contexts. Because of this obvious disparity, intraregional correlation of local culture sequences is quite difficult. However, it is the aim of this concluding section to review the chronological situation in the four major sectors of the Great Basin and to develop a broad chronological framework having application in all of the Great Basin. Figure 25 has been prepared in an effort to graphically summarize this synthesis of Great Basin prehistoric chronology.

In all parts of the Great Basin, there have been claims of extremely old archaeological materials. At Calico Hills, stone tools purportedly dating from 50,000 or more years ago have been excavated. In addition, there have been a series of putative associations of human cultural materials and the bones of extinct fauna. Most of these discoveries are simply too inconclusive to warrant serious consideration. It now seems that the best evidence for man's presence in the Great Basin in the Late Pleistocene comes from the northern Great Basin, at the sites of Wilson Butte Cave (the extreme antiquity of which is challenged by Haynes 1969b) and Paisley Five Mile Point Cave No. 3 (whose extreme antiquity is questioned by Heizer and Baumhoff 1970). Again, the evidence from these sites is not altogether convincing. Yet another intriguing situation is the age of the obsidian point found by McGee (1889) deeply buried in Lahontan silts. Haynes (1969a:714) suggests the specimen was in deposits of Woodfordian age, between 12,500 and 22,000 years ago. Except for the ancient cultural materials radiocarbon-dated to ca. 11,000 B.C. at Fort Rock Cave and at Tule Springs, all other claims of similarly great antiquity for man in the Great Basin must be viewed as extremely tentative.

Fluted points have been found throughout the Great Basin, with the greatest concentrations in western and southern Nevada and southeastern California. Except for a single atypical specimen from the base of Fort Rock Cave (Bedwell 1970), all of these distinctive artifacts are of surface provenience. Typologically, a number do resemble Clovis and Folsom fluted points dated to ca. 8000-10,000 B.C. in the Great Plains and the American Southwest (Haynes 1964, 1969a). Other fluted points, such as the series from Borax Lake, appear to be regional specializations of undetermined age. Because of the wide distribution of fluted points in the area, and the close morphological and technological traits which they share with comparable specimens from elsewhere in North America, I suspect that these artifacts (the Fluted Point Tradition) do indeed represent man's occupation of the Great Basin between 8000-10,000 B.C. However, no substantial case has yet been made which would indicate that the makers of these fluted points followed a "big game hunting" lifeway (cf. Heizer and Baumhoff 1970).

The earliest evidence of human occupation in the Great Basin for which we now have a variety of supportive data is the Western Pluvial Lakes Tradition, initially defined by Bedwell (1970). As outlined earlier in this study, a number of lithic assemblages representative of this tradition have been found at sites throughout much of the Great Basin (see Figure 15). The best chronometric evaluations of the age of this tradition come from the Fort Rock Valley and suggest a time span of roughly 9000-6000 B.C. A similar age range seems likely for manifestations of this tradition elsewhere in the Basin. The settlement pattern data reveal that sites of the Western Pluvial Lakes Tradition were situated along the shores of ancient lake systems, and this implies a predilection toward the utilization of lacustrine resources at an early time level. This tradition has been recognized in the western Great Basin, especially in the Mono Lake, Tonopah, Carson Sink, Pyramid/Winnemucca Lakes, High Rock, and Black Rock Desert areas. It has not yet been documented in either the Humboldt Sink or in northeastern California, both of which contain lake systems. R. F. Heizer (personal communication) has suggested that components of the Western Pluvial Lakes Tradition may eventually be found in the Humboldt Valley, and will come to light under the present thick mantle of Medithermal alluvium along the shores of Humboldt Lake. There seem to have been no pluvial lakes in Grass Valley or in the Reese River and Monitor Valleys, a fact which coincides with the absence of any evidence of the Western Pluvial Lakes Tradition in these three areas of central Nevada.

In the southwestern Great Basin, the Western Pluvial Lakes Tradition is represented by the San Dieguito complex as found in Death Valley, Owens Valley and the Mohave Desert, and by the Western Lithic Co-Tradition of the Panamint Basin. No archaeological remains attributable to the tradition have yet been discovered in the Colorado Desert. Assemblages of the Western Pluvial Lakes Tradition are known from Fort Rock Valley (including Cougar Mountain Cave), the Guano Valley area, and from Coyote Flat. Sites along the northern edge of the Basin (Wilson Butte Cave, Columbet Creek Rockshelter) have yielded no evidence of the tradition. In the eastern Great Basin, concrete data on the Western Pluvial Lakes Tradition come only from eastern Nevada and from the Escalante Valley of southwest Utah. Cultural remains of comparable age are known from Danger and Hogup Caves (and similarly, from Leonard Rockshelter in the western Basin), but these apparently represent a totally distinct tradition. Still, the Western Pluvial Lakes Tradition represents the earliest, well-defined Basin-wide adaptation, and one which possesses lithic traits sufficiently distinct to permit easy recognition of the tradition in a given area.

As already discussed at some length, J. D. Jennings and others have hypothesized a "Desert Culture" adaptation in the Great Basin for much of the pre-Christian era. The data from Hogup and Danger Caves suggest that such a pattern began early and co-existed with the Western Pluvial Lakes Tradition in other parts of the Basin. The "Desert Culture" represents a generalized cultural adaptation to arid-land resources, and the material culture stemming from this adaptation is thought to have changed little over the period of several millennia. However, the "Desert Culture" concept has been challenged by some archaeologists, notably Heizer and Baumhoff (1965) and Epstein (1968). It is argued that the Danger Cave data have been misinterpreted and that in fact the site deposits were disturbed through vertical mixing. In addition, Warren and Ranere (1968:8) contend that Danger Cave has always been in a unique environment, not typical of the Great Basin as a whole. Thus, they reason, the occupations at Danger Cave (both early and late) may represent specialized subsistence-oriented activities and should not be thought of as characteristic of the entire Great Basin area.

The term "Desert Archaic" has been used increasingly to supplant the "Desert Culture" rubric. Shutler (1961a:69) has subsequently suggested that the term "Great Basin Archaic" be adopted, to include Archaic materials representing both "Desert" and lacustrine adaptations. I believe that the varied archaeological remains in the Great Basin in the period between 5000/6000 B.C. and A.D. 500/900 can be subsumed in the Great Basin Archaic.

For example, in the eastern Great Basin, I would include occupational remains from this time span characterized by Elko, Pinto, and Humboldt series points in eastern Nevada, southern Nevada, the Great Salt Lake area, Danger II-IV, and Hogup I-II. In the western Great Basin, the Great Basin Archaic would incorporate the Spooner Complex and Phase I of the Martis Complex (both in the east-central Sierra Nevada), the Elko, Pinto, and Humboldt materials found at Mono Lake, the Leonard and Lovelock cultures of the Humboldt and Carson Sinks, and possibly the ill-defined Carson and Hidden phases of the Carson Sink. In Grass Valley, the Great Basin Archaic would incorporate the Early and Middle Prehistoric periods, while in the Reese River and Monitor Valleys, the Devil's Gate and Reveille Phases would be included. Other cultural assemblages in the western Basin attributable to the Great Basin Archaic are the Lovelock culture materials and the "Lakeshore Ecology Phase" found at Pyramid and Winnemucca Lakes, the Calico, Silent Snake, and Hanging Rock Phases (and part of the Smoky Creek Phase) of the High Rock country, the Northern Side-Notched, Humboldt, Pinto, and Elko materials from the Black Rock Desert (including the Barrel Springs Elko component), and the Menlo, Bare Creek, and Emerson Phases of northeastern California (manifestations of Lovelock culture in northeastern California are also included).

