

NUMBER EIGHTEEN

SOUTHWEST MUSEUM PAPERS



TULE SPRINGS, NEVADA
WITH OTHER EVIDENCES OF
PLEISTOCENE MAN IN NORTH AMERICA

by

MARK RAYMOND HARRINGTON

and RUTH DEETTE SIMPSON

Southwest Museum

BOARD OF TRUSTEES

	TERM EXPIRES		TERM EXPIRES
Judge Stanley N. Barnes.....	1962	Dr. Norman Sprague, Jr.....	1965
Mr. Van Rensselaer G. Wilbur.....	1962	Mr. Charles A. Collins.....	1966
Mr. Keith Spalding*.....	1962	Mr. Carl S. Dentzel.....	1966
Mr. Henry Clifford.....	1963	Mr. Albert P. Drasdo.....	1966
Mr. Jonathan Bell Lovelace.....	1963	Mr. Homer D. Crotty.....	1967
Mr. W. W. Robinson.....	1963	Prof. Kenneth Macgowan.....	1967
Mrs. Stuart Chevalier.....	1964	Mr. Robert J. Woods.....	1967
Mrs. Thomas E. Curtin.....	1964	Mr. Phil Berg.....	1968
Mr. James Jones Prentice.....	1964	Mr. John O'Melveny.....	1968
Mr. Preston Hotchkis.....	1965	His Eminence	
Mr. Garner A. Beckett.....	1965	James Francis Cardinal McIntyre..	1968

EX-OFFICIO

Dr. Franklin D. Murphy, Chancellor of University of California, Los Angeles
 Dr. George C. S. Benson, President of Claremont Men's College
 Rev. Charles S. Casassa, S.J., President of Loyola University
 Dr. Arthur G. Coons, President of Occidental College
 Dr. L. A. DuBridge, President of the California Institute of Technology
 Dr. Frederick Hard, President of Scripps College
 Dr. E. Wilson Lyon, President of Pomona College
 Dr. Joseph B. Platt, President of Harvey Mudd College
 Dr. John E. Pomfret, Director of the Henry E. Huntington Library and Art Gallery
 Dr. Norman H. Topping, President of University of Southern California
 Dr. Paul S. Smith, President of Whittier College
 Mr. Carl S. Dentzel, Director of the Southwest Museum

PRESIDENT: Mr. Homer D. Crotty

VICE-PRESIDENTS: Mr. Preston Hotchkis, Mr. John O'Melveny, Dr. Norman Sprague, Jr.

SECRETARY: Mrs. Madeleine Amsden

TREASURER: Mr. Albert P. Drasdo

ASSISTANT TREASURER: Mrs. Madeleine Amsden

EXECUTIVE COMMITTEE: Mr. Homer D. Crotty, Chairman; Mr. Garner A. Beckett, Mr. Preston Hotchkis, Mr. Jonathan Bell Lovelace, Mr. John O'Melveny, Dr. Norman Sprague, Jr., Mr. Carl S. Dentzel (ex-officio).

FINANCE COMMITTEE: Mr. Albert P. Drasdo, Chairman; Mr. Preston Hotchkis, Mr. Henry Clifford, Mr. Jonathan Bell Lovelace, Dr. Norman Sprague, Jr.

LIBRARY COMMITTEE: Mr. Carl S. Dentzel, Chairman; Mr. W. W. Robinson, Mr. Robert J. Woods.

* Deceased

NUMBER EIGHTEEN

SOUTHWEST MUSEUM PAPERS



TULE SPRINGS, NEVADA
WITH OTHER EVIDENCES OF
PLEISTOCENE MAN IN NORTH AMERICA

by

MARK RAYMOND HARRINGTON

and RUTH DEETTE SIMPSON



SOUTHWEST MUSEUM
HIGHLAND PARK, LOS ANGELES 42, CALIFORNIA
1961

*Printed by the Cole-Holmquist Press
Los Angeles*

Table of Contents

	PAGE
FOREWORD	7
ACKNOWLEDGMENTS	11
INTRODUCTION	13
CHAPTER I: SURVEY OF KEY EARLY ARCHEOLOGICAL LOCALITIES IN THE WESTERN UNITED STATES	15
The High Plains	15
The Basin and Range Province	19
Other Western Physiographical Provinces	31
Brief Summary of Localities Outside the Western Provinces	37
CHAPTER II: TULE SPRINGS	41
A General Statement	41
Discovery	42
Geology	47
First Southwest Museum Expedition	50
New Significance . . . Radiocarbon Dating	58
Second Southwest Museum Expedition	59
Third Southwest Museum Expedition	68
CHAPTER III: SUMMARY OF FIRE AREAS AND PERTINENT FAUNAL EVIDENCE	72
Fire Areas With Associated Animal Bones and Man-Made Artifacts	72
Fire Areas With Associated Animal Bones	76
Fire Areas Without Associated Faunal Remains	90
Occurrences of Faunal Remains Without Associated Charcoal	90
Artifacts on the Surface	97
Miscellaneous Sites	98
CHAPTER IV: TULE SPRINGS ARTIFACTS	100
Artifacts Found in Place in the Charcoal	100
Artifacts Found out of Place in the Side Canyons	103
CHAPTER V: REGIONAL ARCHEOLOGICAL SURVEY	108
Las Vegas Valley Sites, Tule Springs Region	108
Specimens From Las Vegas Valley Sites, Tule Springs Region	110
Corn Creek Survey	125
Artifacts From Corn Creek	126
CHAPTER VI: SUMMARIZATION AND ANALYSIS	131
BIBLIOGRAPHY	139

List of Illustrations

MAPS

MAP	PAGE
1 Some Significant Early Archeological Sites in Western North America	following page 146
2 Southern California-Southern Nevada: Prehistoric and Modern Landmarks	following page 146
3 The Tule Springs Locality	following page 146

CHARTS

CHART	
1 Summary of Sites	99
2 Projectile Points from Las Vegas Valley	129
3 Incising Tools from Las Vegas Valley	129
4 Refined Scrapers from Las Vegas Valley	129
5 Miscellaneous Implements from Las Vegas Valley	129
6 Massive Artifacts from Las Vegas Valley	129

FIGURES

FIGURE	
1 Diagnostic Early Projectile Points	14
2 Unfluted Lanceolate Projectile Points and Cody Knife	18
3 Lake LeConte, Colorado Desert	20
4 Pinto Basin, Colorado Desert	20
5 Playa Complex Projectile Points	22
6 Cochise Grinding Tools, Southern Arizona	24
7 Ventana Cave, Southern Arizona	25
8 Manly Terrace, Death Valley	27
9 Manix Lake Lithic Industry, Type Site	28
10 Manix Lake Lithic Industry Specimens	28
11 Oldest Radiocarbon-dated Locality, Lewisville, Texas	31
12 Material Comparable to Manix Lake	33
a) Black's Fork Specimens	
b) Lake Chapala Specimens	
13 Tule Springs Locality, General View	42

FIGURE	PAGE
14 Tule Springs Locality, Vegas Wash	44
15 The Fenley Hunter Site (Site A, Area 3)	45
16 Obsidian Flake from Hunter Site	46
17 View of Lake Deposits Underlying Las Vegas Valley	51
18 View of Lake Deposits Underlying Las Vegas Valley	51
19 Ground and Polished Pointed Bone, Ash Bed 2	52
20 Exposed Bone Fragments are Guides to Buried Deposits	53
21 Side Canyons of the Vegas Wash	53
22 Stone Implements Found near Ash Bed 2	54
a-c) Limestone Chopper	
d-f) Limestone Scraper	
23 Stone Implements Found near Ash Bed 2	55
a-b) Large Bifacially Flaked Ovoid	
c-e) Small Bifacially Flaked Ovoid	
24 Stone Chopper Found near Ash Bed 2	56
25 Stone Implements (?) Found near Ash Bed 2	57
26 Ash Bed 2	60
a) 1933	
b) 1955	
c) Close View	
27 Mammoth Bones near Ash Bed 2	62
28 Hearth, Dr. Rozaire, Site A, Area 2	63
29 The Hunter Site, 1955	64
30 Mammoth, Survey Site 4	66
31 Orr Removing Overburden, Area 1	69
32 Area 2, Site D	70
a) Orr Removing Overburden	
b) Ruth Simpson Continues Excavation	
33 Charcoal Pocket Containing Scraper	75
34 Scraper From Site D, Area 2	76
35 Ash Bed 2	77
a) Profile	
b) Close View	
36 Ash Bed 1, Profile	79
37 Teeth and Charcoal, Ash Bed 1	80

FIGURE	PAGE
38 Site A, Area 1	81
a) M. R. Harrington	
b) Excavation of Charcoal	
39 Profile of Site A, Area 1	82
40 The Use of Dynamite	83
41 Site A, Area 1	84
a) After Excavation: Half of Feature Left Intact	
b) Recording and Collecting Charcoal	
42 Site A, Area 2	85
43 Sketch of Site A, Area 2	86
44 Camel Bone from Site C, Area 2	88
45 Survey Site 6	89
46 Site D, Area 1	92
a) McCown and Peck at Work	
b) Mammoth Jaw Bones Uncovered	
47 Diagram of Survey Site 4	94
48 Removing Mammoth Bones, Survey Site 4	95
49 Survey Site 7	96
50 Rocks in Erosion Channel Below Ash Bed 2	97
51 Pointed Bone Tool, Ash Bed 2	101
52 Las Vegas Valley	109
a) Surface Site, Regional Survey	
b) Knolls Rising Above Floor of Las Vegas Valley, Occupation Area	
53 Projectile Points	111
54 Projectile Points	114
a) Side-Notched Projectile Point, Southern Survey, Las Vegas Valley	
b) Miscellaneous Weapon Points	
55 Miscellaneous Artifacts, Las Vegas Valley	116
56 Scrapers	118
57 Massive Implements, Las Vegas Valley	122
58 Camp	126
59 Corn Creek	128
a) Locality	
b) Corn Creek Specimens	
60 Concept of Columbian Mammoth, Tule Springs	135

Foreword

LOOKING BACK, one may well wonder why the original discovery of the Tule Springs locality in 1933, with its evidences of contemporaneity of man and extinct Pleistocene fauna as reported in that year by Dr. George Gaylord Simpson of the American Museum of Natural History, did not draw more attention from archeologists. About all that can be said now is that many American archeologists were then still having difficulty in believing the evidence at Folsom, New Mexico, that man had actually killed bison there of a species now extinct. Let me hasten to add that this difficulty was not characteristic of *all* American archeologists, especially of some Latin-Americans who had already discovered and reported several such associations and were merely puzzled by the reluctance of certain American "authorities" to accept them. These American "authorities," on the other hand, had one important point to fall back on: they claimed that in every purported case of association of man and extinct Pleistocene fauna the field work was inadequate to prove such association beyond question.

In the long run, this attitude of doubt had beneficial results: workers in the field began to make much more careful observations and they became more conscious of their obligations to science in proving that such associations were *primary* rather than "secondary" or "accidental." Thus, through improved field methods, there is no longer any doubt that many purported associations of man and extinct Pleistocene fauna are entirely valid. The next obvious question — how far back in time can man be traced in the New World? — is now undergoing constant revision in the light of geological and radiocarbon dating. Magnitudes of "greater than 37,000 years" have been obtained at the Lewisville site in north central Texas, and of about 30,000 years on Santa Rosa Island off the coast of southern California.

Although Harrington had followed up the American Museum discovery at Tule Springs promptly, in 1933, and found additional evidence for the contemporaneity of man and Pleistocene fauna—even several additional artifacts—this work likewise gained little attention among archeologists. At that time there was, of course, no radiocarbon dating technique and no one had any clues as to the actual age of the charcoal deposits or the split and burned bones of now-extinct animals associated with them. Twenty-one years were to pass before the Southwest Museum organized a series of expeditions to explore the Tule Springs locality further as a direct result of a radiocarbon age-determination from the University of Chicago laboratory of "greater than 23,800 years" on charcoal from one of

the deposits. Even this dating aroused little attention from archeologists, most of whom were far from satisfied that the date was correct, or that it could be proved to apply to the presence of man. The writer, having announced the date in the Notes and News section of *American Antiquity*, subsequently heard many such remarks as "I'll wait for the field report before I'll believe it."

In August, 1956, I visited the locality with Dr. Charles Rozaire of the Southwest Museum and Dr. Homer Aschmann of the University of California at Riverside. I will not soon forget our hike of some five miles to the site from the nearest road, and back again, over the desert sands in August heat. What impressed me most was the series of silt, sand, and caliche deposits *overlying* the lacustrine clays in which the fire areas and fossils were buried. I thought then, and still do, that the locality had a long and impressive geological history after the time that Pleistocene animals had been killed and roasted around the margins of "pluvial" lakes and swamps. Compared with the present true desert which can be classified as "Lower Sonoran," the past environment which supported Pleistocene game represents an enormous difference—as great a change as can be found anywhere in the New World. Although I did not see very much in the way of fossils or charcoal deposits, Dr. Rozaire pointed out several places where the Southwest Museum had collected this material.

Now that another radiocarbon date has been obtained that is at least 28,000 years and might—if the sample could be completely freed of contaminants—be as much as 33,000 years, the Tule Springs discoveries are unquestionably of the very greatest importance in New World prehistory. The present report presents numerous field details not previously available in print and answers most of the questions that will arise as to the validity of the association between man and several Pleistocene mammals. It does not pretend to answer *all* questions: that can only be done with more extensive exploration, which in turn requires considerably greater funds than the Southwest Museum has had available. I feel that the authors and their voluntary assistants have done a very creditable job under most trying circumstances. Those who have never worked in sites of this nature can have little appreciation of the vast amount of work needed to gain even a small amount of solid evidence from most of our "Early Man" sites. These localities, in the course of time, commonly became covered with thousands of tons of overburden in one way or another; today we can see but a tiny proportion of the original land surfaces, usually through arroyo cutting or wind deflation. One of the most frustrating experiences imaginable is to be able to expose only the tantalizing bits of a buried site, and know what riches might be found if only

it were possible to expose the former surfaces laterally over wide areas.

I still am puzzled by one matter: namely, whether the ancient inhabitants actually dug basin-shaped pits in which to roast the meat of their kills. While one of the features is classified as a "hearth" and several others are called "pits," and still others are called "charcoal deposits" or "charcoal dumps," it still is not clear whether there was a general trait of digging pits for roasting or whether some natural depressions may have served the same purpose. Having visited the locality, I can understand that the question cannot readily be answered without considerably more laborious excavation in the tough clays to expose the fire areas in section.

One thought occurred to me as I read the manuscript which may bear watching in the future. No sign of a stone projectile point has yet appeared at this locality, nor would one expect such artifacts so long ago. The accounts of the individual "sites" or features show a certain tendency as follows: where there was fire, the animals identified are mainly camel, horse, or bison; where there was no sign of fire, the animals were mainly mammoth. Is it possible, then, that man could not have killed the mammoths here or anywhere until he had effective weapons such as stone spear points? He naturally would have cut the meat from such animals as bogged in swamps and eventually died, but I have the feeling from the evidence so far given here that it was the camels which were most often and easily killed by man, and portions roasted at or near the kill sites. One might speculate further that nowhere in the world did man become an effective hunter of the largest animals until he had invented suitable weapons or trapping devices.