The Great Basin Archaic in the northern Great Basin is comprised of Period I and II in the Fort Rock Valley, the Early Period and part of the Middle Period of the Warner Valley, the Elko, Pinto, Humboldt, McKean and Northern Side-Notched materials at Coyote Flat, Elko, Humboldt and Pinto artifacts from the Guano Valley, Wilson Butte Cave phases II-V, the assemblage at Columbet Creek Rockshelter, and the bulk of the lower deposits at Catlow and Paisley caves.

In the southwestern Basin, the Pinto materials from the Mohave Desert, Owens Valley (especially the Stahl site) and in the Panamint Basin can be incorporated in the Great Basin Archaic. Also included are the Elko, Humboldt and Silver Lake materials from the Colorado Desert, possibly the "Pre-Yuman" remains from the Providence Mountains, Death Valley II, and the Little Lake, and early and Middle Rose Spring phases of the Owens Valley.

In general, the Great Basin Archaic can be characterized as an assortment of relatively similar material culture traits during the time span between 5000/6000 B.C. and A.D. 500/900. Similarities in lithic artifacts are especially striking, given the occurrence in most sites of this period of dart points of the Humboldt, Silver Lake, Pinto, Gypsum and Elko series. As previous discussion has indicated, the time ranges of these point series are quite variable. In most parts of the Basin, these series do seem to follow a general temporal sequence (roughly Humboldt-Pinto-Elko-Gypsum). However, the data from Danger and Hogup Caves suggest much earlier origins for Humboldt, Pinto and Elko. This situation cannot be clarified at this time; in some instances, there are differences in typological classifications, and there may be some confusion caused through the vertical mixing of deposits at these sites. Such disturbance has already been mentioned in regard to Danger Cave. At Hogup Cave, Aikens (1970b:11) notes the "sorting" of the deposits through human agencies, and the movement of cave fill by prehistoric occupants in order to make a more even living surface (Ibid.:19). If such alterations occurred repeatedly in a cave site, this could cause a great amount of mixing and such mixing might not always be clearly recognized. There is some evidence of aboriginal pits at Hogup Cave, and of rodent burrowing. However, the excavations were carried out under strict controls, and Aikens (1970b:19) argues that the chances of mixing earlier and later cultural materials are "virtually nil."

It is clear from previous research (Meighan 1959a; Rozaire 1963; Heizer 1956; Heizer and Krieger 1956; Shutler 1968a; Heizer and Napton 1970a) that a single economic pattern did not prevail over the entire Basin throughout much of the pre-Christian era. The Great Basin Archaic involved the extensive exploitation of both desert and lacustrine resources, and certainly the utilization of other resources, such as those provided by mountain environments.

The best chronological evidence now indicates that the bow and arrow was introduced into the Great Basin sometime around A.D. 500 (Aikens 1970b thinks the introduction was much earlier, around 1250 B.C.). It is generally accepted that this new trait is represented by the occurrence of Rose Spring and Eastgate points. With the appearance of these two points, the larger dart point forms previously in use appear to have subsided in popularity, and in some instances, disappeared altogether. The introduction of the bow and arrow is marked by the appearance of Rose Spring and Eastgate points at most Great Basin sites, and I refer to these materials and the period in which the use of these point styles took place as the <u>Rose Spring-Eastgate Complex</u>. Radiocarbon dates available for the Rose Spring-Eastgate Complex suggest a time span of roughly A.D. 500-A.D. 1000/1200. There is no substantial evidence that the use of the bow and arrow brought about any significant economic changes.

The Rose Spring-Eastgate Complex is perhaps best known in the western Great Basin. Phase II of the Martis complex is included, as are materials and sites from Mono Lake, the Humboldt and Carson Sinks, the Underdown Phase in the Reese River and Monitor Valleys, Rose Spring and Eastgate materials at Pyramid and Winnemucca Lakes, possibly the latter part of the Smoky Creek Phase in the High Rock country (Layton 1970 believes the High Rock area was abandoned between A.D. 200 and A.D. 1300), Rose Spring and Eastgate artifacts from the Black Rock Desert, and the Alkali Phase of northeastern California.

In the eastern Great Basin, the Rose Spring-Eastgate complex is found primarily in eastern Nevada. At Hogup Cave, Utah, both point styles are supposed to have been present at a considerably earlier date (Aikens 1970b). The complex is not clearly represented in the northern Great Basin, and in the southwestern Basin, it is clearly present only in Owens Valley (late Rose Springs Phase), possibly in the "Milling Archaic" of Panamint Basin, and in Death Valley II.

Also around 500 A.D., and lasting to ca. A.D. 1150, there appear Puebloid occupations in southern Nevada (the Virgin Branch, with Moapa, Muddy River, Lost City and Mesa House phases). Beginning sometime around A.D. 1000, the Western Fremont/Promontory culture becomes dominant in the Great Salt Lake area, at Hogup Cave, and in much of Utah. The lowland Patayan tradition is found at this time period in the Colorado Desert just outside the southwestern Basin.

Aside from these specialized developments (Virgin Branch, Western Fremont, lowland Patayan), much of the Great Basin saw the introduction of brownware ceramics and Desert Side-Notched and Cottonwood series projectile points ca. A.D. 1000 or somewhat later. In most areas, it is believed that these materials mark the advent of Paiute and Shoshonean peoples, ancestors of tribes found in the Great Basin at the time of historic contact. In Figure 25, I group these manifestations into a Late Prehistoric period. The southwestern Great Basin Late Prehistoric remains consist of the "Shoshonean" Horizon (and possibly the Providence Complex), Death Valley IV, the Cottonwood Phase in Owens Valley, the Pottery Archaic of the Panamint Basin and the Shoshone-Yuma materials of the Mohave Desert. The Late Prehistoric period is well represented in the western Great Basin, including the King's Beach complex of the east-central Sierra Nevada , Dunes Springs Phase of the Carson and Humboldt Sinks, the Yankee Blade Phase in the Reese River and Monitor Valleys, the Hanging Rock Phase in the High Rock area, and the Bidwell Phase in northeastern California. Brownware ceramics, Desert Side-Notched points and Cottonwood points also appear in the Late Prehistoric period at sites in the northern Great Basin and in the eastern Great Basin.

In concluding, the following general chronological ordering for Great Basin prehistory is offered: (1) hypothesized "pre-projectile point" and man-megafauna associations prior to 11,000 B.C., and poorly known human occupations of the period around 11,000 B.C. (at Tule Springs, Fort Rock Cave); (2) the Fluted Point Tradition, still poorly known, but possibly dating sometime between 8000-10,000 B.C.; (3) the Western Pluvial Lakes Tradition of 9000-6000 B.C., represented by a specialized tool kit and a lacustrine adaptation; there are also concomitant non-lacustrine occupations in the Basin, but these remain vaguely understood; (4) the Great Basin Archaic, including both "Desert Culture" and lacustrine patterns (and probably others), with a variety of projectile point types occurring in a general temporal sequence; a wealth of perishable remains is available from the period, especially in the Lovelock culture and from Danger and Hogup caves; (5) the Rose Spring-Eastgate Complex, representing the epoch in which the bow and arrow (and Rose Spring and Eastgate points) were introduced, roughly A.D. 500-1000; contemporary developments include the

Puebloid intrusion in southern Nevada, and the advent of Western Fremont culture in the western part of Utah; (6) the Late Prehistoric period, characterized by Desert Side-Notched and Cottonwood points and brownware ceramics (all used into the Historic era); these cultural remains are attributed to Numic speakers (Paiute, Shoshone); (7) the Historic or Post-Contact period.

These chronological divisions are offered as working hypotheses, to be tested by further archaeological research in the Great Basin.

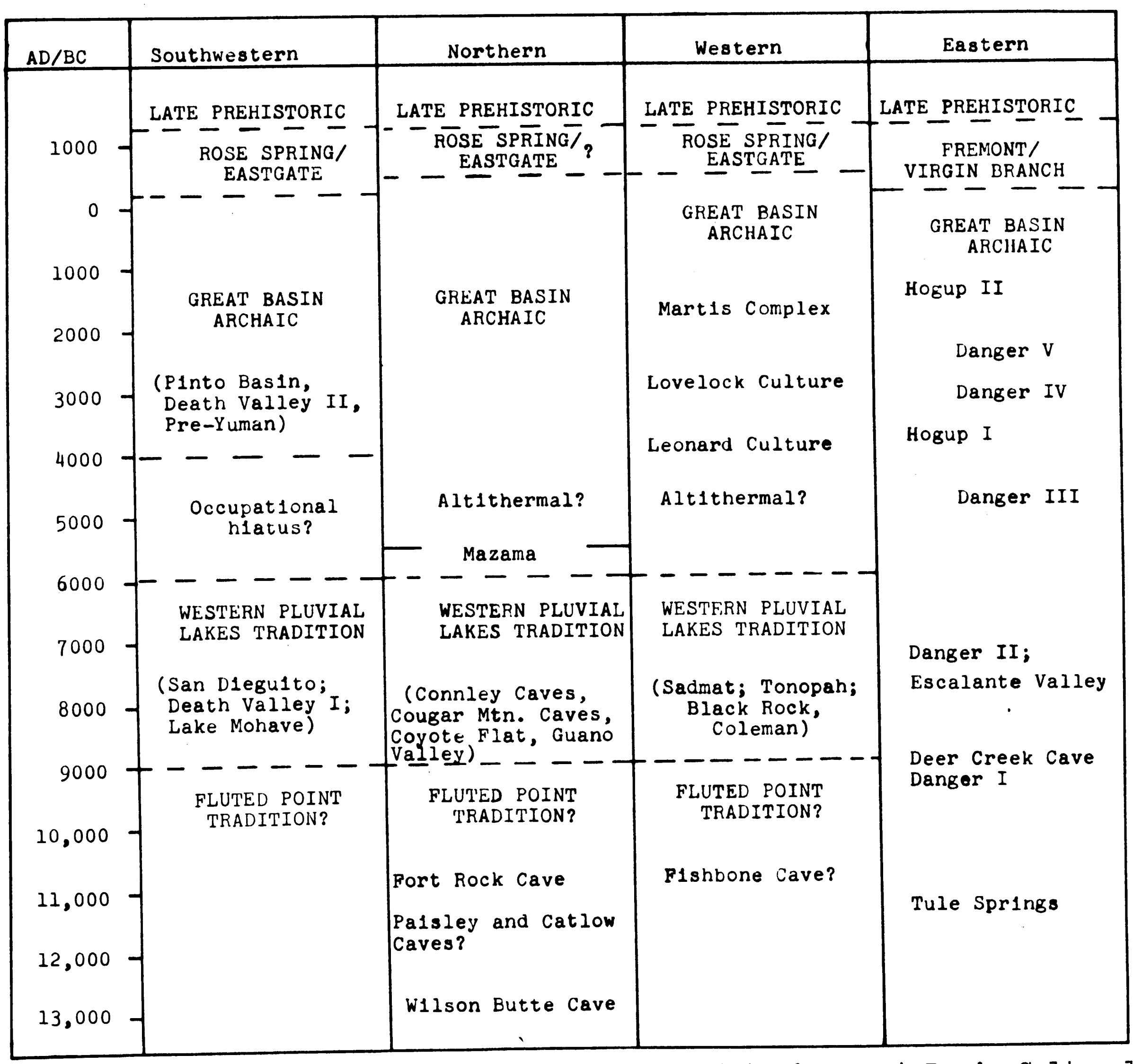

Figure 25. Chronological Ordering of the Prehistoric Great Basin Cultural Sequence.
Major chronological units within each of the four sectors of the Great Basin are indicated.

APPENDIX I

Archaeological Radiocarbon Dates from the Great Basin

In this section, radiocarbon dates from Great Basin archaeological sites have been assembled. While it is certain that every such date from this region is not included, the list is felt to be reasonably complete.

Most of the radiocarbon determinations given here are derived from published sources and the appropriate citations are listed. At times, the date lists published originally in issues of Science and later by Radiocarbon provided the best information on certain dates, and in these instances, the journals are cited directly. In some cases, radiocarbon determinations have not been formally published, and have been made available through the cooperation of Great Basin archaeologists. Those dates listed as from "Dalley letter" (Gardiner Dalley, University of Utah), "Tuohy letter" (D. R. Tuohy, Nevada State Museum), and "Fowler letter" (D. D. Fowler, University of Nevada, Reno) were originally submitted to R. F. Heizer and have been incorporated in a previous paper (Heizer and Hester, ms.). D. H. Thomas has made available certain new radiocarbon dates from central Nevada and these are cited as "Thomas letter."

The list of dates given here is intended simply as a basic reference or guide. No attempt has been made to comment on the validity or accuracy of individual dates. Similarly, there has been no effort made to indicate those dates which are based on assay of wood charcoal, basketry, shell, bone collagen, or other types of organic materials. All of the A.D./B.C. dates have been calculated in terms of C^{14} years before 1950. The bulk of the dates were computed using a half-life of 5570 ± 30 years; many of the more recently obtained determinations are undoubtedly based on newer estimates of the C^{14} half-life. Those readers wishing to adjust the radiocarbon assays to recently published correction curves should consult Ralph (1971) and Suess (1970).