ALEX D. KRIEGER

June 1960

Acknowledgments

THE SOUTHWEST MUSEUM gratefully acknowledges the assistance which has come from many sources to make the Tule Springs project and publication possible.

First and foremost, of course, is our appreciation of the scientific skill displayed by Mr. Fenley Hunter, from the American Museum of Natural History, and his associates Albert Silberling and Frank Bell. It was these men who made the original discovery at Tule Springs and who recognized the importance of the charcoal with imbedded obsidian flake. We also acknowledge the generous cooperation of Mr. Hunter and the American Museum of Natural History in turning over the archeological investigation to Dr. Harrington and the Southwest Museum.

For work done with Dr. Harrington in 1933, we wish to thank Mr. Fay Perkins of the Overton Museum, Overton, Nevada.

For assistance in the field during the 1955 and 1956 expeditions, we are obligated to Mr. Stuart Peck, Mr. and Mrs. Ernest McCown, Lt. and Mrs. S. M. Wheeler, Mr. Willis Grafton and, from our own staff, Dr. Charles Rozaire. No acknowledgment of field activity would be complete without sincere recognition of the important role played by Mr. Phil Orr of the Santa Barbara Museum of Natural History who contributed to our investigations not only through the recovery of paleontological specimens, but also by the removal of overburden. Without Mr. Orr's help, the one stone implement found in place in the charcoal would not have been uncovered. We are, of course, indebted to the Santa Barbara Museum which permitted Mr. Orr to bring his jeep and other equipment and join us for a week.

Technical assistance, too, has come from many sources. Mr. David Bailey and Mr. John Kettl have prepared the maps included in this report. Drawings of specimens were the work of Mr. Hasso von Winning, Southwest Museum associate. Photographs of the original excavation and of the obsidian flake have been made available by Mr. Hunter and the American Museum of Natural History. Most illustrations were taken by the authors, but as indicated in the text, some photographs were the work of Mr. John Kettl and Mr. Stuart Peck. Identification of paleontological specimens was made by Dr. George Gaylord Simpson, American Museum of Natural History, Mr. Orr and Dr. Ted Downs, Los Angeles County Museum. Shells have been classified by Dr. Gaylord Simpson and Dr. Carl Hubbs, Scripps Institution of Oceanography. Wood samples have been identified by Dr. Ted Smiley, Geochronological Laboratories, University of Arizona, and by the Forest Products Labora-

tory. Geological background has been supplied by Dr. Chester Longwell, U. S. Geological Survey, who generously took time to visit the locality and to discuss the several geological problems involved in the project. Radiocarbon dates have been supplied by Dr. Willard Libby, University of Chicago, and Drs. Wallace Broecker and Edwin A. Olson of Lamont Geological Laboratory, Columbia University. It was the determination of "more than 23,800 years" by Dr. Libby that first made Tule Springs one of America's crucial prehistoric localities.

Excavation was made possible by permits granted the Southwest Museum by the U.S. Department of the Interior and by the Nevada State Park Commission through the cooperation of the Nevada State Museum.

The Tule Springs expeditions were facilitated by hospitality offered by the owners of the Gilchrist Ranch and Mr. and Mrs. Gerald Davis in Las Vegas.

It is a pleasure to express our appreciation of the help, criticism and encouragement graciously afforded by Dr. Alex Krieger, Riverside Municipal Museum, who has read the entire manuscript and Mr. Ted Sayles, Arizona State Museum, who has read major portions of it; by the several archeologists who have verified data presented in Chapter I, and by the institutions which furnished photographs used in Chapters I and II.

As the Museum is grateful to Mr. Hunter, whose cooperation made the Tule Springs investigations possible, so it gratefully acknowledges deep indebtedness to the Haynes Foundation which provided the financial assistance making possible this publication.

Lithic materials represented by the stone tools were identified by Dr. Thomas Clements, Geology Department, University of Southern California. The artist's reconstruction of the mammoth (Fig. 60) was prepared by Mr. Allen Welts, State of California, Division of Beaches and Parks. Profiles of representative excavations were drawn by Dr. Rozaire.

Introduction

ARCHEOLOGY IS A YOUNG, GROWING SCIENCE. Only a century has passed since Man's antiquity and the Paleolithic stage of his cultural evolution were accepted even in the Old World. It is just 35 years since the first discovery was made in America which gave scientific backing to the concept of Man's presence in this country during the terminal phase of the Pleistocene or Ice Age. Discovery in 1926 of a few flaked weapon points with bones of an extinct species of bison kindled the flame, and a challenging new facet of American archeology came into existence. Today, the study of American Pleistocene and early post-Pleistocene prehistory commands the attention of archeologists, geologists, paleontologists and physicists across the land.

The preconceived idea that Man—the American Indian and his ancestors—could not have been on this continent more than 3,000 or 4,000 years, has largely disappeared. Dogma is giving way before the determination of the search for Truth. Slowly, the accepted age for Man in America has lengthened, first to 10,000 years, to 12,000, to 20,000. Gradually, conservative scientists are coming to recognize the accumulating evidence which indicates that Man has occupied the Americas for 30,000 years and perhaps longer.

Throughout this advancement of the scientific frontier, the Southwest Museum has played an important role: Man was linked with the ground sloth, camel and horse at Gypsum Cave; California's first early sites were found by searchers working under this Museum's auspices; investigation of Pleistocene lithic industries in the Mohave Desert continues; our work at Tule Springs, which will be covered in detail later in this monograph, yielded charcoal from cooking fires that are at least 28,000 years old—a discovery which has done much to solidify scientific opinion regarding the antiquity of Man in America.

Before considering the Tule Springs data, let us review briefly some of the key discoveries upon which the foundations of our new science of early American prehistory have been built during the past 34 years.

Although the first discovery establishing the co-existence of Man and extinct Pleistocene animals was made on the High Plains, succeeding discoveries have been reported from several regions: the Plains, the desert provinces, the Pacific Coast and peripheral areas. Our survey will begin with the Plains. The chronological order in which archeological investigations were conducted at the several localities is indicated in the text.

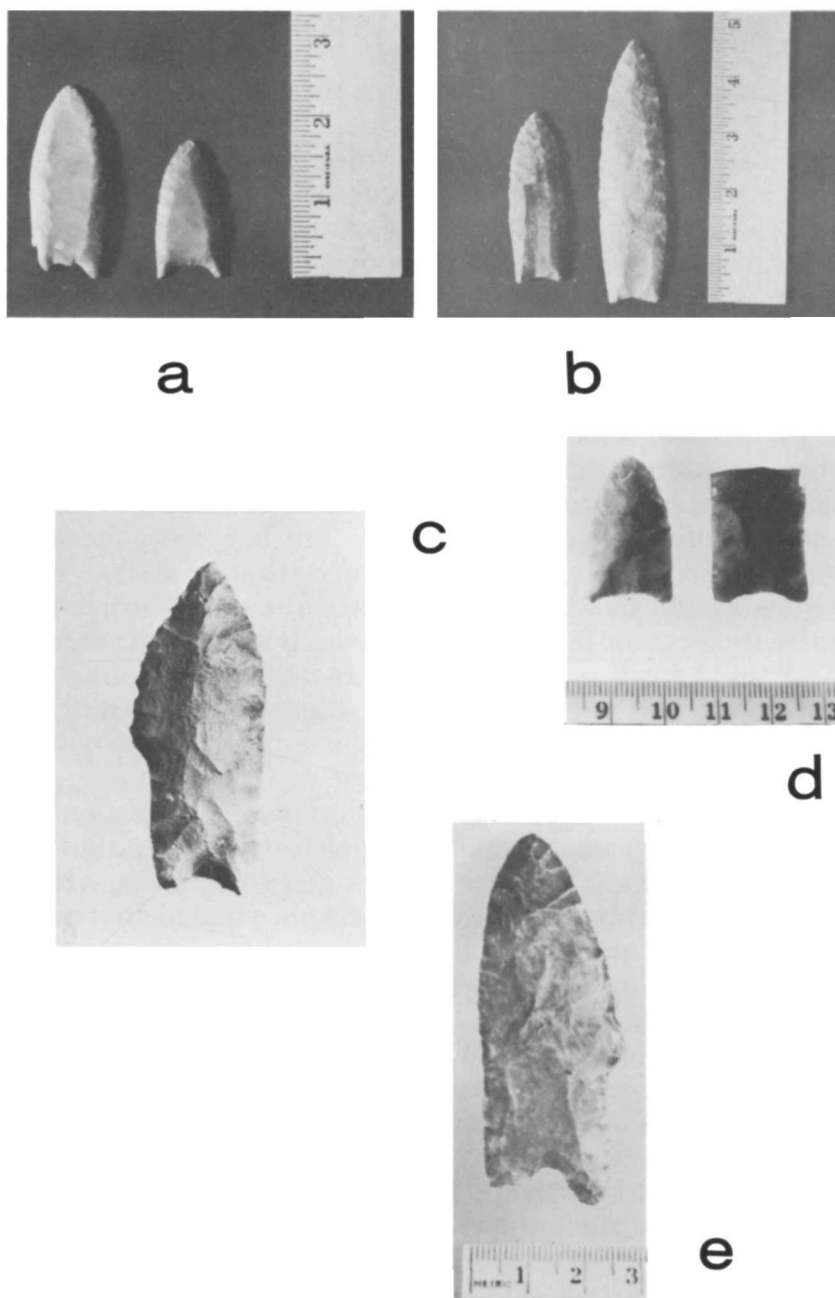


FIG. 1. Early projectile points of Western America: a, Folsom (courtesy Texas Memorial Museum); b, Clovis (courtesy Texas Memorial Museum); c, Sandia, length 8.1 cm. (courtesy University of New Mexico); d, unfluted Folsom (courtesy William Roosa); e, fluted Sandia (courtesy William Roosa).

CHAPTER I

Survey of Key Early Archeological Localities

by RUTH SIMPSON

THE HIGH PLAINS

THE FOLSOM SITE (Figgins 1927: 229-239): Near Folsom, New Mexico, in 1926, a Negro cowhand found an exposure of bones in the bank of a tributary to the Cimarron River. This discovery was reported to the Denver Museum of Natural History and excavations revealed a bison "kill." There were flaked stone weapon points among these bones, which represented several individuals of an extinct species of Pleistocene bison. Unusual in form, fluted on both surfaces and with basal edges ground smooth, the implements were destined to become known around the world as Folsom points (Fig. 1a).

Many archeologists doubted the authenticity of the discovery but, after several seasons' work, and visits to the locality by well-known scientists, the importance of the discovery was gradually accepted and critics could only suggest that some Pleistocene animals probably survived until more recent times. Geological proof of age was still needed.

THE LINDENMEIER SITE (Roberts, Jr. 1935, 1936): One of the best sources of geological proof came from the Lindenmeier Site in northeastern Colorado. Reported by Judge C. C. Coffin and Major Roy Coffin, this locality was excavated from 1934 to 1940 by Frank H. H. Roberts, Jr., of the Smithsonian Institution, aided by the Denver Museum of Natural History during the 1935 season. This was a camp of the "Folsom People." Partly uncovered by erosion, partially still buried, it could be studied by geologists. Their investigations showed that the camp had been occupied near the terminal phase of the Wisconsin Glaciation—the last stage of the Pleistocene or Ice Age. But how old was that in years? Eventually, Carbon-14 tests made on material from another Folsom Site near Lubbock, Texas, were to indicate that these points were made at least 9,800 years ago.

The Lindenmeier Site yielded, beside Folsom points, other implements used by the Folsom people: knives, various kinds of scrapers, incising tools, hammerstones, choppers, pieces of hematite, some carved bone ornaments—all associated with the bones of an extinct species of bison and other paleontological material.

CLOVIS SITE (Howard 1935: Part I, 299-303; Sellards 1952: 17-31; 32-36; 54-58), or as it is now more often called, BLACKWATER DRAW: This is one of the most important stratified localities in America and, here again, the antiquity of Man in America is carried back into the Pleistocene. The topography indicates an area which was once a large swamp or lake fed by seepage springs. At the Blackwater locality have been found, in deposits of increasing age: recent artifacts of an undetermined complex; older "archaic" material; diagnostic implements of the Portales Complex, Eden and Scottsbluff points; a small assemblage of typical Folsom projectile points and tools associated with an extinct species of bison; and, lastly, separated from the Folsom level by a marked disconformity, the basal cultural deposit representing the Llano Complex. In this lowest stratum the Columbian elephant is associated with pointed bone tools, hammerstones and typical Clovis fluted points (Fig. 1b). These latter stone implements are fluted, but are generally larger, thicker and less precisely fluted than the classic Folsom, with which they were confused before being placed in the Clovis classification.

First excavations at Blackwater Draw were conducted by Drs. E. B. Howard and J. L. Cotter, representing several institutions including the University of Pennsylvania and the National Academy of Sciences. More recently, excavations have been carried forth by Dr. E. H. Sellards and Mr. Glen L. Evans of the Texas Memorial Museum.

MIAMI (Studer 1935; Sellards 1952: 18-29): Another principal locality representing the Llano Complex is Miami in northern Texas. From the clays and silts of an ancient water-hole have been recovered the bones of several mammoths and among these bones were three Clovis projectile points and a convex-edged side scraper. Though the number of specimens is not large, this is a site of prime importance as it further establishes the contemporaneity of Man and the Columbian mammoth.

SCOTTSBLUFF (Barbour & Schultz 1932), FINLEY (Howard 1943: 224-234), HORNER (Jepsen 1953: 19-24; Libby 1955; Wormington 1957): These are three of several important High Plains localities from which superbly flaked projectile points have been found in association with bison bones. The several types of weapon points were classified collectively for many years as "Yuma" projectile points. The term indicates distinctive ribbon-like parallel flaking which may extend diagonally or horizontally across the blades. Now, however, the Yuma classification has been subdivided with such characteristics as medial ridge and basal form distinguishing the dominant point types (Fig. 2a, b).

The type site at Scottsbluff in Scotts Bluff County, Nebraska, was reported in 1932. Finley, the type site for the superb Eden point which has paired flakes meeting along a medial ridge, is near Eden, Wyoming, and was excavated in 1940-41. These discoveries have been described numerous times and only their place in the story of early human occupation of Western North America need be recorded here.

The Horner site, also known as the Cody Site, near Cody, Wyoming, was reported more recently, having been excavated in 1949-52. Importance of the Cody Site lies in the fact that it contributed both Scottsbluff and Eden points, as well as a rather complete series of small tools, most of which are similar to those mentioned from the other two sites. However, the distinctive Cody knife (Fig. 2c) was first reported from this locality. It has an offset square-based stem and a single shoulder. Carbon-14 dates obtained from charcoal associated with the bison bones and from the bones themselves average close to 7,000 years B.P.

THE PLAINVIEW LOCALITY (Sellards 1947: 927-954; 1952: 60-67): Here, associated with the massed bones of extinct bison, was found an assemblage of large unfluted projectile points less precisely flaked, but of the same general shape as the earlier fluted forms. These unfluted specimens were designated as Plainview Points (Fig. 2d), and constituted the only variety found at the site. Bone which was exposed to contamination afforded a C^{14} date of $7,100 \pm 160$ B.P.; however, uncontaminated snail shells have recently been dated at $9,800 \pm 500$ B.P.