For convenience, the following list of dates has been divided into four arbitrary periods: Period I (+10,000 to 5000 B.C.), Period II (5000 to 2000 B.C.); Period III (2000 B.C. to 0 A.D.); Period IV (1 A.D. to present). It must be stressed that no cultural or chronological significance is attached to these divisions.

Period I (10,000-5,000 B.C.)

Site	Sample No.	Date	Reference
OREGON			
Fort Rock Cave	GaK-1738	13,200 ± 720 (11,250 B.C.)	Bedwell 1970
"	GaK-2146	8,550 ± 150 (6,600 B.C.)	"
"	GaK-2147	10,200 ± 230 (8,250 B.C.)	"
"	C-428	9,053 ± 350 (7,103 B.C.)	Libby 1955
Paisley Five Mile Point Cave No. 3	Y-109	7,619 ± 120 (5,669 B.C.)	Science 122:958
Connley Cave No. 3	GaK-1739	8,290 ± 310 (6,340 B.C.)	Bedwell 1970
" No. 4A	GaK-1741	7,900 ± 170 (5,950 B.C.)	"
" No. 4A	GaK-1742	10,100 ± 400 (8,150 B.C.)	"
" No. 4A	GaK-2136	9,150 ± 150 (7,200 B.C.)	"

Site	Sample No.	Date	Reference
Connley Cave No. 4B	GaK-2140	7,240 ± 150 (5,290 B.C.)	Bedwell 1970
" No. 4B	GaK-2141	11,200 ± 20 (9,250 B.C.)	"
" No. 4B	GaK-2142	9,670 ± 180 (7,720 B.C.)	"
" No. 4B	GaK-2143	10,600 ± 190 (8,650 B.C.)	"
" No. 5A	GaK-1743	9,800 ± 250 (7,850 B.C.)	"
" No. 5B	GaK-1744	9,540 ± 260 (7,590 B.C.)	"
" No. 5B	GaK-2135	7,430 ± 140 (5,480 B.C.)	"
" No. 6	GaK-1745	9,710 ± 880 (7,760 B.C.)	"
Cougar Mountain Cave No. 1	UCLA-112	8,510 ± 250 (6,560 B.C.)	Radiocarbon 1962:111
Cougar Mountain Cave No. 2	GaK-1751	11,950 ± 350 (10,000 B.C.)	Bedwell 1970

Site	Sample No.	Date	Reference
IDAHO			
Wilson Butte Cave (Stratum C)	M-1409	14,500 ± 500 (12,550 B.C.)	Gruhn 1965:57
Wilson Butte Cave (Stratum E)	M-1410	15,000 ± 800 (13,050 B.C.)	"
CALIFORNIA			
Bench Mark Bay (Lake Mohave)	Y-2406	10,270 ± 160 (8,320 B.C.)	Radiocarbon 1969:583
C. W. Harris (San Dieguito component)	A-724	8,490 ± 400 (6,540 B.C.)	Warren 1967:179
"	A-725	8,490 ± 400 (6,540 B.C.)	"
"	A-722A	9,030 ± 400 (7,080 B.C.)	"
Menlo Baths*	I-4604	13,750 ± 250 (11,800 B.C.)	O'Connell 1971
King's Dog	GaK-2876	7,430 ± 150 (5,480 B.C.)	O'Connell and Ericson ms.

* O'Connell (1971) dismisses this date as aberrant.

Site	Sample No.	Date	Reference
NEVADA			
Gypsum Cave (sloth dung)	C-222	av. 8,527 ± 250 (6,577 B.C.)	Libby 1955:118
"	C-221	av. 10,455 ± 340 (8,505 B.C.)	Libby 1955:117
"	LJ-452	11,690 ± 250 (9,740 B.C.)	Hubbs, Bien and Suess 1963:259
Tule Springs	UCLA-552*	13,100 ± 200 (11,150 B.C.)	Haynes 1968:616, 622, 626
"	UCLA-636	11,500 ± 500 (9,550 B.C.)	"
Tule Springs (Deposition B2)	UCLA-519	7,480 ± 120 (5,530 B.C.)	"
"	A-463a	8,540 ± 340 (6,590 B.C.)	"
"	I-991	9,670 ± 200 (7,720 B.C.)	"
"	UCLA-505	10,000 ± 200 (8,050 B.C.)	"

* UCLA-552 and UCLA-636 (Tule Springs) are the earliest and latest of 11 radiocarbon dates obtained on the oldest occupation at the site.

Site	Sample No.	Date	Reference
Leonard Rockshelter (NV Pe 14)	C-281	8,660 ± 300 (6,710 B.C.)	Grosscup 1958
"	C-298	7,038 ± 350 (5,088 B.C.)	"
Deer Creek Cave	I-1028	10,085 ± 400 (8,135 B.C.)	Shutler and Shutler 1963
"	I-1029	9,670 ± 300 (7,720 B.C.)	"
O'Malley Shelter	RL-92	7,100 ± 190 (5,150 B.C.)	Fowler letter
Spooner Lake	I-2001	7,100 ± 140 (5,140 B.C.)	Elston 1971
Fishbone Cave	L-245	11,200 ± 250 (9,245 B.C.)	Science 124:163
"	L-289K	7,830 ± 350 (5,880 B.C.)	Science 126:1332
"	RL-49	7,240 ± 180 (5,290 B.C.)	Adovasio 1970: Table 3
UTAH			
Danger Cave I	TX-85	10,600 ± 20 (8,650 B.C.)	Radiocarbon 1964:156, 157

Site	Sample No.	Date	Reference
Danger Cave I	TX-86	8,970 ± 150 (7,020 B.C.)	Radiocarbon 1964:156, 157
"	TX-87	10,150 ± 170 (8,200 B.C.)	"
"	TX-88	9,050 ± 180 (7,100 B.C.)	"
"	TX-89	9,740 ± 210 (7,790 B.C.)	"
"	C-610	11,151 ± 570 (9,201 B.C.)	Libby 1955:119
"	C-609	11,453 ± 600 (9,503 B.C.)	"
"	C-640	8,960 ± 340 (7,010 B.C.)	"
"	M-204	10,270 ± 650 (8,320 B.C.)	Science 124:670
"	M-202	10,270 ± 650 (8,320 B.C.)	"
"	M-119	10,400 ± 700 (8,450 B.C.)	Dalley letter
"	M-118	11,000 ± 700 (9,050 B.C.)	Science 124:670

Site	Sample No.	Date	Reference
Danger Cave II	GaK-1900	10,900 ± 200 (7,950 B.C.)	Dalley letter
"	GaK-1899	10,130 ± 250 (8,180 B.C.)	"
"	GaK-1896	9,590 ± 160 (7,640 B.C.)	"
"	GaK-1895	6,960 ± 210 (5,010 B.C.)	"
"	C-611	9,789 ± 630 (7,837 B.C.)	Libby 1955:119
Danger Cave III	GaK-1897	7,100 ± 150 (5,150 B.C.)	"
Hogup Cave	GaK-2086	7,860 ± 160 (5,910 B.C.)	Dalley letter
"	GaK-1569	8,350 ± 160 (6,400 B.C.)	"
"	GaK-2083	8,880 ± 200 (6,850 B.C.)	"
"	GX-1287	7,815 ± 350 (5,865 B.C.)	"

Site	Sample No.	Date	Reference
Hogup Cave	GaK-2082	7,250 ± 100 (5,300 $\bar{B}$.C.)	Dalley letter
Sandwich Shelter	RL-55	7,040 ± 280 (5,090 $\bar{B}$.C.)	Marwitt, Fry and Adovasio 1971

Period II (5,000-2,000 B.C.)

Site	Sample No.	Date	Reference
OREGON			
Fort Rock Cave	GaK-2145	4,450 ± 100 (2,500 B.C.)	Bedwell 1970
Connley Cave No. 5A	GaK-2134	4,320 ± 100 (2,370 B.C.)	"
" No. 6	GaK-2131	4,350 ± 100 (2,400 B.C.)	"
" No. 6	GaK-2132	4,720 ± 200 (2,770 B.C.)	"
Table Rock Cave No. 1	GaK-1748	5,520 ± 210 (3,270 B.C.)	"
IDAHO			
Wilson Butte Cave (upper Stratum C)	M-1087	6,850 ± 300 (4,900 B.C.)	Gruhn 1961a:27
CALIFORNIA			
Menlo Baths	I-4782	5,250 ± 120 (3,300 B.C.)	O'Connell 1971
King's Dog	UCLA-1770	5,640 ± 155 (3,690 B.C.)	O'Connell and Ericson ms.

Site	Sample No.	Date	Reference
NEVADA			
Stuart Rockshelter	M-376	4,050 ± 300 (2,100 B.C.)	Shutler, Shutler and Griffith 1960:Plate 3
Tule Springs (preceramic hearth)	A-465	4,190 ± 170 (2,240 B.C.)	Haynes 1968:621
Corn Creek Dunes	UCLA-526	5,200 ± 100 (3,250 B.C.)	Williams and Orlins 1963
"	UCLA-525	4,440 ± 100 (2,490 B.C.)	"
"	UCLA-531	4,580 ± 100 (2,630 B.C.)	"
"	UCLA-532	4,610 ± 100 (2,660 B.C.)	"
"	UCLA-533	4,900 ± 100 (2,950 B.C.)	"
"	UCLA-534	4,380 ± 100 (2,430 B.C.)	"
"	UCLA-535	4,030 ± 100 (2,080 B.C.)	"
Deer Creek Cave	I-1031	4,170 ± 150 (2,220 B.C.)	Shutler and Shutler 1963

Site	Sample No.	Date	Reference
South Fork Rockshelter	UCLA-295	4,360 ± 300 (2,410 B.C.)	Radiocarbon 1964:328
"	UCLA-296	4,310 ± 40 (2,360 B.C.)	"
O'Malley Shelter	RL-91	4,630 ± 170 (2,680 B.C.)	Fowler letter
"	RL-46	6,700 ± 140 (4,750 B.C.)	"
Lovelock Cave	I-4631	3,980 ± 20 (2,030 B.C.)	Heizer and Napton 1970a: Table 4
"	I-4632	4,720 ± 110 (2,320 B.C.)	"
"	I-4634	4,430 ± 130 (2,480 B.C.)	"
"	I-4633	4,520 ± 110 (2,570 B.C.)	"
"	I-4673	4,580 ± 120 (2,630 B.C.)	"
"	I-3692	4,690 ± 110 (2,740 B.C.)	"

Site	Sample No.	Date	Reference
Silent Snake Springs	WSU-994	5,300 ± 380 (3,350 B.C.)	Layton 1970
Leonard Rockshelter (NV Pe 14)	C-544	5,737 ± 250 (3,787 B.C.)	Grosscup 1958
NV Wa 200	UCLA-978	4,030 ± 85 (2,080 B.C.)	Radiocarbon 1966:473
NV Wa 525	GaK-2808	4,470 ± 110 (2,520 B.C.)	Tuohy letter
Newark Cave	WSU-511	5,470 ± 400 (3,920 B.C.)	Fowler 1968b
Spooner Lake	I-2000	4,920 ± 120 (2,970 B.C.)	Elston 1971
Cow Bone Cave	L-289FF	5,970 ± 150 (4,020 B.C.)	Grosscup 1958
UTAH			
Danger Cave III	GaK-1901	6,570 ± 110 (4,620 B.C.)	Dalley letter
"	GaK-1898	6,560 ± 120 (4,610 B.C.)	"
Danger Cave IV (or late D-III)	GX-1465	6,825 ± 160 (4,875 B.C.)	"

Site	Sample No.	Date	Reference
Danger Cave IV	GaK-1902	5,050 ± 120 (3,100 B.C.	Dalley letter
Danger Cave V	M-203	4,000 ± 300 (2,050 B.C.)	Science 124:670
"	M-205	4,900 ± 350 (2,850 B.C.)	"
Hogup Cave	GaK-1570	3,970 ± 100 (2,020 B.C.)	Dalley letter
"	GX-1286	6,020 ± 380 (4,070 B.C.)	"
"	GX-1288	5,795 ± 160 (3,845 B.C.)	"
"	GaK-1567	5,960 ± 100 (4,010 B.C.)	"
"	GaK-1563	6,400 ± 100 (4,450 B.C.	"
"	GaK-2048	6,190 ± 110 (4,240 B.C.)	"
"	GaK-1568	4,610 ± 100 (2,660 B.C.)	"

Site	Sample No.	Date	Reference
Hogup Cave	Gak-2076	4,490 ± 100 (2,540 B.C.)	Dalley letter
Thorne Cave	M-783	4,230 ± 250 (2,280 B.C.)	"
"	W-1395	4,170 ± 250 (2,220 B.C.)	"
Spotten Cave	I-3363	4,200 ± 120 (2,250 B.C.)	"
"	I-3362	4,640 ± 120 (2,690 B.C.)	"
"	I-4484	5,580 ± 120 (3,630 B.C.)	"

Period III (2,000-1 B.C.)