THE MIDLAND SITE (Wendorf *et al* 1955; 1959: 66-78): Near the town of Midland, Texas, for the first time in the United States, human bones have been found in unquestionable association with extinct Pleistocene faunal remains. The human bones were fossilized and encrusted with particles of gray sand from the deposit in which they lay, and which is markedly different from the overlying younger red-sand beds. On top of these upper beds, in wind-hollowed blowouts, were Folsom artifacts.

Chemical analyses have confirmed the visible geological and archeological evidence. However, radiocarbon dates are in disagreement. Carbon, obtained with difficulty from fossil tusk and bone samples, has yielded dates of 7,100 and 8,670 B.P., while residual carbon from burned caliche indicates an age *circa* 20,000 B.P. A fourth date, on snail shells, is $13,400 \pm 1200$ B.P.

Excavations subsequent to the original investigation have confirmed the major initial interpretations, but still do not provide data for a conclusive statement of absolute age. It seems certain

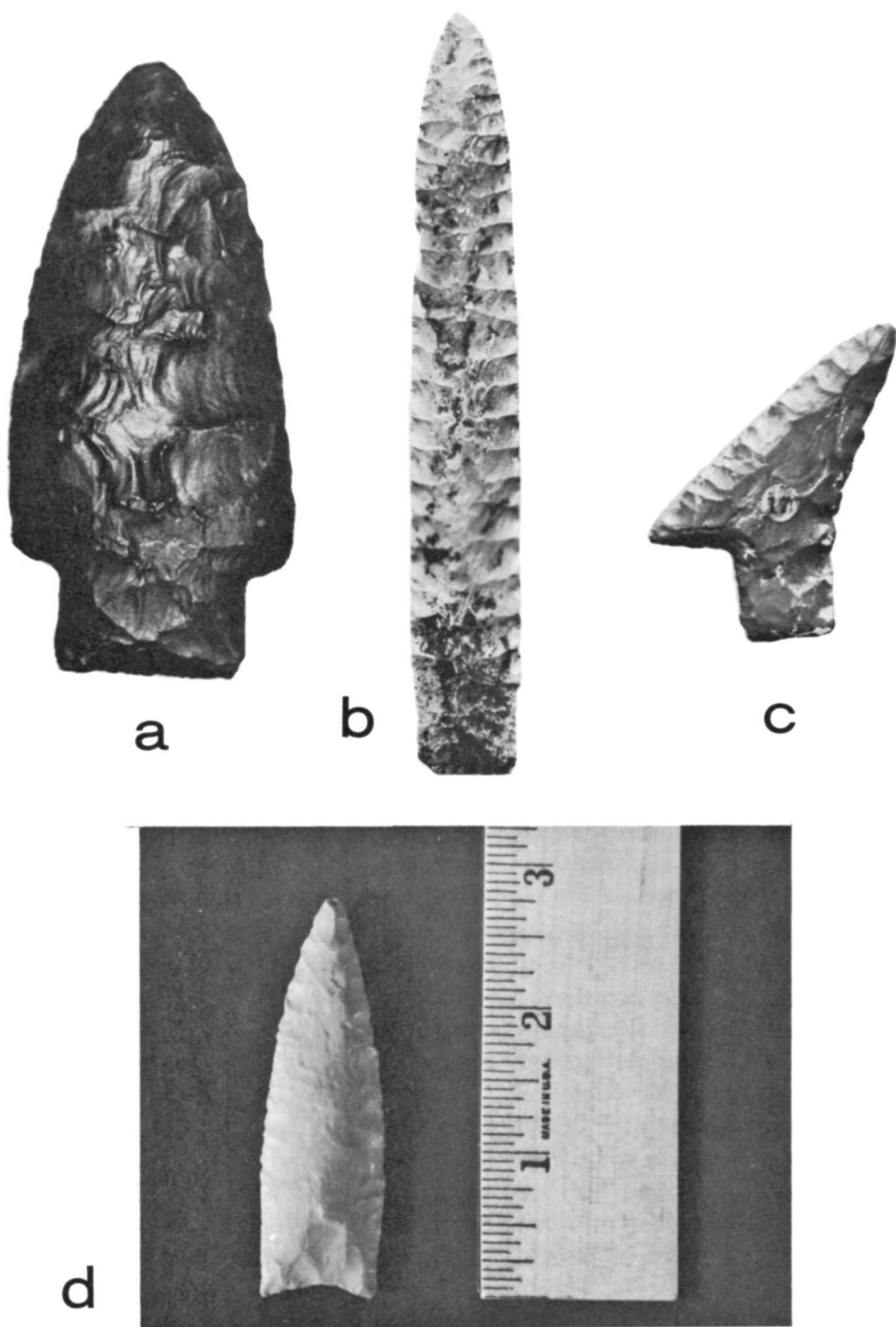


FIG. 2. Unfluted lanceolate projectile points and Cody knife: a, Scottsbluff (courtesy Denver Museum of National History); b, Eden Valley (courtesy University of Pennsylvania Museum, Denver Museum); c, Cody knife (courtesy Smithsonian Institution, Princeton University); d, Plainview (courtesy Texas Memorial Museum). Length of a, 6.4 cm.; b, 10.3 cm.; c, 4.4 cm.; d, 7.0 cm.

that the antiquity of the human bones and cultural material in the gray sand would be greater than the age of the overlying Folsom assemblage, but only, perhaps, by the amount of time needed for importation by wind and stabilization of the red sand.

THE BASIN AND RANGE PROVINCE

The Basin and Range Province includes the Great Basin, the desert areas south and west of the Colorado Plateau, much of western Sonora and a portion of Chihuahua and Texas. This has been an extremely crucial region throughout the known span of human occupation in Western America. Many diverse climatic and topographic areas are represented here and we may begin our review of important early archeological data by referring to the Colorado Desert of southeastern California, which incorporates the Salton Trough and part of the Sonoran Desert sections of the Basin and Range Province.

Mr. Malcolm Rogers began an archeological survey of the California Deserts in 1920, and, through the years, developed a vast knowledge of sites and complexes (Rogers 1939). Although twenty years have passed since Rogers wrote his important paper on desert lithic industries, much of his sequence has stood the test of research by other investigators. It was Rogers who introduced the "San Dieguito Complex" which is still a basic aspect of all western desert sequences, and which appears to be assuming even more formidable stature as specific localities are excavated (see Ventana Cave), and as Rogers reevaluates his own work (Rogers 1958). The San Dieguito, which, in Rogers' sequence of prehistory, involves four southwestern American states and three northern Mexican states, has been divided into four geographical "Aspects" (Rogers, personal correspondence, 1959). His Central Aspect embraces most of the Basin and Range Province, hence the subdivisions of this Aspect are of particular concern in this discussion. Under the new interpretation, San Dieguito Phase I replaces the old term Malpais; Phase II replaces the previous Playa I; Phase III replaces Playa II. Thus, the San Dieguito Central Aspect, Phases I-III, encompasses all the known desert archeological horizons prior to the Amargosa. The old, established, widely accepted terms of "Malpais" and "Playa" are abandoned.

Since 1933, a lengthy series of important scattered archeological discoveries associated with the Pluvial climate of late Wisconsin times has been reported throughout the Basin and Range Province. In California, the southernmost of these was Pinto Basin. However, reconnaissance work currently in progress may yield evidence of equal age from the drainage basin of Lake LeConte (McCown 1954). Thus far, sites representing several different periods of occu-



FIG. 3. Beach of Lake LeConte, showing house rings at one of many old beach sites.

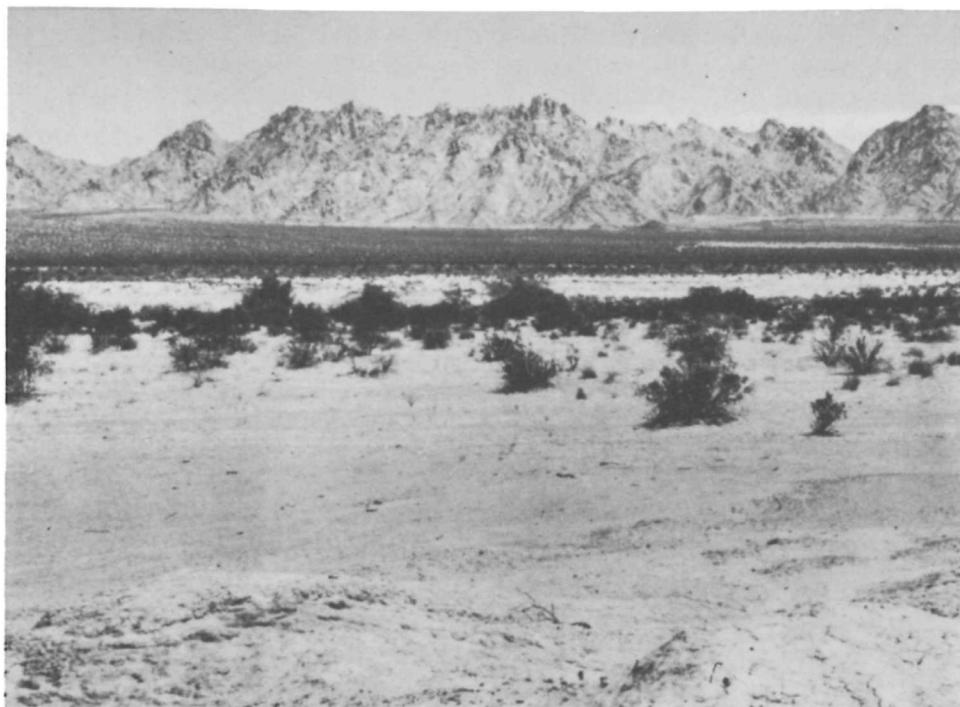


FIG. 4. A portion of the Pinto Basin Locality, Colorado Desert.

pation have been recorded at and above the ancient shoreline and on the recessive lake beaches. It is evident that occupation close to the major ancient beachline extended virtually around Lake Le-Conte (Fig. 3).

PINTO BASIN (Campbell, E. & W. 1935): Along the banks and on the floor of a long-dry cienega in Pinto Basin (Colorado Desert) (Fig. 4), Mr. and Mrs. William H. Campbell, assisted by Mr. Sam Bailey and Mr. Jack Meek, discovered the first evidence reported in California of a lithic industry in association with geological features and faunal remains suggestive of Pluvial age. The archeological survey which resulted in this discovery was sponsored by the Southwest Museum and was reported in 1935. The stone weapon points recovered in Pinto Basin were of a variety then not known to archeologists and so were named Pinto Basin Points (Fig. 5a). These implements have since become recognized as one of the most abundant and widely distributed early projectile types in Western America. Other artifacts were also recovered from the eroded land surfaces in Pinto Basin. These included bifacially-flaked pointed blades, knives, scrapers of numerous types, incising tools, hammerstones, choppers, grinding tools, etc. The people who left these tools and weapons had apparently lived here when there was abundant water. With the artifacts were bones of extinct camels and horses. It was thought probable, therefore, that the Pinto Complex might be 8,000 or 10,000 years old, thus dating from the terminal phase of the "Great Pluvial," a rainy period associated with the last major Pleistocene glacial advance. Information derived later by the Southwest Museum from another Pinto locality, the Stahl Site (Harrington 1957) in Owens Valley, California, suggests that there this complex may date from a later rainy period, perhaps from the "Little Pluvial" of 3,000 or 4,000 years ago. It has been suggested that this might also be the age of the Pinto Basin locality, and that the fossil camel and horse bones were left from an earlier time. Dr. Ernst Antevs and many other scientists, however, are more inclined to believe that the Pinto Complex had more than one period of florescence.

LAKE MOHAVE (Campbell, E. & W. 1937): The Campbells also found a rich assemblage of artifacts, including weapon points typologically very different from those reported in Pinto Basin, on the high beaches of long-extinct Pleistocene Lake Mohave in the Mohave Desert near Baker, California. The weapon points are dominated by two special varieties named respectively "Silver Lake" and "Lake Mohave" (Fig. 5b, c), both apparently of the same culture complex. Since the Pinto Basin and Lake Mohave localities

have been discussed repeatedly in the literature, details are not necessary here. However, it is important to note that their ages have not yet been finally established. Also, in view of current efforts being made to develop a workable desert archeological sequence, it should be observed that Pinto Basin, Silver Lake and Lake Mohave projectile points, together with their associated tools, have been found widely distributed in Western America.

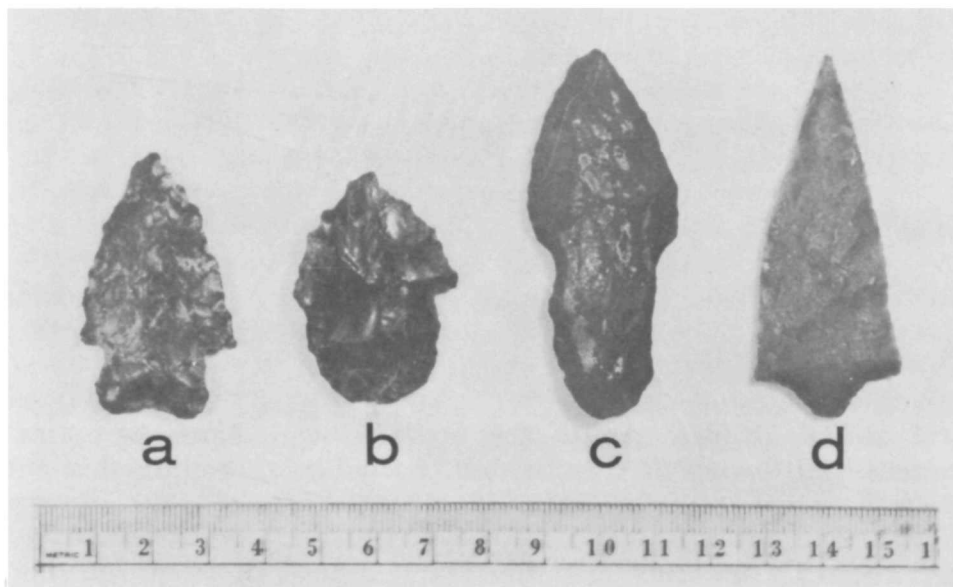


FIG. 5. Playa Complex projectile points: a, Pinto Basin; b, Silver Lake; c, Lake Mohave; d, Gypsum Cave.

During the early 1930s, the Southwest Museum was also engaged in the investigation of two other crucial Great Basin sites: Tule Springs and Gypsum Cave. The former will be discussed in detail in ensuing chapters of this publication.

GYPSUM CAVE (Harrington 1933): This is a limestone cavern in the Great Basin near Las Vegas, Nevada, which has yielded proof of human occupation unquestionably associated with remains of extinct animals. M. R. Harrington directed the extensive excavation for the Southwest Museum 1930-31. In the excavation and interpretation of this site the Southwest Museum was assisted by the California Institute of Technology and the Carnegie Institution of Washington. Subsequently, Carbon-14 dates were obtained by Dr. Willard Libby at the University of Chicago.

Although no older than localities previously discovered or soon

to be reported, the evidence in this cavern is significant because it corroborated the accumulating data. At Gypsum Cave there was definite association of man-made objects with dung, bones and hair of the extinct ground-sloth *Nothrotherium*, as well as with a small species of camel and American horse.

In the cave chamber closest to the entrance recent Indian objects, apparently Paiute, were found near the surface. Beneath this, subsequent deeper strata contained early Pueblo pottery and Basket-maker material. Still deeper, layers of ground-sloth dung appeared, covering the remains of a campfire and containing a small, oval knife-like bifacially chipped stone implement and a stick of wood with round ends distinctly worked by Man.

In other parts of the cave were found pieces of atlatl dart shafts, some of them decorated; "diamond-shaped" stone dart points (Fig. 5d) and the remains of a cane torch, all in or under the sloth dung. A variety of man-made objects was recovered from positions not directly associated with sloth remains. Some sloth bones showed distinct scratches apparently made by stone implements while the bones were still green. The age, first interpreted on geological grounds and later confirmed by Carbon-14 (Libby 1955), was between $8,527 \pm 250$ and $10,455 \pm 340$ years.

THE COCHISE SITES (Sayles & Antevs 1941): The Cochise Culture sequence, in the Open Basin Section of the Basin and Range Province, spans the climatic period identified with the Anathermal, Altithermal, and the beginning of the Medithermal. The sequence ends about the time of Christ. Carbon-14 dates indicate the following ages for the three Cochise Culture stages: Sulphur Springs, $8,200 \pm 260$ B.P.; Chiricahua, $7,000 \pm 265$ B.P.; San Pedro, $1,950 \pm 200$ B.P. (Broecker & Kulp 1957: 1324-1334). It must be remembered, of course, that these few dates are but reference points in the comparatively long time intervals spanned by each of the three stages. So far as determined, the Cochise Culture reflects virtually continuous occupation of southeastern Arizona from the beginning of the sequence to its end, which is associated with the appearance of pottery. Reports of corn pollen from sites identified with the San Pedro Stage would indicate that agriculture had reached the Southwest well in advance of horizons previously hypothesized. The Sulphur Springs Stage is particularly significant because its lithic complex includes milling stones and handstones (Fig. 6). Weapon points are said to be lacking in this stage, and the high frequency of milling stones, throughout the Cochise Culture, indicates that the people were primarily gatherers rather than hunters. This series of hunting-gathering sites with possible agricultural features in its latest stages does much to bridge the cultural gap between early

hunters and sedentary agriculturalists. The Cochise material goes far to mark out the cultural evolution that occurred gradually through the millenia, and to show that changes took place in an orderly normal manner until, at the end of the Cochise sequence, there was a transition to the era of pottery-making.

VENTANA CAVE (Haury 1950): Excavations of stratified deposits in Ventana Cave, Arizona, were directed by Emil Haury, Wilfred Bailey and Julian Hayden of the University of Arizona, 1940-1942. The locality is in the Sonoran Desert section of the Basin and Range Province (Fig. 7). Very recent Papago ethnological material was found at the top of the cave sequence. Below this was a Hohokam level, and that was preceded by San Pedro and Chiricahua Cochise cultural material with an apparent Amargosa (California Desert) relationship. Earlier still were two strata containing early Amargosa and Ventana complexes respectively; the latter occurring at the bottom of the archeological column. Deposited in volcanic debris, these oldest specimens were encrusted with matrix and included some projectile points, one being an unfluted point with "Folsom" characteristics. There were also scrapers, etc. There appear to have been strong influences affecting the earliest Ventana development: elements including those derived from San Dieguito and Cochise complexes. Chiricahua and San Pedro Cochise and Amargosa traits were conspicuous later. Because of its peripheral position with relation to the eastern and western culture centers of

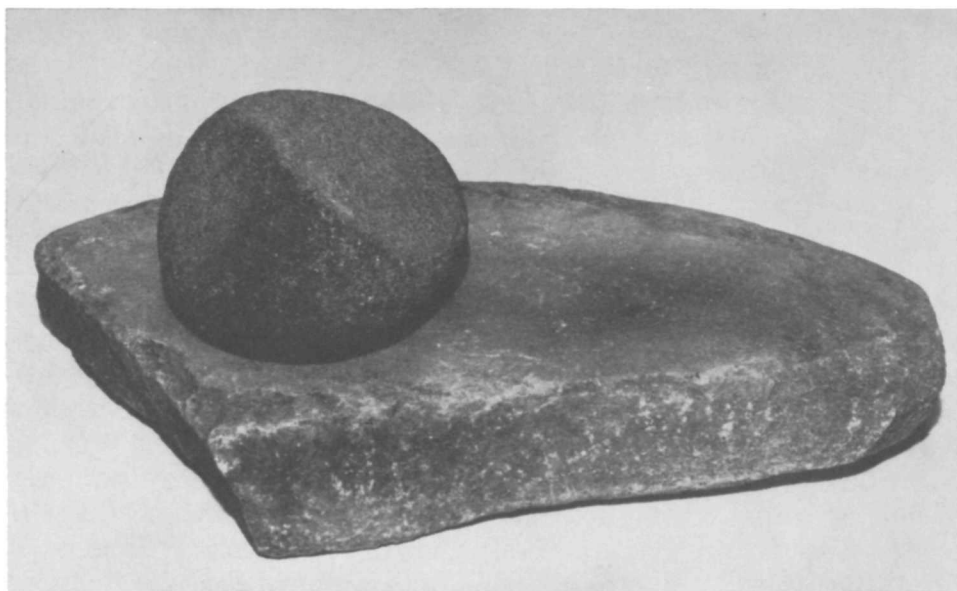


FIG. 6. Grinding tools, Cochise Culture. (Courtesy Arizona State Museum).



FIG. 7. Ventana Cave, southern Arizona. (Courtesy Arizona State Museum).

the time, Ventana Cave could receive traits and influences from either direction. It is, however, improbable that cultural traits began here and were diffused.

Unquestionably, the investigation of Ventana Cave was a major contribution to American archeology. The stratified deposits yielded evidence which spells out cultural relationships and interchanges in progress even at this early time. Ventana Cave has underscored the concept of a cultural continuum in western America. This kind of evidence is available only from stratified sites—sites which pull together the valuable but unsorted data derived from localities where there is evidence of only single occupation.

DANGER CAVE, UTAH (Jennings 1957): Excavated by the University of Utah, under the direction of Dr. Jesse D. Jennings, 1949-1953, Danger Cave, in the Great Basin, has given us one of the richest inventories of early cultural material yet recovered from a single site. This superbly stratified cave confirmed by duplication the story told in many other western areas. The stratified position of materials affords us new insight into the relationships of various complexes already known. Interpretations have been enhanced by a sequence of Carbon-14 dates extending from approximately 10,000 B.P. to 4,000 B.P. In the various deposits, stability of certain artifact types is significant.

WINNEMUCCA CAVES (Orr 1954-1955; 1956; personal communication 1959): Reference is made here to a series of caves in Pershing County, Nevada, in the Great Basin. Excavation has been conducted by the Western Speleological Institute and Nevada State Museum under the direction of Mr. Phil Orr, Santa Barbara Museum of Natural History. Of these caves, Fishbone is representative. Here there were four levels containing archeological material. The lowest (fourth) contained ash, vegetal matter, and bones including horse, camel and marmot. Two large chert choppers lay on a bed of juniper fiber which yielded C¹⁴ dates of 11,200 B.P. on tests run by the Lamont Laboratory. One chopper bears a coating of tufa over the original flaking and had been reworked since the tufa was deposited. This suggests that the chopper was submerged by a filling of Lake Lahontan; then, after the lake receded, the tool was reused and finally placed in the cave. Level 3 also contains horse bones, many of them burned. Much of the value of the upper levels had been lost through vandalism.¹

¹Human bones, partially burned, were found with matting in Level Four, near the choppers. Thus, Fishbone Cave affords one of the earliest dated evidences of human skeletal material on the continent. (Phil Orr, personal correspondence, 1961.)

FORT ROCK CAVE (Cressman 1942; Cressman *et al* 1940): While considering key cave deposits of the Great Basin, it is important to make note of Fort Rock, Oregon, which contained an occupational record interrupted by deposition of pumice. Charred sandals, basketry, etc., recovered from under the pumice have yielded Carbon-14 dates averaging $9,053 \pm 350$ years. Excavation was conducted by Dr. Luther Cressman, University of Oregon, and associates. Again, this is a site—one of several important caves in the area—which, through the years has been so thoroughly discussed in the literature that we need only note its presence in the Great Basin, and the evidence there which reflects well-developed techniques of making sandals and other perishable items at a very early date.

One of the other caves reported by Cressman is Paisley, above



FIG. 8. Manly Terrace, Death Valley National Monument, looking southwest across the location of the Clements' archeological site, on the intermediate terrace. Higher terrace in foreground, lowest in background. (Photo by Mr. J. Hodgkins, courtesy Dr. Thomas Clements).

Summer Lake. Here, too, the archeological record was interrupted by deposition of pumice.

MANLY TERRACE (Clements, T. & L. 1953: 1189-1203): Within the Great Basin region of the Basin and Range Province is one more locality which must be considered: Manly Terrace in Death Valley, California (Fig. 8). This area was examined during 1950-1951 by Dr. and Mrs. Thomas Clements, Geology Department of the University of Southern California. It is an intermediate shore feature of Pleistocene Lake Manly, in the southeastern portion of Death Valley and nearly 300 feet above the playa. The desert-pavement-covered surface of the terrace is more than one-half mile long and several hundred feet wide. Simple edge-flaked artifacts are found deeply imbedded as integral parts of the pavement. The Clements



FIG. 9. Manix Lake B-63, type site for Manix Lake Lithic Industry; Coyote Embayment of Pleistocene Manix Lake in background.



FIG. 10. Type specimens, Manix Lake Lithic Industry.

consider occupation of the site to have been during the presence of the last major lake in Late Wisconsin (Tioga) times.

Mr. Malcolm Rogers has classified the specimens, nearly all of which are characterized by uniface edge-flaking, as representative of San Dieguito I.

MANIX LAKE (Simpson, R. 1958: 4-10; 1960: 25-35): A series of Mohave Desert culture complexes is represented on and above beaches visible on the slopes of Manix Lake *bolsón* which lies at the border of the Sonoran Desert zone of the Basin and Range Province. The most significant aspect of the archeological survey which Ruth Simpson has been conducting here since 1955 is an assemblage of large, crude, generalized artifacts including *coup de poing*-like implements (Fig. 10) which were found only above the high shoreline of Pleistocene Manix Lake (Fig. 9) and in the adjacent Calico Mountains. These specimens, classified as the Manix Lake Lithic Industry, are found singly and in workshops. Workshop material and finished specimens are deeply imbedded in the desert pavements above Manix Lake and in the eastern Calicos, and are also imbedded in the clastic mantle which covers shoulders and crests of the eastern Calicos. Thus far, only one site in the Calicos has revealed artifacts in place in a deep deposit. Here, exposed in the walls of a prospector's excavation, is gravel 15 feet deep throughout which there are scattered many specimens and flakes. The age of the deposit has not been determined; however, erosion, not deposition, is the dominant natural agent at work in the area today. It is characteristic of Manix Industry sites, at both the Calico and Manix localities, that a majority of completed scrapers are found in workshops, but a majority of choppers and *coup de poing*-like implements are found lying away from the workshops. This is especially true of implements with retouched edges.

SANDIA CAVE (Hibben 1941): Two of the most important early archeological sites in the western United States represent the Sandia Culture Complex. These are Sandia Cave and the Lucy Site in the Basin and Range Province—both near the margin of the Southern Rocky Mountain Province.

Sandia Cave is near the northern end of the Sandia Mountains of New Mexico and provides further evidence of Pleistocene human occupation. Here, Dr. Frank Hibben, University of New Mexico, collected projectile points which are stratigraphically older than Folsom and probably older than Clovis. The surface layer of the cave deposit yielded some Pueblo potsherds. Beneath a limy crust, excavation exposed a "Folsom" occupation layer containing the traditional implements and bones of extinct animals. Below this de-

posit was an unbroken water-laid laminated layer of yellow ochre covering another habitation layer. The bones of extinct animals were here also, including those of mastodon and mammoth. There were bone and stone implements, including a hitherto unknown type of projectile: the single-shouldered, well-formed Sandia point (Fig. 1c).

A Carbon-14 date of approximately 20,000 years has been reported for the fossil ivory found in this deposit, but it is possible that it was fossilized before being associated with Man.

THE LUCY SITE (Roosa 1956: 36-49): This is the second Sandia site to be excavated. The work was supervised by Hibben and carried out by William B. Roosa. Sandia points and other artifacts (Fig. 1d, e) were found *in situ* in old pond deposits and re-deposited on an old erosion surface in association with fragmentary proboscidian bones. This probably represents a pre-Valders kill which was partly eroded away during the Altithermal. A Scottsbluff point was found in place in the pond deposits above the Sandia material. Pinto points were found in place in old dune sand above the erosion surface. A pre-Sandia disk core industry may also be present on this site. Surface finds included Clovis fluted, Folsom, Midland, and Agate Basin points.

THE NACO SITE (Haury 1953: 1-14): Two more important sites remain to be discussed before we leave the Basin and Range Province: Naco and Lehner. Both are in the Open Basin Section.

The Naco Site lies just north of the Mexican border near Bisbee, Arizona. Excavations were carried out in 1952 by Dr. Emil Haury, University of Arizona, and colleagues. A large portion of a mammoth skeleton was uncovered from an arroyo bank. Eight Clovis points were found in association with the bones and one was found in a nearby wash. All points in the carcass lay between the base of the skull and the fore part of the rib cage. No other implements were recovered. The section of matrix and bones from which the points were recovered was taken intact to the Arizona State Museum.

THE LEHNER SITE (Haury 1956: 23-24; Haury *et al* 1959: 2-30; Wormington 1957: 55-56): Situated near Hereford, Arizona, this locality, only twelve miles from the Naco mammoth, was excavated under Dr. Haury's direction in 1955-56, and yielded remains of nine mammoths, as well as bison, tapir and horse bones. In association with these bones were thirteen Clovis points and eight other tools. Two hearths were excavated a short distance away.

Uncertainty exists as to the precise age of the Naco and Lehner

localities. Dr. Ernst Antevs believes the age of the Naco kill to be *circa* 13,000 years, while the C^{14} date is *circa* 9,500 B.P. Geological association indicates to Dr. Antevs an age for Lehner greater than 13,000 years. C^{14} dates for Lehner vary, those *circa* 11,000 to 12,000 B.P. appearing most plausible.

Although a few are markedly small, the Clovis points from these two localities are typical specimens of the Llano Complex and serve to emphasize the wide distribution of this early hunting culture. Artifacts other than projectile points contribute additional information concerning Llano tools, and hearths at the Lehner kill add new data on the life of the people.

OTHER PHYSIOGRAPHIC PROVINCES

Thus far, consideration of Pleistocene and early post-Pleistocene archeological localities has been largely concentrated on the High Plains, the Basin and Range provinces. However, several important discoveries have been reported from other Western physiographical regions and we shall turn now to a brief review of these. Perhaps the most significant of all sites evidencing early human occupation is near Lewisville in Texas (Fig. 11).