Site	Sample No.	Date	Reference
OREGON			
7-Mile Ridge	GaK-1747	2,250 ± 100 (300 B.C.)	Bedwell 1970
Connley Cave No. 3	GaK-2144	3,080 ± 140 (1,130 B.C.)	"
" No. 4	GaK-1740	3,420 ± 140 (1,470 B.C.)	"
" No. 4A	GaK-2137	3,140 ± 80 (1,190 B.C.)	"
" No. 4A	GaK-2138	3,730 ± 90 (1,780 B.C.)	"
" No. 5A	GaK-2133	3,330 ± 110 (1,380 B.C.)	"
" No. 6	GaK-2130	3,720 ± 270 (1,770 B.C.)	"
Table Rock Cave No. 2	GaK-1750	3,068 ± 420 (1,118 B.C.)	"
CALIFORNIA			
Rose Spring	UCLA-1093A	2,240 ± 145 (290 B.C.)	Clewlow et al. 1970

Site	Sample No.	Date	Reference
Rose Spring	UCLA-1093B	2,900 ± 80 (950 B.C.)	Clewlow et al. 1970
"	UCLA-1093C	3,520 ± 80 (1,570 B.C.)	"
"	UCLA-1093D	3,580 ± 80 (1,630 B.C.)	"
"	UCLA-1093E	3,900 ± 180 (1,950 B.C.)	"
Crane Flat	UCLA-278	2,040 ± 100 (90 B.C.)	E. Davis 1964:257
Bare Creek Ranch	I-2007	2,130 ± 105 (180 B.C.)	Radiocarbon 1968:278
Rodriguez	I-3209	2,150 ± 100 (200 B.C.)	Radiocarbon 1969:76-77
"	UCLA-1222	2,620 ± 80 (670 B.C.)	O'Connell and Ambro 1968
King's Dog	UCLA-1732	3,000 ± 80 (1,050 B.C.)	O'Connell and Ericson ms.
Karlo	LJ-76	2,350 ± 150 (400 B.C.)	Riddell 1960:91

Site	Sample No.	Date	Reference
NEVADA			
Stuart Rockshelter	M-377	3,870 ± 250 (1,920 B.C.)	Shutler, Shutler and Griffith 1960
Gypsum Cave (sticks)	UCLA-1069	2,400 ± 60 (450 B.C.)	Berger and Libby 1967: 479-480
Gypsum Cave (atlatl dart shaft)	UCLA-1223	2,900 ± 80 (950 B.C.)	"
Deer Creek Cave	I-1030	2,640 ± 140 (690 B.C.)	Shutler and Shutler 1963
"	I-1032	2,585 ± 150 (635 B.C.)	"
Conway Shelter	RL-39	2,050 ± 110 (100 B.C.)	Fowler letter (see also Radiocarbon 1971:75)
"	RL-40	2,090 ± 100 (140 B.C.)	"
"	RL-41	1,980 ± 110 (30 B.C.)	"
O'Malley Shelter	RL-44	2,970 ± 100 (1,020 B.C.)	"
"	RL-93	3,740 ± 170 (1,790 B.C.)	"

Site	Sample No.	Date	Reference
O'Malley Shelter	RL-45	3,940 ± 120 (1,990 B.C.)	Fowler letter (see also Radiocarbon 1971:75)
"	RL-106	3,290 ± 170 (1,970 B.C.)	"
Thompson Site (Steamboat Springs)	TX-1391	3,480 ± 110 (1,530 B.C.)	Elston and Davis 1972
Hidden Cave	L-289BB	3,050 ± 200 (1,100 B.C.)	Radiocarbon 1967:478
Humboldt Cave	C-587	1,953 ± 175 (3 B.C.)	Grosscup 1958
Crypt Cave	L-289II	2,400 ± 200 (450 B.C.)	"
Guano Cave	L-356B	3,200 ± 130 (1,250 B.C.)	"
NV Ch 15	M-649	2,690 ± 250 (740 B.C.)	"
Lovelock Cave	C-276	2,481 ± 260 (531 B.C.)	Heizer and Napton 1970a: Table 4
"	I-4630	2,610 ± 120 (660 B.C.)	"

Site	Sample No.	Date	Reference
Lovelock Cave	C-735	3,168 ± 260 (1,218 B.C.)	Heizer and Napton 1970a: Table 4
"	I-4758	3,370 ± 100 (1,420 B.C.)	"
"	UCLA-1459C	3,400 ± 80 (1,450 B.C.)	"
NV Do 1	GaK-3358	3,720 ± 100 (1,770 B.C.)	Tuohy letter
Kramer Cave	UCLA-122	3,720 ± 100 (1,770 B.C.)	Radiocarbon 1962:114
Spooner Lake	I-1999	2,960 ± 195 (1,010 B.C.)	Elston 1971
"	I-1998	3,050 ± 105 (1,110 B.C.)	"
Wagon Jack Shelter	LJ-203	2,930 ± 200 (980 B.C.)	Clewlow et al. 1970 (and Radiocarbon 1967:478)
South Fork Rockshelter	LJ-212	3,320 ± 200 (1,370 B.C.)	Heizer, Baumhoff and Clewlow 1968
Newark Cave	WSU-538	2,035 ± 315 (85 B.C.)	Fowler 1968b
Chimney Cave (dessicated human burial)	UCLA-689	2,500 ± 80 (550 B.C.)	Radiocarbon 1965:337

Site	Sample No.	Date	Reference
Chimney Cave (dessicated human burial)	UCLA-690	2,510 ± 80 (560 B.C.)	Radiocarbon 1965:337
"	UCLA-692	2,590 ± 80 (640 B.C.)	"
Chimney Cave (matting with burial)	M-437	2,040 ± 250 (90 B.C.)	"
Pintwater Cave	UCLA-752	3,255 ± 80 (1,305 B.C.)	Radiocarbon 1965:342
NV Wa 198 (Falcon Hill)	UCLA-904	2,175 ± 80 (225 B.C.)	Radiocarbon 1966:472
NV Wa 196	UCLA-905	3,660 ± 80 (1,710 B.C.)	"
NV Wa 202	UCLA-931	3,325 ± 90 (1,375 B.C.)	"
NV Wa 196	UCLA-932	3,745 ± 90 (1,795 B.C.)	"
"	UCLA-976	3,620 ± 80 (1,670 B.C.)	Radiocarbon 1966:473
"	UCLA-979	3,660 ± 100 (1,710 B.C.)	"

Site	Sample No.	Date	Reference
NV Wa 196	UCLA-980	3,760 ± 80 (1,810 B.C.)	Radiocarbon 1966:473
"	UCLA-983	3,850 ± 100 (1,900 B.C.)	"
"	UCLA-984	3,700 ± 80 (1,750 B.C.)	"
NV Wa 315	GaK-2805	3,270 ± 180 (1,320 B.C.)	Tuohy letter
NV Wa 404	GaK-2386	2,480 ± 120 (530 B.C.)	"
NV Wa 196	GaK-2387	3,830 ± 110 (1,880 B.C.)	"
NV Wa 275	GaK-2388	2,430 ± 100 (480 B.C.)	"
"	GaK-2390	2,140 ± 110 (190 B.C.)	"
NV Wa 525	GaK-3361	2,410 ± 90 (460 B.C.)	"
Gatecliff Cave	GaK-3618	3,690 ± 100 (1,740 B.C.)	D. Thomas letter

Site	Sample No.	Date	Reference
Gatecliff Cave	GaK-3615	3,140 ± 120 (1,190 B.C.)	D. Thomas letter
"	GaK-3617	2,280 ± 90 (330 B.C.)	"
UTAH			
Danger Cave IV	C-636	3,819 ± 160 (1,869 B.C.)	Libby 1955:120
Hogup Cave	GaK-1564	3,200 ± 140 (1,250 B.C.)	Dalley letter
"	GaK-2081	2,600 ± 100 (650 B.C.)	"
"	GaK-2079	2,550 ± 70 (600 B.C.)	"
"	GaK-1560	2,920 ± 80 (970 B.C.)	"
Deluge Shelter	GX-0898	3,840 ± 210 (1,890 B.C.)	"
"	GX-0899	3,630 ± 85 (1,680 B.C.)	"
"	GX-0897	3,260 ± 120 (1,310 B.C.)	"