LEWISVILLE (Crook & Harris 1957: 7-97): This locality is situated in the interior of the Atlantic and Gulf Coastal Plain, West Gulf Section. Excavation was directed by Mr. Wilson Crook and R. K. Harris of the Dallas Archeological Society. While exploration was



FIG. 11. Dallas Archeological Society excavating Hearth No. 1, Lewisville Site, Texas. (Courtesy Mr. W. W. Crook, Jr.).

carried on occasionally between 1951 and 1957, the important discovery came in 1956 when excavations revealed a series of hearths buried in the 70-foot terrace of the Trinity River. The clay was burned around these fire areas and quantities of charred bones of various extinct faunal species were recovered. With the bones and charcoal were burned hackberry seeds and simple flaked tools. A Clovis point was recovered from one of the hearths. Its contempo-

raney with the other material is questioned by some archeologists. The association of the other artifacts with the bones and charcoal is not questioned, nor are the two Carbon-14 dates in excess of 37,000 years B.P.

Lewisville, with its exceedingly complete Pleistocene faunal record and the very early Carbon-14 dates, obtained through use of ample samples, is of great importance in itself and also because it introduces the study of Pleistocene archeology in a new area.

FRIESENHAHN CAVE (Sellards 1952: 94): Also in the West Gulf Section of the Atlantic and Gulf Coastal Plains is Friesenhahn Cave. Although it cannot be proved with finality that Man was there contemporaneously with Pleistocene fauna, the bones of many extinct animals have been recovered and deep within the cave deposit there were several hundred pieces of flint. A few of these appear to be flake scrapers. Also two pieces of cut bone were recovered. The deposit containing the paleontological and archeological specimens was undisturbed when the cave was excavated.

BLACK'S FORK (Renaud 1936): 1-12; 1938; 1940): In the physiographic regions surrounding the Basin and Range Province, two localities have been reported with artifacts very similar to the Manix Lake Lithic Industry: Black's Fork in the Wyoming Basin of the Middle Rocky Mountain Province, and Laguna Chapala in the Lower California Section of the Sierra-Cascade-Coast Mountain Province.

Black's Fork was the first archeological area in the western United States to yield a Lower Paleolithic-like implement assemblage. Investigations were directed (1935-1939) and reported by Dr. Etienne B. Renaud of Denver University. The archeological area comprises more than forty surface sites scattered along the terraces of Black's Fork River and its tributaries. Three industries constitute the Black's Fork lithic record: 1) The "Peripheral" assemblage characterized by small non-diagnostic artifacts occurring mostly on sites marginal to the central portion of the locality; 2) The more recent Sand Dune material; and 3) The significant "Black's Fork Culture" (or, in the terms of this monograph, "The Black's Fork Industry") which is the oldest and consists of Lower Paleolithic-like implements made primarily of chert and classified into three series. The principal artifacts are heavy choppers, large scrapers and many *coup de poing*-like implements (Fig. 12a). These are found on the second and third (or intermediate) terraces. Occurring with this important material is a series of crude, boldly flaked specimens fashioned from quartzite pebbles. These are deeply patinated and have been classified as being strikingly

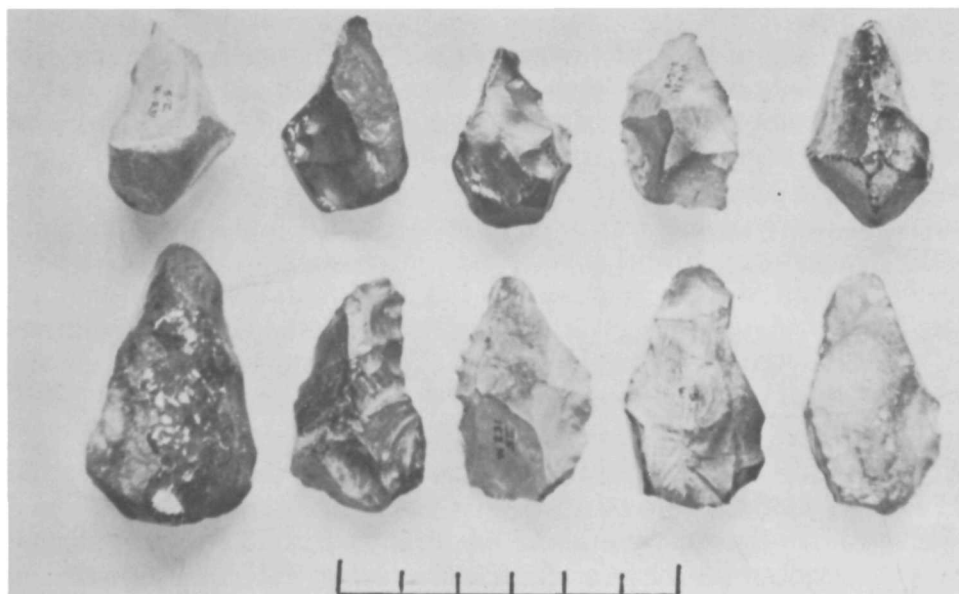


FIG. 12-A. Material comparable to the Manix Lake Lithic Industry: specimens from Black's Fork, Wyoming; scale in inches. (Courtesy Dr. E. B. Renaud).

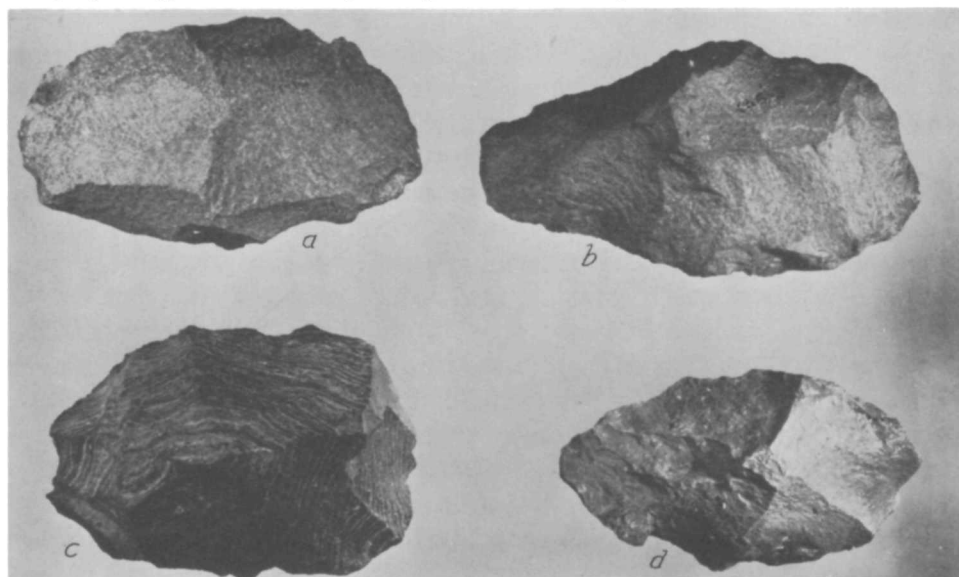


FIG. 12-B. Specimens from Chapala Basin, Baja California; length of a, 4 inches. (Courtesy Dr. Brig Arnold).

similar to the Pebble Industry placed at the base of the Lower Paleolithic culture sequence on other continents. There are workshops on some, but not all, of the sites.

LAKE CHAPALA, Baja California (Arnold 1957: 201-318): Situated in the Lower California Section of the Sierra-Cascade-Coast Mountain Province, this area was examined, 1949-1950, by Dr.

Brigham Arnold, Department of Geography, Sacramento State College. Most significant of the archeological material recovered was an assemblage of large "elongate-bifaces" (Fig. 12b) imbedded in the gravels above or adjacent to the high strand lines. Flaking was bold and there was a minimum of retouching on the edges. Weathering and discoloration were more advanced than on specimens of more recent origin at other sites in Chapala Basin. Elongate-bifaces were found at sites associated with workshops, and at others devoid of workshop material. All artifacts were found on the surface. Dr. Arnold suggests placing the elongate-biface assemblage in the earlier part of the Chapala Lake history, probably near the beginning of the Wisconsin or Fourth Glacial Period.

TEXAS STREET, California (Carter 1957: 303-346; Simpson, R. 1955: 174-176): Also in the Lower California Section, this is one of the most controversial archeological investigations yet reported. Work was done by Dr. George Carter, Johns Hopkins University, during the 1940s and early 1950s. The evidence seen at the Texas Street site is in the terraced alluvial fill 40 feet or more below the rim of Mission Valley in San Diego. Exposure has resulted mostly from excavation associated with a highway borrow pit. This site is within ancient valley fill, most of which was removed by erosion prior to the present period of valley filling. Evidence includes burned rock, charcoal, a small amount of burned bone and shell, and exceedingly crude stone artifacts. A Carbon-14 date of more than 35,000 years has been obtained.

Those opposing the inclusion of Texas Street in the accumulating record of Pleistocene human occupation of Western America maintain that the rocks and wood were burned by natural causes and that the "artifacts" resulted from natural causes as well (Krieger 1958: 974-978). *If* all of this evidence had natural origins of the varied types necessary to create the material recovered, it seems strange indeed that none of the products present here have been found in similar deposits elsewhere along Mission Canyon; that each of those natural agents acted but once, and only at the Texas Street site. It remains for the future to determine the significance of this locality.

SCRIPPS INSTITUTION, La Jolla, California (Carter 1957: 241-243): A few miles north of San Diego, but still in the Lower California Section of the Sierra-Cascade-Coast Mountain Province is the Scripps Institution of Oceanography. Here fan materials extending to the ocean have been truncated by wave action. Just north of Scripps' pier fire areas are exposed deep within the truncated fan. The man-made origin of these hearths has been quite

widely accepted and now the hearths have been given an average Carbon-14 age of 21,500 years. Pleistocene faunal material and bits of charcoal have also been recovered from a probable hearth at the base of the alluvial fan.

SANTA ROSA ISLAND, California (Cole *et al* 1956: 74-80; Santa Barbara Museum 1956; Orr 1957-1958; personal communication 1959): Farther northwest along the coast of California is another crucial Pleistocene archeological discovery. This is on Santa Rosa Island, which lies within the Los Angeles Ranges Section of the Pacific Coast Ranges. Phil Orr, Santa Barbara Museum of Natural History, has directed work here (1947-1960) as well as at the Winnemucca Caves. Along the northwest coast of Santa Rosa Island there is a thick bed of terrestrial alluvium. Exposed in this alluvium are bones of many dwarf elephants. Frequently, these bones occur in association with fires and the bones are burned. Crudely flaked pieces of chert are found near the fire areas and elephant bones. No artifacts as yet have been found in contact with the fossils. Leg bones are conspicuously numerous and indicate that butchering was done where the animals died. Some meat apparently was cooked at the kills, but much of it also seems to have been carried to the camps. Though no such "camps" have been found, it is thought that these were on the beaches far below the present sea level. Carbon-14 tests conducted by Lamont Geological Observatory and Michigan University afford a series of dates for archeological and paleontological material on the islands extending from 7,000 years for the comparatively recent Dune-dweller Culture, back to $29,650 \pm 2500$ B.P. for the most deeply buried fire areas with dwarf mammoth bones.

TANK SITE (Treganza & Malamud 1950; Treganza & Bierman 1958): Also within the Los Angeles Ranges Section of the Pacific Coast is the Tank Site in Topanga Canyon—a site from which has been assembled a collection of artifactual material and burials designated as representing the two-phase Topanga Culture. Most abundant among the artifacts were "core tools," especially scraper planes, choppers and hammerstones. These were associated with projectile points and grinding stones. Many of the diagnostic traits are impressively similar to varieties of implements collected from other lithic sites along the Santa Barbara coast and in the Southern California desert areas. The ages of these complexes remain to be determined.

POTTER CREEK CAVE (Sinclair 1907: 1-27): This locality is situated high above the McCloud River of Northern California, in the

contact zone between the physiographic provinces designated as Sierra-Cascade-Coast Mountains and Pacific Troughs. The system of galleries which comprises Potter Creek Cave is today mostly inaccessible without aid of ladders. During 1902 and 1903 paleontological excavations were carried forward in the stalagmite-covered deposits within the main chamber. A large collection of material was made, including the bones of twenty-one extinct Pleistocene vertebrate species exclusive of birds and tortoise. Also collected were forty pieces of animal bone which bear at least some indication of modification by Man. In several instances, this modification is in the form of parallel rows of evenly spaced grooves. In most instances, these grooves probably resulted from gnawing by animals. However, the placement of the grooves on a few specimens is such that it is very difficult to visualize an animal's jaws functioning so as to produce these marks.

More important, however, are the few cut and polished bone fragments with beveled edges. On three of these there is a significant combination of polish, beveled edges and sharpened tips. These three specimens and an unpolished piece of bone with a bifacially perforated hole near its base appear to meet all the qualifications for man-made implements. The records of depth: 80"-90" and 130"-140" are also most noteworthy. Certainly the evidence would indicate that Potter Creek, like Friesenhahn Cave, should be regarded at least as a probable Pleistocene archeological site.

LIND COULEE, Washington (Daugherty 1956): The final localities remaining to be considered in this survey are Lind Coulee on the Walla Walla Plateau and the Five-Mile Rapids Site along the Columbia River. Lind Coulee was one of several important sites investigated by the River Basin Surveys, Richard Daugherty directing the work during 1950-1952. In a channel carved by glacial melt waters, Pleistocene animal bones and artifacts have been recovered, some under thirteen feet of overburden. Daugherty believes this was a site situated, at the time of occupation, at the edge of a sluggish stream or a lake. Artifacts include projectile points, some of which are not fluted but have the characteristic basal grinding of early fluted types. There are bone implements similar to those from Clovis and stone implements suggestive of the Pinto Basin-Lake Mohave complexes. Carbon-14 dates on burned bison bones average 8700 ± 400 years B.P.

FIVE-MILE RAPIDS, Oregon (Cressman, L. S.: personal communication, 1960): "Excavations by the University of Oregon, with the cooperation of the National Park Service and the National Science Foundation, at the head of the former Five-Mile Rapids of the Co-

lumbia River about five miles east of The Dalles on the Oregon shore have disclosed continuous occupation of the area from late glacial or the terminal glacial period to post-1820. The site is now covered in part by relocated U.S. Highway 30 and in part submerged by the waters of the Dalles dam. The geological dating is supported by a series of C¹⁴ dates.

"The early phase of cultural development, based on exploitation of salmon, seals, elk, large birds (condor, etc.), and the use of bolas, heavy chopping tools, burins, unifacial percussion and bifacial percussion flaked knives or blades and some pressure flaking, fades out about 7500 years ago. A limited range of artifacts continues until about 6000 years ago when there is markedly increased activity, followed by the introduction of new types of projectile points probably derived from Great Basin sources. This change is undoubtedly due to in-migration of population. About 4000 years ago the beginning of the stone industry characteristic of the Columbia River culture of The Dalles area of contact times began to shape up."

* * * * *

Thus we conclude a brief review of a few key Late Pleistocene and Early Post-Pleistocene sites of human occupation in Western America. There are many others which are helping to tell the story of Man's prehistory, and which, combined with those noted here, indicate that Man has been in America far longer than suspected a decade or so ago. But, in the final analysis, it will not be possible to consider the record of Western America in isolation. It must be placed in proper relation to the data being recovered from important investigations in the Mid-West and East, in Canada, Alaska and Mexico. The material from the West constitutes but one large and important segment of American prehistory. Thus far, all of the oldest C¹⁴ dates have come from western localities, as have the implement assemblages characterized by the large fist ax-like bifaces. However, there is an increasing number of Mid-Western and Eastern sites reflecting early occupation.