Site	Sample No.	Date	Reference
Spotten Cave	I-3364	2,110 ± 100 (160 B.C.)	Dalley letter
"	I-3361	3,660 ± 110 (1,710 B.C.)	"
Swallow Shelter	RL-109	2,630 ± 110 (680 B.C.)	"
"	RL-87	2,850 ± 100 (900 B.C.)	"
"	RL-110	3,500 ± 120 (1,550 B.C.)	"
Rockshelter near Ferron, Utah	RL-131	3,070 ± 170 (1,120 B.C.)	"

Period IV (1 A.D.-present)

Site	Sample No.	Date	Reference
OREGON			
Catlow Cave No. 1	C-430	959 ± 150 (A.D. 991)	Heizer 1951b
7-Mile Ridge	GaK-1746	1,060 ± 80 (A.D. 890)	Bedwell 1970
IDAHO			
Wilson Butte Cave	M-1088	425 ± 150 (A.D. 1535)	Gruhn 1961a:37
CALIFORNIA			
"Moon Mountain Phase" (Lowland Patayan)	?	450 ± 200 (A.D. 1,500)	Harner 1958
"	?	130 ± 200 (A.D. 1,820)	"
"	?	120 ± 200 (A.D. 1,830)	"
Crane Flat	UCLA-276	950 ± 70 (A.D. 1,000)	E. Davis 1964:257
"	UCLA-277	1,580 ± 80 (A.D. 370)	"
Rodriguez	I-3208	1,050 ± 100 (A.D. 900)	O'Connell and Ambro 1968

Site	Sample No.	Date	Reference
King's Dog	GaK-2580	1,330 ± 90 (A.D. 620)	O'Connell 1971
NEVADA			
Tule Springs (ceramic occupation	UCLA-640	200 ± 80 (A.D. 1,750)	Haynes 1968:616
"	UCLA-635	570 ± 80 (A.D. 1,380)	"
"	UCLA-515	360 ± 120 (A.D. 1,590)	"
"	UCLA-516	725 ± 80 (A.D. 1,215)	"
Spooner Lake	I-2003	1,720 ± 100 (A.D. 230)	Elston 1971
"	I-1996	1,800 ± 100 (A.D. 150)	"
"	I-1997	1,890 ± 100 (A.D. 60)	"
"	I-1995	565 ± 120 (A.D. 1,385)	"
"	I-2004	380 ± 0 (A.D. 1,570)	"

Site	Sample No.	Date	Reference
Spooner Lake	I-2002	410 ± 95 (A.D. 1,540)	Elston 1971
Daphne Creek (Jack's Valley)	I-2006	460 ± 0 (A.D. 1,490)	Radiocarbon 1968:280
"	UCLA-1072	365 ± 135 (A.D. 1,585)	Elston 1971
Thompson (Steamboat Springs)	TX-1390	330 ± 60 (A.D. 1,620)	Elston and Davis 1972
Hesterlee (NV Pe 67)	UCLA-1071D	320 ± 50 (A.D. 1,630)	Clewlow et al. 1970
Lovelock Cave	UCLA-1071E	145 ± 80 (A.D. 1,805)	Heizer and Napton 1970a: Table 4 (See also Radiocarbon 1967:479)
"	I-4672	520 ± 95 (A.D. 1,430)	"
"	UCLA-1071F	1,210 ± 60 (A.D. 756)	"
"	I-3963	1,470 ± 90 (A.D. 480)	"
"	I-4629	1,510 ± 90 (A.D. 440)	"

Site	Sample No.	Date	Reference
Lovelock Cave	UCLA-1418	1,600 ± 50 (A.D. 350)	Heizer and Napton 1970a: Table 4 (See also Radiocarbon 1967:479)
"	UCLA-1459B	1,650 ± 60 (A.D. 300)	"
"	C-728, C-729 and C-730	1,672 ± 220 (A.D. 268)	"
"	UCLA-1459A	1,830 ± 60 (A.D. 120)	"
"	UCLA-1417	1,900 ± 60 (A.D. 50)	"
"	RL-48	1,440 ± 110 (A.D. 510)	Adovasio 1970:Table 3
NV Ch 15	UCLA-1071A	550 ± 60 (A.D. 1,400)	Clewlow et al. 1970
Falcon Hill	UCLA-124	1,860 ± 70 (A.D. 90)	Radiocarbon 1963:7
"	UCLA-677	580 ± 80 (A.D. 1,370)	Rozaire 1966
NV Wa 200 (Falcon Hill)	UCLA-906	1,240 ± 80 (A.D. 710)	Radiocarbon 1966:472

Site	Sample No.	Date	Reference
NV Wa 198	UCLA-933	1,725 ± 20 (A.D. 225)	Radiocarbon 1966:473
NV Wa 205	UCLA-982	390 ± 80 (A.D. 1,560)	"
"	UCLA-985	400 ± 80 (A.D. 1,550)	Radiocarbon 1966:474
NV Wa 198	UCLA-986	595 ± 80 (A.D. 1,395)	"
NV Wa 385	GaK-2806	1,830 ± 90 (A.D. 120)	Tuohy letter
NV Wa 528	GaK-2809	1,340 ± 100 (A.D. 610)	"
NV Wa 729T	GaK-2810	620 ± 80 (A.D. 1,330)	"
NV Wa 1016	I-2846	1,820 ± 180 (A.D. 130)	Tuohy and Stein 1968
NV Wa 291	GaK-2804	1,950 ± 100 (A.D. 0)	Tuohy letter
NV Wa 372C	GaK-2385	380 ± 100 (A.D. 1,570)	"

Site	Sample No.	Date	Reference
NV Wa 355	GaK-2389	240 ± 100 (A.D. 1,710)	Tuohy letter
NV Ch 162 (Hanging Rock Cave)	GaK-2391	1,730 ± 90 (A.D. 220)	"
NV Nye 251	GaK-3359	80 ± 0 (A.D. 1,870)	"
NV Pe 00	GaK-3360	910 ± 80 (A.D. 1,040)	"
NV Do 37	UCLA-1072	365 ± 135 (A.D. 1,585)	Radiocarbon 1967:480
Newark Cave	WSU-464	1,760 ± 100 (A.D. 190)	Fowler 1968b
"	WSU-463	840 ± 340 (A.D. 1,110)	"
Deer Creek Cave	WSU-244	715 ± 140 (A.D. 1,235)	Shutler and Shutler 1963
"	WSU-245	1,150 ± 110 (A.D. 440)	"
Scott	RL-47	940 ± 120 (A.D. 1,010)	Fowler letter (See also Radiocarbon 1971:74)