Fluted points of the Clovis type are found in abundance in the Central United States and through the Ohio-Tennessee-Virginia region in the East. North and south of this zone, the number of fluted points decreases markedly, but the tradition is represented even in Canada, Nova Scotia and Mexico. It is assumed that early hunters migrated into the eastern United States at a time later than their counterparts reached the High Plains, probably even after the florescence of the western hunting economy. This would be true especially in the glaciated Northeast.

Some important Eastern sites characterized by Clovis fluted points include: the Reagen Site in northeastern Vermont; Bull Brook in Massachusetts; Shoop in Pennsylvania; Parrish in Ken-

tucky; and the Quad Site in Alabama. Douglas Byers (1959) has reported C^{14} dates of $6,940 \pm 800$ to $9,300 \pm 400$ for Bull Brook.

Not all early eastern localities yield fluted points. Less specialized stone, and occasionally bone, implements are being recovered as the search for early material is intensified. Among these sites is Modoc Rock Shelter in Illinois. There, the earliest of five occupation zones has yielded a scraper, a side-notched "bunt," a pointed bone tool and many flakes. C^{14} dates on this level range from $9,101 \pm 440$ to $10,651 \pm 650$ B.P. (Fowler 1956).

Another important early locality is Russell Cave, Alabama (Miller 1956; personal communication, 1959). Here, to a depth of between 42 and 43 feet were hearths, miscellaneous evidences of fire and scattered artifacts. Woodland cultures were represented in the upper five feet. The earliest C^{14} date obtained by the Phoenix Memorial Radiocarbon Laboratory, Ann Arbor, Michigan, on the Woodland material is $6,300 \pm 350$ B.P. Beneath this to a depth of 23 feet were specimens representing various phases of the Archaic. At the 23 foot level was a hearth which has been dated at $9,020 \pm 350$. Other deeper deposits of charcoal have been recovered but have not been dated as yet.

There are reports of numerous assemblages of lithic material from beaches, moraines, and other topographic features associated with the last major glacial advance. Some of this lithic material suggests that it may have been modified by Man and then subjected to water action. Future investigations must clarify the record of Pleistocene and early post-Pleistocene times around the ancestral Great Lakes.

As we have indicated, evidence representing the fluted projectile point tradition in Canada is very slight. Perhaps this is because intense archeological work is just beginning (Wormington 1957, *passim*). A scattering of Clovis and Folsom weapon points has been reported from Alberta and Saskatchewan. Moving to slightly later times, we find the Cody Complex well represented in both Alberta and Saskatchewan. Indeed, Scottsbluff and Eden points are indigenous to the western Plains of both the United States and Canada. Plainview points have been reported from Alaska to Mexico, as well as from California to the Atlantic seaboard.

Farther north, Arctic archeology is also receiving serious attention, not only from American scientists but also from the scientists of Denmark. One of the most important early localities, excavated by Helge Larsen of Copenhagen's National Museum, is Trail Creek. Two caves have been excavated. There are points with parallel ribbon flaking from an intermediate stratum which also contained bone artifacts. Material at the bottom of the cave has yielded a C^{14} date of 6,000 B.P. (Larsen, personal communication, 1960).

As yet unplaced in the Arctic culture sequence is a rather widespread lithic industry distinguished by polyhedral cores and associated microblades. This industry has been dated by C¹⁴ as being earlier than 4,000 B.P. It is classified as the Denbigh Flint Complex.

Turning now from the Far North to Mexico, we must take note of the fact that very little work has been done in the field of Pleistocene or Pluvial archeology. Yet Mexican scientists are making extremely important contributions to this field. An early discovery of marked significance was made by Dr. Jorge Engerrand and reported in 1910 at the International Congress of Americanists. Engerrand reported a lithic industry characterized by fist axes, scrapers and other crude implements in the state of Campeche, Mexico. The site is called Concepción (Engerrand 1912: 80-100). If a reexamination of the locality, in the light of contemporary knowledge of American prehistory, confirms Engerrand's early findings Concepción would be the first scientific report of an American lithic industry similar to those now known in Wyoming, California and Baja California.

Best known of recent discoveries in the Valley of Mexico are the Tepexpan human skeleton (De Terra *et al* 1949; Wormington 1957: 238-241), the Santa Isabel Istapan mammoths (Aveleyra & Maldonado-Koerdell 1953: 332-340; Aveleyra 1956: 12-28), and Tequixquiác (De Terra 1949; Wormington 1957: 200-202; Krieger: personal communication, 1960).

The Tepexpan human skeleton, while not complete, is represented by most of the long bones, much of the skull, some vertebrae, ribs, etc. Although excavation was not carried out ideally, it is generally agreed that Tepexpan Man did lie in an undisturbed late Pleistocene deposit. A C¹⁴ date of 11,003 $\pm$ 500 B.P. has been obtained from a related but not identical deposit in another section of the Valley of Mexico.

Since the discovery of Tepexpan Man, two mammoth skeletons have been found in the same geological formation approximately one mile away. Artifacts including weapon points, scrapers and prismatic blades have been recovered from these mammoths.

One of Mexico's most interesting early sites is Tequixquiác. As early as 1870 it became an important station for the collection of late Pleistocene fossils. Since 1952, investigations conducted by Aveleyra and Maldonado have yielded stone scrapers and crudely pointed bone implements. About 60 of these artifacts have been found, but no weapon points have been recovered.

Many facets of Mexican Pleistocene prehistory are just beginning to be revealed. The significance of some of these is not known as yet. It remains for continuing detailed investigations to clarify and classify the elements now seen only as isolated fragments of

the record. Enough is now known, however, to establish these basic principals: 1) Man and the mammoths were contemporaries; 2) Man-made implements do exist in the Upper Becerra, the terminal Pleistocene formation of the Valley of Mexico.

When considering the Pleistocene archeological record of North America, we are not concerned solely, nor primarily, with the artifacts as such. Our principal concern is with the understanding of Man, his life, his behavior, his problems. To do this we must relate the prehistory of North America to that of the rest of the world, especially to that of Siberia, eastern Asia and the European Far North. We must understand, too, the environment Man faced: the climate, the flora and fauna. Such matters are far too extensive for consideration in this publication which is to be the examination of one archeological locality in Western America—one which yields the fragmentary clues with which scientists must work in reconstructing the Past. Nonetheless, it is important for the reader and author alike to keep in mind the fundamental importance of the broad, general concept of Prehistory.

To meet the multitude of problems confronting the archeologist there is a growing array of new techniques and methods of interpretation. None of these is perfect, but gradually the many lines of evidence will be untangled and the possibilities will be separated: the probable from the improbable. Today we know as facts data about the life of Man millenia ago, about his association with animals and climates that are part of the geological past of America; we know facts undreamed of a half century ago; we use techniques unknown a quarter of a century ago; and we are laying the background for more exciting, more illuminating discoveries to come in the decades ahead as scientists of many fields combine their talents to enable America to learn the truth about her Past.

Now, against this background of American prehistory, we shall begin the consideration of one significant locality, Tule Springs in Clark County, Nevada. This is the oldest locality yet excavated by the Southwest Museum and it is one of the oldest yet dated by Carbon-14.

CHAPTER II

Tule Springs

GENERAL STATEMENT

by RUTH D. SIMPSON

THE TULE SPRINGS LOCALITY is not spectacular, but it is compelling. Weather-worn mountains rise starkly on either hand. Hidden until one stands at its brink, a deep erosion-cut gash slits the wide, peaceful Las Vegas Valley. In that arroyo a miniature badlands has developed. Descending into the arroyo, into the shelter and silence of the twisting side canyons, one literally walks into the Past—geologically and archeologically.

The data reported in the chapters which follow will testify that Tule Springs is one of the oldest known American prehistoric localities. It will be shown that Man had come here by 28,000 years B.P., before or during the last formation of freshwater Pleistocene lakes in Las Vegas Valley; that he was here contemporaneously with Pleistocene mammals including camels, bison, horses, mammoths and ground sloths; and that he burned oak and juniper in his cooking fires. His camps were situated on the bottom lands at the margin of an ancient giant flood plain now buried beneath Las Vegas Valley.

It will be very evident that archeological specimens are rare—as they are at most of the oldest known sites discussed in Chapter I: Lewisville, Santa Rosa Island, Friesenhahn Cave, etc. Nonetheless, archeological specimens are present, unquestionably in place in the charcoal. Who were the people who made these implements? What was their economy, their way of life? These are questions that will be resolved only after the persistent intensive investigation of known data, and of data from comparable sites yet to be reported. However, the people who camped at Tule Springs can be at least tentatively described as food gatherers with a predilection toward hunting—even if that hunting may have taken the form of miring individual animals and waiting for them to die, or of scavenging at carcasses of animals killed by natural causes.

In the descriptions that follow we shall see that the several charcoal deposits record numerous separate, concentrated fire areas in which were the bones of the diverse species of mammals identified in the area. However, these are not whole nor even partial carcasses, they are disarticulated elements—leg bones, foot bones, jaws, etc.—from which we may infer that most butchering oc-



FIG. 13. The Tule Springs Locality: general view of typical erosion basin and partially eroded sedimentary deposits, looking southeast across Area 3 to the main wash. (Photo by John Kettl).

curred away from camp and only selected portions were carried in. We shall note also that elements of more than one species were frequently brought to a single fire.

With these simple introductory remarks in mind, let us follow the assembling of the scanty but crucial evidence from the fires that burned 28,000 years ago.

DISCOVERY

by M. R. HARRINGTON

Back in the dim past, in Wisconsin Glacial times, before the last major advance of the ice, a band of hunters roamed what is now southern Nevada. We know very little about them except that they hunted, cooked and ate animals now long extinct: the camelops or large American camel; at least one species of American horse; the big long-horned bison; and the Columbian mammoth.

This much we know because one camp of these hunters has been found with its fire pits and ash beds containing bones of all these animals. Many of the bones are burned, broken and split for marrow. Bones of the several kinds of animals are mixed in the same

fire areas. Found near the bones but outside the charcoal deposits were a few crude stone tools which we believe were fashioned to split bones and scrape hides. Three definitive implements and an obsidian flake were recovered with the bones in the charcoal.

This locality, Fig. 13, is approximately four miles east-southeast of the Tule Springs Ranch in Las Vegas Valley, and eleven miles northwest of Las Vegas. It is situated in sections 9 and 10 (with extensions northwestward into section 6), T19S/R61E, on the Gass Peak Quadrangle. Elevation is approximately 2200 feet. This was discovered in 1933 by Mr. Fenley Hunter, Mr. Frank Bell and Mr. Albert C. Silberling, paleontologists collecting bones of extinct mammals for the American Museum of Natural History in New York. Hunter financed and led the expedition.

We are grateful to Mr. Hunter for preparing the following first-hand report of the discovery of the Tule Springs Locality:

Twenty-seven years ago last December we¹ were heading south out of Tonopah, Nevada in Frank Bell's old Dodge truck and trailer loaded with camp gear, 40 days grub, a 30 gallon tank for storing drinking water, a small Yukon-type cook stove and several old railroad cross-ties for firewood. While this paraphernalia was needed for travel in the desert it all seemed very cumbersome as I was accustomed to traveling light and living off the country in northern Canada.

We were hoping to make the first collection of Pleistocene mammalian fossils in the little known Nevada field, previously reported by Buwalda. Ex-Governor James G. Scrugham of Nevada, a fellow Kentuckian, had suggested we go south 300 miles to Indian Springs and visit its only inhabitant, one Tim Harnedy, a long time resident of the desert. As it turned out, we could not have received a better suggestion.

On our way south along the main gravel highway, we prospected many exposures and out-crops without finding a scrap of fossil material. A week later we reached Indian Springs where we found Tim Harnedy and we were soon the recipients of his unbounded hospitality. Tim knew nothing about fossils and a month later confided to me he had thought our mission a most curious one and he had harbored the opinion we were really looking for silver!

A week of steady prospecting up and down the main drainage of Las Vegas Valley from Indian Springs yielded an abundance of fossil shells, fragments of bison, camel, horse and many mammoth bones (52 different mammoth localities in all), so we decided to pitch our tent five miles east of the Tule Springs turn-off from the main highway, on the south side of Las Vegas Wash. By this time we had tramped more than 200 miles in Clark County and were glad to settle down in what we called Buffalo Camp.

A report of our work in this region was written by Dr. George Gaylord Simpson² shortly after our collection had been received and studied at the American Museum of Natural History. The title used by Dr. Simpson: "A

¹Fenley Hunter, Flushing, Long Island, Leader; Albert C. Silberling, Harlowton, Montana, Paleontologist; Frank Bell, Tonopah, Nevada, staunch companion in the desert who became a good bone digger and found a mandible of *Camelops* with complete dentition on both sides (A.M.N.H. no. 30053).

²Simpson, George G. "A Nevada Fauna of Pleistocene Type and Its Probable Association with Man," American Museum *Novitates*, No. 667, New York. 1933.



FIG. 14. View east, down the Vegas Wash; channel cut through Pleistocene lake beds.

Nevada Fauna of Pleistocene Type and Its Probable Association with Man" certainly reflected the true significance of the discovery. Our intentions were to make the first comprehensive collection of Pleistocene fossils in Nevada; we had not the slightest idea that we were to stumble upon a campsite used by Early Man more than 28,000 years ago! (Date reported by Dr. Wallace Broecker in 1960.)

The wide and rapid variations in temperature, from freezing and below at night, to 80 degrees or more at noon on sunny days, was highly stimulating. The arid condition of the desert, with strong winds almost daily, produced sand storms which would often obscure the sun. Heavy rain storms were not infrequent, but the wind was our worst enemy. To prevent our tent at Buffalo Camp from being carried away by heavy gales coming down off the snow capped Spring Mountains west of us, we used guy-lines extending 50 feet or more to railroad ties we buried 3 feet in the ground.

We experienced one unpleasant "Poke-A-Nip" fog, a Paiute Indian term used in Nevada to designate a dank, dismal fog that occasionally descends upon the desert. The flora of the region was limited to numerous varieties of cactus and mesquite brush, which we sometimes used for firewood. This sparse vegetation plus the fact that there is no permanent water closer than Tule Springs Ranch accounted for the dearth of animals and birds observed by us during our winter rambles. We saw only one coyote, a few jack rabbits and cotton tails, several chipmunks and striped gophers and two species of lizards in hibernation. Nature had aptly provided the latter with double eyelids—the inner lid being transparent to enable the lizard to see during sand storms. Snakes, tarantulas and desert tortoises were in hibernation. We saw one road runner, two species of hawks, one eagle and several flocks of bluebirds. Surely, the climate and flora of Pleistocene times must have been radically different from the harsh desert conditions we experienced, to have enabled the many large Prehistoric animals to thrive and roam over this region contemporaneously with Early Man.



FIG. 15. The Fenley Hunter Site (Site A, Area 3): a, 1933. (Courtesy Mr. Fenley Hunter, American Museum of Natural History). b, 1959. (Photo by John Kettl).

In the area of Hunter's "Buffalo Camp," the Vegas Wash (Fig. 14) is a wide channel, generally steep-sided, and, in the area under consideration, is about 25 feet deep. The arroyo, cut into the level floor of broad Las Vegas Valley, winds its way southeastward along the base of Sheep Mountains. The main wash is joined at frequent intervals by smaller side canyons cutting in, especially from the south. In the vicinity of these junctures the steep arroyo walls, usually more than 20 feet high, are, in some cases, much eroded, remaining only in the form of low points, knolls and "islands."

In one of the side canyons, which had cut deeply into the floor of Las Vegas Valley, Hunter found a layer of charcoal and ashes buried under 5 to 8 feet of valley fill (Fig. 15). In the ashes were the scattered bones of extinct animals, many of them broken, split and burned. Among these bones was a man-made flake of obsidian, suitable for use as a cutting tool but with unmodified edges (Fig. 16). Realizing the archeological as well as paleontological importance of this discovery, Hunter did not extract it from the matrix, but cut out a section of the ash deposit with the obsidian and bones still imbedded and took the block back to his museum. There, Dr. George Gaylord Simpson (1933) prepared an account of the find for publication. Even before the article appeared Hunter very generously turned his site over to the Southwest Museum for further investigation.

Before beginning our report on the Tule Springs Locality it is essential to review the geological history of the region. Dr. Chester Longwell of the U.S. Geological Survey has generously contributed such a review and it is presented herewith.

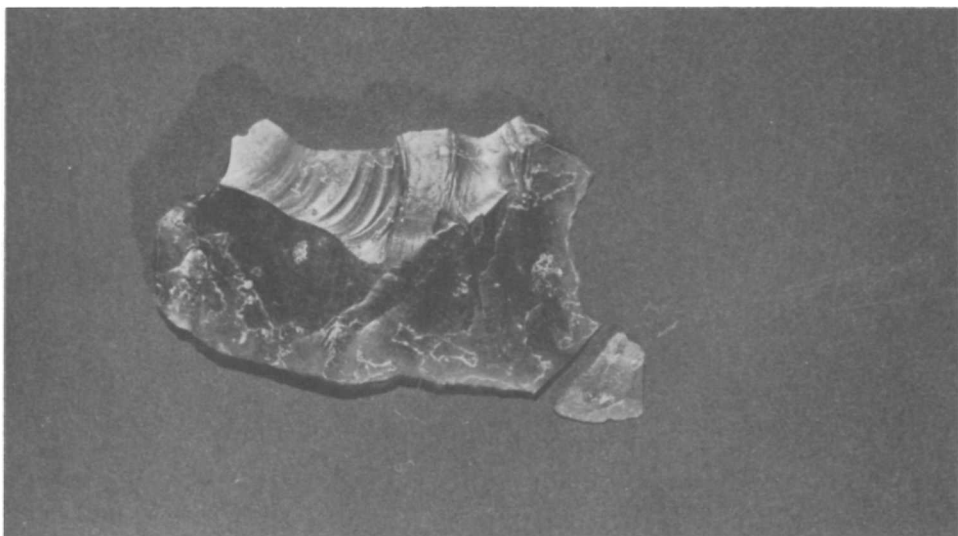


FIG. 16. The first archeological specimen found at Tule Springs: the obsidian flake recovered at the Hunter Site in 1933; length of larger segment, 3.6 cm. (Courtesy American Museum of Natural History; American Museum of Natural History retains all rights for future usage).

GEOLOGY OF SOUTHERN NEVADA

by CHESTER LONGWELL

Rocks in the high ranges bordering Las Vegas Valley consist chiefly of limestone and its magnesium-rich relative, dolomite. These layered carbonate rocks, many thousands of feet in total thickness, contain abundant fossil forms of mollusks, corals, arthropods and other organisms closely related to those now living in seas. Similar rocks form the ranges and plateaus in a wide region including Nevada and other western states. Thus the old bedrock records a long history of widespread seas, during which the seafloor was sinking slowly, thus maintaining the shallow and moderate depths indicated by the kinds of fossil forms distributed through the great thickness of superposed layers.

Relations of the old marine deposits are most clearly shown in the Grand Canyon, Arizona. There the uplift has been nearly uniform over a wide area, leaving the old sedimentary layers almost horizontal, as they were formed. In Nevada the uplifted crust was broken into great blocks that were tilted variously in direction and degree; thus were formed the steep-sided ranges and the intervening wide basins such as Las Vegas Valley. Continuous erosion has removed vast quantities of rock from the mountain blocks, and much of the resulting gravel, sand and finer sediment has been deposited in the basins. In most of Nevada and eastern California the rainfall is at present too little to maintain through-flowing drainage, and sediments in basins have accumulated in great thickness. The part of Las Vegas Valley from the vicinity of Corn Creek south-eastward has intermittent drainage to the Colorado River. This drainage not only carries away much of the sediment now being eroded from the surrounding highlands, but also cuts locally into and exposes some of the deposits spread over the valley floor at an earlier date. The light-colored layers of silt and clay exposed in a wide area east of Tule Springs are of particular interest.

The sequence of events outlined above covered a vast span of time. Long eras of relative quiet, during which marine deposits slowly accumulated, ended with the start of mountain-making movements about 100 million years ago. Crustal disturbance was renewed at later intervals, and large breaks in the land surface attended by modern earthquakes indicate that some movements are still in progress. During much of the later history the regional climate has been arid, as at present. Aridity has been the general rule in Nevada and eastern California since uplift of the Sierra Nevada interrupted the circulation of moisture-laden air currents from the Pacific. This arid regime was modified during the Pleistocene epoch, or "Great Ice Age," which began less than a million

years ago, when general cooling of the atmosphere attended by increased precipitation caused wide glaciation in Canada and northern United States. Although Nevada lay south of the great ice caps, the climate of the whole region became moister and cooler, the snow line was lowered in high mountains, and some ranges, such as Spring Mountains northwest of Las Vegas, developed small glaciers in high valleys. Increased moisture in the low country also is attested by lake deposits now exposed at many localities along a 50-mile stretch, from near Indian Springs to points several miles south of Las Vegas. These deposits, chiefly light-colored silt and clay, are in thin, horizontal layers. The lake deposits are particularly well exposed in a wide area east and southeast of the Tule Springs Ranch, about 10 miles northwest of Las Vegas. There and at other localities in the valley the lake beds have yielded bones of large extinct mammalian species, including elephant, horse, camel and bison.

The most southerly exposures of the lake beds are at altitudes of about 2,000 feet. Northwestward in the valley the altitudes increase, to a maximum near 3,500 feet west of Indian Springs. Certainly there was not a single lake more than 50 miles long and with maximum depth 1,500 feet. A lake of such depth would have extended laterally into the foothills west of Las Vegas; but active washes reveal no remnants of lake deposits in such locations. The molluscan fauna suggests shallow or moderate depth; and the mammalian bones, found at various altitudes on the valley floor, suggest that the animals died near lake margins, perhaps some of them by bogging in marshy land or in shallow water. All the evidence is harmonized by assuming a chain of lakes kept separate by growing alluvial fans nourished by streams from the highlands on opposite sides of the valley. Under the more humid Pleistocene climate the mountain streams must have been more effective than now in building such obstructions. The pattern of exposed deposits suggests strongly there were three or more separate lakes. Continuous wide outcrop of the beds near Tule Springs narrows progressively northwestward and ends against the great fan built into the valley at an earlier stage by Kyle Canyon. Similarly the lake deposits near Indian Springs are separated, by coarse fan debris opposite the Pintwater Range, from similar lake beds covering a large area that reaches southeast to Corn Creek. Probably the largest and perhaps the deepest lake in the chain covered the wide, low area around Las Vegas. The obstruction that contained this lake presumably was in the valley now occupied by Las Vegas Wash, northeast of Henderson. No remnants of such an obstruction have been found.

Sedimentary deposits widely exposed on the floor of Las Vegas

Valley record a considerable interval of time during which the climate of southern Nevada was more pluvial than at present. These deposits, conspicuously light colored and locally dissected to form badlands, consist largely of fine silt and clay, interbedded with fine-grained sand and some gravel. The layers of silt and clay locally contain numerous shells of small mollusks, some of which represent forms that live in open water. This evidence, together with the physical nature of the deposits, indicates lacustrine conditions of considerable extent. On the other hand, the individual layers of this kind at any one place are no more than a few feet thick, and are enclosed in layers of sand and gravel that suggest deposition by laterally shifting streams. The gravel, composed chiefly of carbonate rocks common in the adjacent ranges, occurs in lenticular layers a few inches to 2 feet thick. Individual pebbles, fractions of an inch to a maximum of about 2 inches in diameter, are rounded to subrounded, and have smoothed surfaces characteristic of pebbles carried by active streams. Some layers made of mixed sand and gravel have cross-bedding that records flow of currents.

Colors of the sedimentary layers range from light brown through various shades of gray to nearly white. At any one exposure a succession of color shades may seem to be consistent from older to younger parts of the section. Examination of a wide area, however, reveals that the shades are repeated in the section and in themselves have no value in identification of individual layers. The best exposures are along Las Vegas Wash, from the vicinity of Tule Springs Ranch several miles eastward. Many vertical bluffs, 20 feet or more in height, afford clean exposures for study, and sections along the larger tributary washes provide a third dimension for study. The many variations in color and arrangement of sediments, both vertically and horizontally, are clearly revealed in this area.

Study of the deposits suggests the following history: In a climate considerably more humid than at present, streams from the adjoining ranges and basins coalesced along Las Vegas Valley. The main stream emptied into the Colorado River, which for considerable time during the Pleistocene epoch was obstructed to form a large lake (Longwell 1946: 827). Near the site of Hoover Dam the surface of this lake was at an altitude somewhat above 1,500 feet. Tributaries of the river were forced to aggrade, and the deposits along Las Vegas Valley record such aggradation. Under the more pluvial climate coarse waste was moved from adjoining ranges to form great alluvial fans, which made local obstructions in the valley, resulting in numerous shallow lakes. Sediments accumulated on the lake floors, and on floodplains which locally were

broad on the wide valley floor. With shifting of stream channels, lakes were filled with sediments at some locations, others formed as dictated by the aggrading alluvial fans. The resulting valley fill is extremely complex, laterally and vertically.

Animals and early men lived on the valley floor, attracted by abundant water and vegetation. Their remains were buried by flood deposits, eventually to considerable depth as the aggrading processes continued. When the Colorado River cut into the lake deposits (presumably by removal of a natural dam), Las Vegas Wash began removing the fill built up in its valley. Thus the record is being exposed to view.

Mammalian and molluscan fossils fix the age of the Las Vegas deposits as Pleistocene (Longwell 1946: 828), and recent study indicates that the camp sites near Tule Springs were occupied and buried during Wisconsin Time, the latest division of the Pleistocene Ice Age.

FIRST SOUTHWEST MUSEUM EXPEDITION

by M. R. HARRINGTON

The first expedition was arranged for October, 1933. Mr. Fay Perkins of Overton, Nevada, a long-time friend and veteran expedition assistant, joined me and we went to the Vegas Wash.

As Dr. Longwell has stated, the strata underlying the present valley floor, as exposed in the banks of the washes, is composed of sedimentary deposits, including considerable clay. As noted, this fill was laid down in the bed of swamps or ponds and lakes that occupied the valley (Fig. 17 and 18) during the last stage of the Wisconsin. This interpretation is confirmed by the finding of abundant shells of small fresh-water mollusks which occur singly and in clusters, imbedded in the deposit which rests on the original valley floor of solid, tough clay. Dr. Carl Hubbs of Scripps Institution of Oceanography has identified the shells as *Pisidium*, *Limnaea*, *Holisoma* and *Amnicole*, the latter a snail. Dr. George Simpson added *Planorbis* and *Physa*.

Camp was established in a protected cove near Hunter's original headquarters. The first objective was a visit to the Hunter Site. This was easily accomplished with Hunter's directions. In the side canyon his charcoal deposit was clearly visible. As would be expected, the site had been quite thoroughly examined. Did others exist? If so, it was the task of this expedition to find them. Perkins made the first discovery for the Southwest Museum. Entering a side canyon near the Museum camp, he found bone fragments strewn about the base of an eroded remnant of a cliff. As proved to be the case in so many subsequent discoveries at the locality, the



FIG. 17. View of lake beds, showing flat surface and profile.

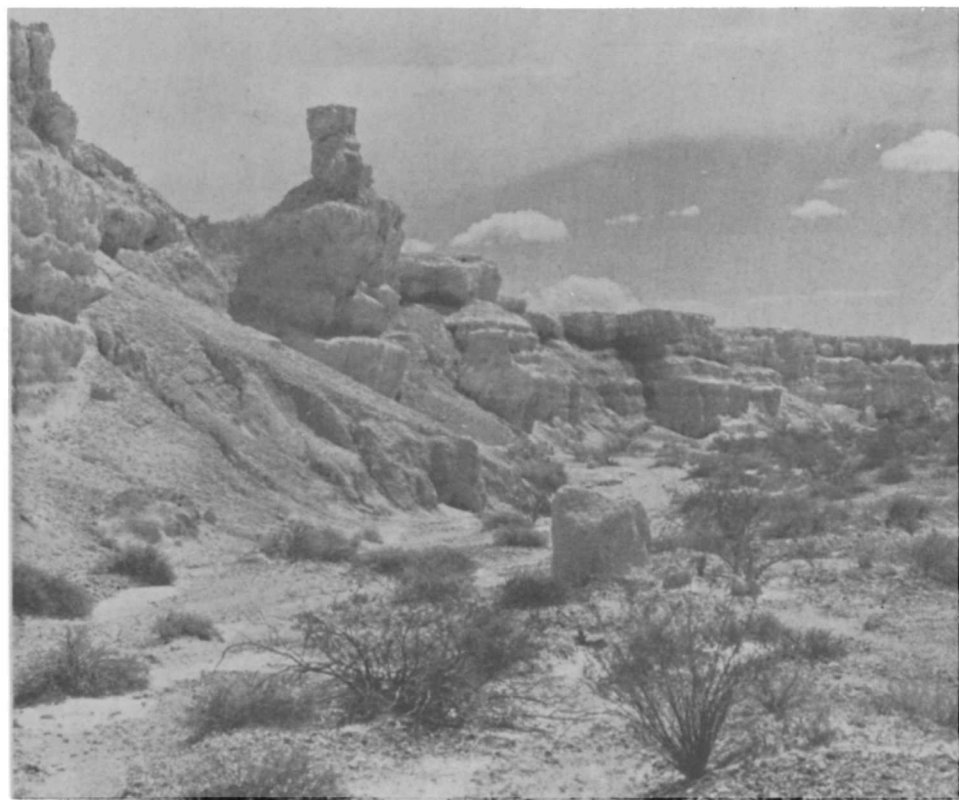


FIG. 18. View of lake beds, showing erosion-cut profile and tabular deposits. Taken in the Vegas Wash, looking upstream along the south bank. (Photo by Stuart Peck).

bones were eroding out of charcoal deposits resting on solid clay hardpan and buried by a deep overburden of softer clay—*i.e.*, resting on the land surface of the time when Man occupied the area and built his fires, and covered by lake clays and sands laid down during the centuries or millenia that followed.