Site	Sample No.	Date	Reference
Conway Shelter	RL-36	230 ± 100 (A.D. 1,720)	Fowler letter (See also Radiocarbon 1971:74)
"	RL-37	1,050 ± 100 (A.D. 900)	"
"	RL-38	940 ± 100 (A.D. 1,010)	"
O'Malley Shelter	RL-42	890 ± 100 (A.D. 1,060)	"
"	RL-43	870 ± 100 (A.D. 1,080)	"
Gatecliff Cave (Reveille Phase)	GaK-3609	2,020 ± 80 (A.D. 280)	D. Thomas letter
"	GaK-3610	1,580 ± 90 (A.D. 370)	"
Gatecliff Cave (Underdown Phase)	GaK-3608	1,000 ± 90 (A.D. 950)	"
Gatecliff Cave (Yankee Blade Phase)	GaK-3606	750 ± 90 (A.D. 1,200)	"
"	GaK-3607	590 ± 90 (A.D. 1,360)	"

Site	Sample No.	Date	Reference
Gatecliff Cave (Yankee Blade Phase)	GaK-3614	550 ± 90 (A.D. 1,400)	D. Thomas letter
"	GaK-3613	470 ± 90 (A.D. 1,480)	"
UTAH			
Danger Cave V	C-635	1,930 ± 240 (A.D. 20)	Libby 1955:120
Deluge Shelter	GX-0896	1,625 ± 95 (A.D. 325)	Dalley letter
"	GX-0895	1,215 ± 85 (A.D. 735)	"
"	GX-0894	1,030 ± 85 (A.D. 920)	"
Hogup Cave	GaK-1561	1,530 ± 80 (A.D. 420)	"
"	GaK-2078	1,210 ± 100 (A.D. 740)	"
"	GaK-2080	620 ± 100 (A.D. 1,330)	"
Promontory Cave	GaK-1579	1,310 ± 70 (A.D. 640)	"

Site	Sample No.	Date	Reference
Promontory Cave	GaK-1578	320 ± 80 (A.D. 1,630)	Dalley letter
"	GX-0551	850 ± 75 (A.D. 1,110)	"
Spotten Cave	I-3359	730 ± 90 (A.D. 1,220)	"
"	I-3358	1,310 ± 90 (A.D. 640)	"
Swallow Shelter	RL-108	1,120 ± 100 (A.D. 830)	"

APPENDIX II

Geological Radiocarbon Dates from the Great Basin

I have listed below a select group of geological radiocarbon dates. There are many geological radiocarbon assays from the Great Basin region, but only a small percentage are directly applicable to archaeological problems, and it is these pertinent dates which are given here. For more extensive listings of geological radiocarbon dates from this region, see Broecker and Orr (1958) and Broecker and Kaufmann (1965).

Site and description	Sample No.	Date	Reference
OREGON			
Christmas Valley; shell sample; old beach line	GaK-1752	13,380 ± 230 (11,430 B.C.)	Bedwell 1970
Christmas Valley; caliche sample; overlies GaK-1752	GaK-1753	9,780 ± 220 (7,830 B.C.)	"
Fort Rock Valley; caliche sample; late terrace	GaK-1754	2,840 ± 140 (890 B.C.)	"
Near Crater Lake; Mazama ash	GaK-1124	7,010 ± 120 (5,050 B.C.)	Bedwell and Cressman 1971:10
"	TX-487	6,940 ± 120 (4,990 B.C.)	"
Mt. Mazama ash	C-247	6,453 ± 250 (4,503 B.C.)	Bedwell 1970
"	W-858	6,650 ± 250 (4,700 B.C.)	"
CALIFORNIA			
Lake Mohave; on _Anodonta_ shells between 925-930 foot level	LJ-200	9,640 ± 240 (7,690 B.C.)	Warren and DeCosta 1964
Lake Mohave: antedates "Lake Mohave complex"	Y-1585	13,620 ± 160 (11,670 B.C.)	Radiocarbon 1969:582-584

Site and description	Sample No.	Date	Reference
Lake Mohave: period of overflow	Y-1586	14,550 ± 140 (12,600 B.C.)	Radiocarbon 1969: 582-584
"	Y-1587	15,350 ± 240 (13,400 B.C.)	"
"	Y-1588	13,040 ± 120 (11,090 B.C.)	"
Lake Mohave: early high level	Y-1589	13,290 ± 240 (11,340 B.C.)	"
"	Y-1590	11,320 ± 120 (9,370 B.C.)	"
Lake Mohave: late high stand	Y-1591	10,700 ± 100 (8,750 B.C.)	"
"	Y-1592	9,900 ± 100 (7,950 B.C.)	"
"	Y-1593	10,580 ± 100 (8,630 B.C.)	"
Panamint Dry Lake: organic mat	UCLA-990	10,520 ± 140 (8,570 B.C.)	E. Davis 1967:345
Panamint Dry Lake: "environment date"	UCLA-989	10,020 ± 120 (8,070 B.C.)	"

Site and description	Sample No.	Date	Reference
Pluvial Manix Lake; on tufa below the high stand shoreline	LJ-269	17,540 ± 400 (15,590 B.C.)	Radiocarbon 1962:227
"	UCLA-121	17,340 ± 400 (15,390 B.C.)	Radiocarbon 1962:113
NEVADA			
Leonard Rockshelter; on shell; high stand of Lake Lahontan	UCLA-298	13,100 ± 100 (11,050 B.C.)	Radiocarbon 1964:328
Leonard Rockshelter; on bat guano at base of deposits	C-599	11,199 ± 570 (9,248 B.C.)	Libby 1955
Hidden Cave (tufa)	L-289AA	15,130 ± 400 (13,180 B.C.)	Science 126:1332
Dixie Valley; on tufa; last high stand of Dixie Lake	I-3269	11,560 ± 180 (9,610 B.C.)	Radiocarbon 1970:90
"	I-3270	11,560 ± 180 (9,750 B.C.)	"
Boot Hill (Humboldt Sink); on tufa; near 4300' elevation	L-364AA	9,500 ± 200 (7,550 B.C.)	Shutler 1961b

Site and description	Sample No.	Date	Reference
Boot Hill (Humboldt Sink); on tufa; near 4300' elevation	L-289G	9,700 ± 200 (7,750 B.C.)	Shutler 1961b
Lovelock Cave; bat guano at base of occupation	C-278	6,004 ± 250 (4,054 B.C.)	Heizer and Napton 1970a: Table 4
Lovelock Cave (bat guano)	C-277	4,448 ± 250 (2,498 B.C.)	Heizer and Napton 1970a: Table 4

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AA	American Anthropologist
AAnt	American Antiquity
BGSA	Bulletin, Geological Society of America
NAS	Nevada Archeological Survey
-R	Reporter
NSM	Nevada State Museum
-AP	Anthropological Papers
SWM	Southwest Museum
-M	Masterkey
-P	Papers
UC	University of California
-AR	Anthropological Records
-CARF	Contributions, Archaeological Research Facility
-PAAE	Publications, American Archaeology and Ethnology
UCAS	University of California Archaeological Survey
-R	Reports
UCLA	University of California, Los Angeles
-ASAR	Archaeological Survey, Annual Report
UUAP	University of Utah Anthropological Papers

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