These first bones led us to two charcoal deposits which we designated as Ash Bed 1 and Ash Bed 2. (For details of these and subsequent discoveries mentioned in this chapter see Chapter III). Two fragmentary bone tools (Fig. 19) were recovered from Ash Bed 2. Mammoth bones were seen lying on the clay knoll just south of Ash Bed 2; many evidences of scattered faunal remains were seen

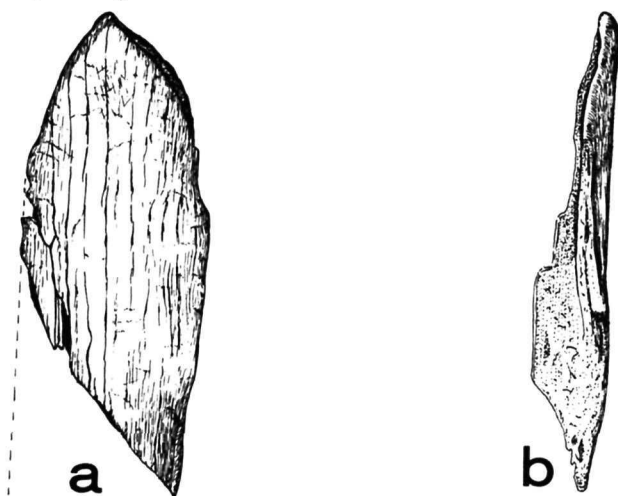


FIG. 19. Tip of bone implement recovered from Ash Bed 2, Area 1, 1933. Length 9.25 cm.; catalogue no. 10-F-39. a, dorsal view; b, edge view (note rounded, polished tip at top of drawing).

in the banks of the various side arroyos, and even in the banks of the main channel.

While excavating Ash Beds 1 and 2, and while testing other areas of charcoal, we hoped to find modified flakes or, better still, some finished implements that would help to identify the people who had hunted camels and other Pleistocene animals in this valley. This hope was not to be realized. We did find a few fragmentary cut and polished bones. These were buried in the charcoal and there could be no doubt of contemporaneity.

Moving away from Ash Beds 1 and 2, we widened our survey, finding remnants of charcoal deposits exposed in the banks of small side washes. Other ash beds were detected also, these being visible because of exposed particles of charcoal contained in the eroding surfaces. Frequently we were led to such deposits by a telltale scattering of bone fragments on the canyon floor (Fig. 20). Gradually it became apparent that, for 180 feet east of Ash Bed 2, charcoal deposits with imbedded bones were numerous. At greater distances



FIG. 20. Fragments of mammoth bones exposed by erosion of lake deposits, Area 3. Such eroded material suggests possibility of nearby cooking fire.



FIG. 21. Erosion of upper sedimentary deposits re-exposes old land surface and creates side canyons in which cooking fires have been found. Area 3 (Hunter Site, left rear).

we found clusters of bones without evidence of fire. In general it may be stated that the charcoal deposits appeared to be irregular in outline but seldom more than 4 or 5 feet in diameter. On this first trip we saw no pit more than 3 feet deep.

The reader may wonder why, if these fire areas were buried by a flood plain and lacustrine deposits, we are able to see them thousands of years later. The answer is quite simple: clays and silts, deposited by streams and lakes, constitute the valley floor; this is being eroded in times of flood; arroyos are forming; the younger, soft clays and sands are being carried away; and gradually the old tough clays are being reëxposed (Fig. 21). Side canyons are being enlarged and evidence of human occupation is thus being revealed to archeologists. Unfortunately, this constant erosion is also tearing away many valuable chapters in the story. Proof of this lies in: the

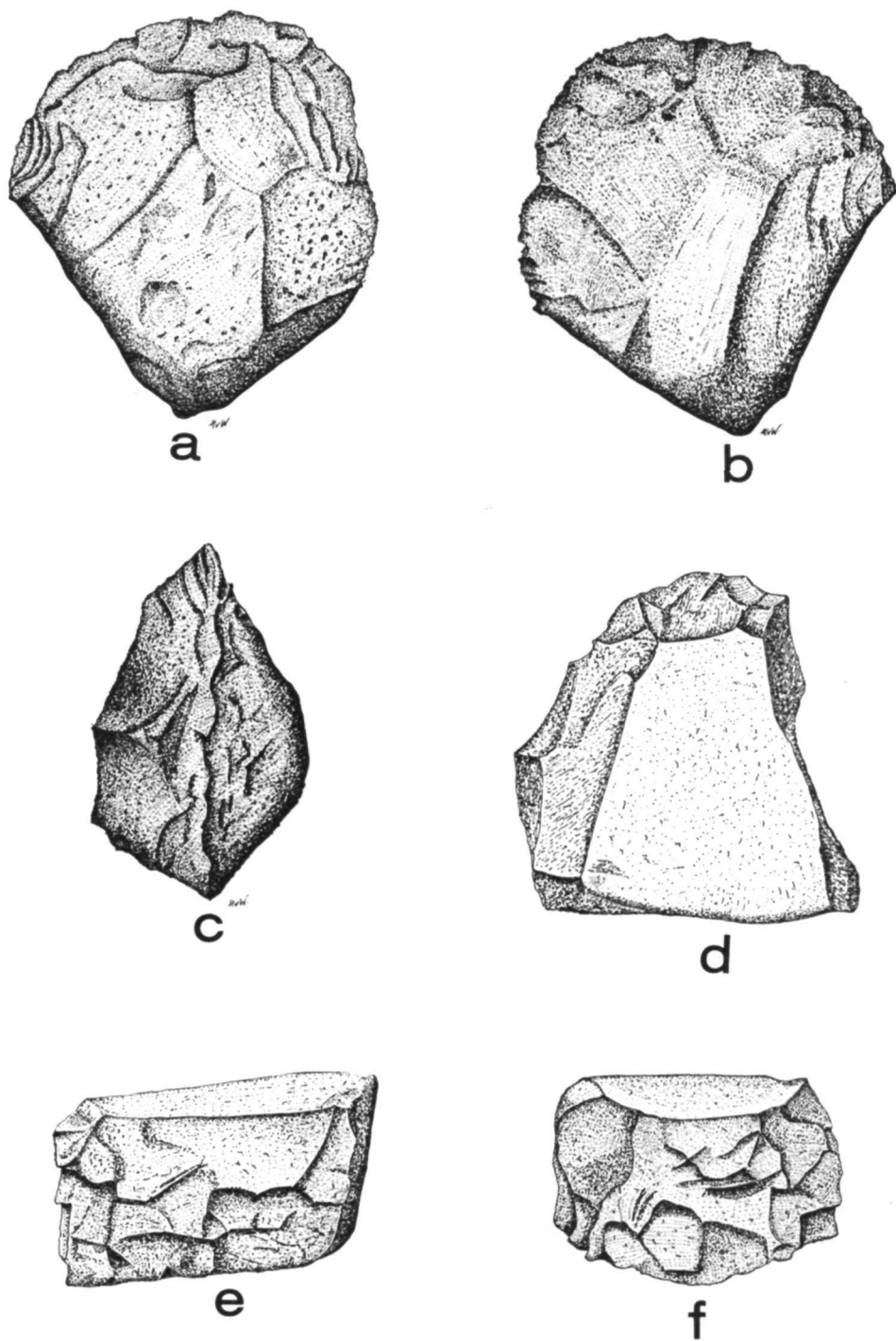


FIG. 22. Stone implements found near Ash Bed 2, Area 1, in the erosion channel. a-c, limestone chopper; d-f, limestone scraper; length of chopper is 7.5 cm. (10-F-1); length of scraper is 7.4 cm. (10-F-2).

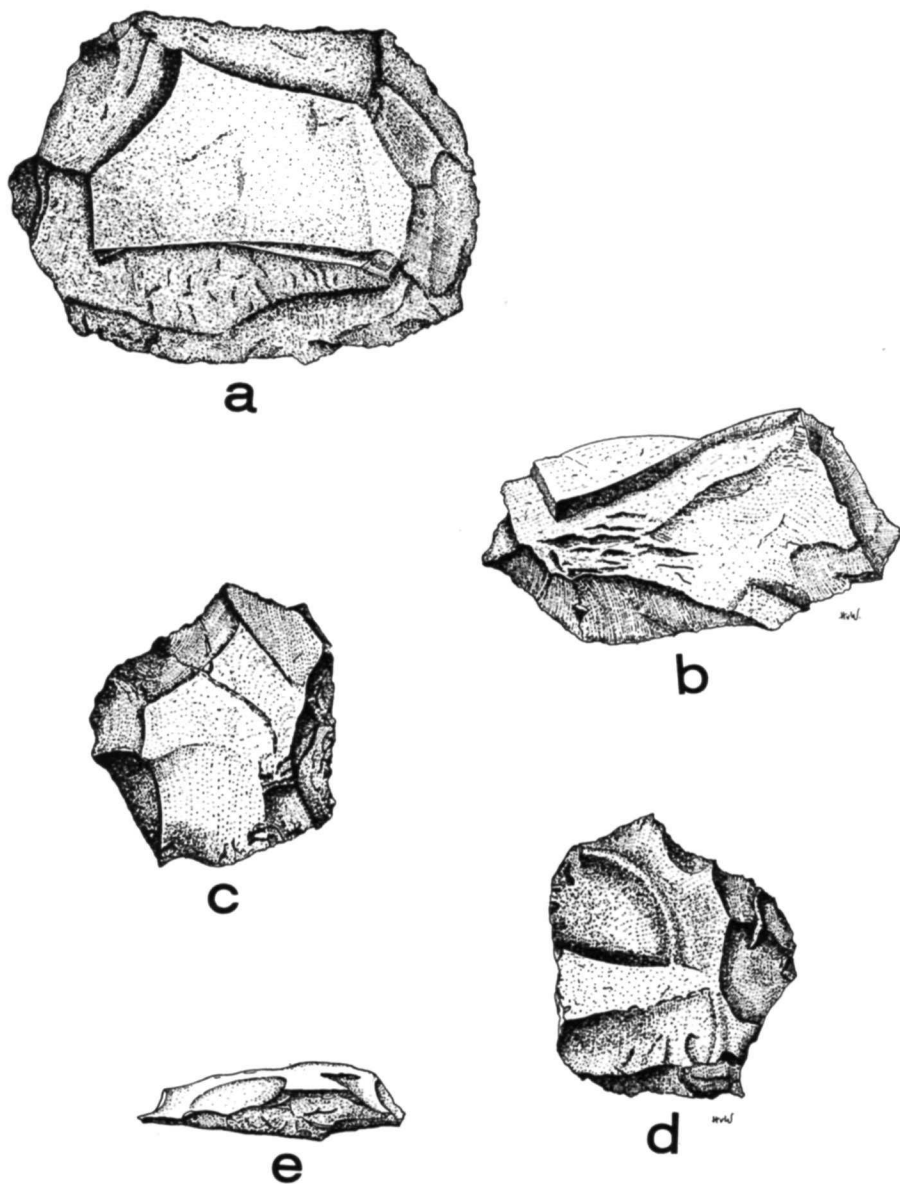
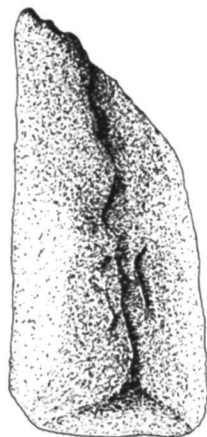


FIG. 23. Stone implements found near Ash Bed 2, Area 1: a, b, large bifacially flaked ovoid (dorsal and edge views); c-e, small bifacially flaked ovoid (dorsal, ventral and edge views). Length of larger specimen is 9 cm. (10-F-5). Length of smaller specimen is 5.65 cm. (10-F-6).



a



b

FIG. 24. Side chopper found near Ash Bed 2, Area 1: a, dorsal view; b, edge view. Length 10.9 cm. (10-F-3).

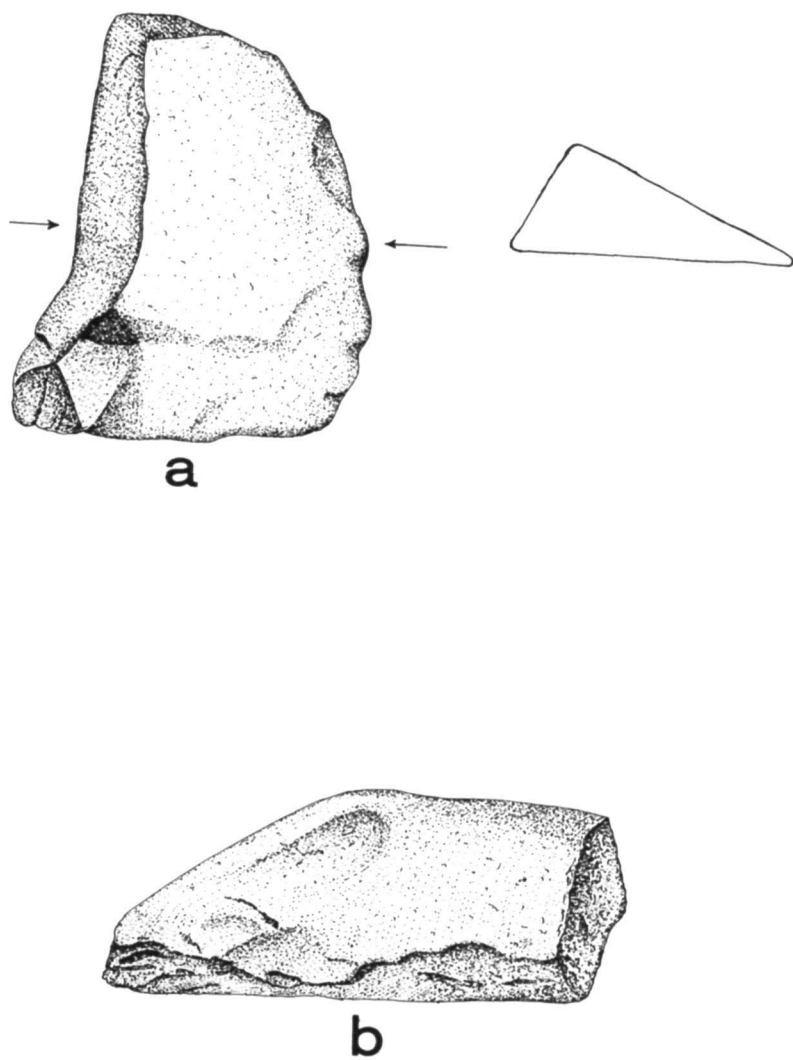


FIG. 25. Stone implements (?) found near Ash Bed 2, Area 1: a, possibly a cutting tool; length 8.5 cm. (10-F-8). b, probably a side chopper; length 11.25 cm. (10-F-9).

remnants of charcoal deposits visible in the sides of arroyos; the bone fragments strewn over the canyon floors; and the badly eroded younger lake deposits themselves. One can only wonder what valuable records have been swept down the Vegas Wash.

In view of this destruction of charcoal deposits, and indeed of parts of the ash beds we dug in 1933, I hoped that perhaps the eroding flood waters might have left heavier stone implements near the deposits. I started to search near Ash Bed 2, and, before traveling 50 feet, I had made the first discovery. It was a crude chopper fashioned from a dolomitic limestone cobble and bifacially flaked (Fig. 22a-c). For this type of specimen it was a very good artifact. Through the years, flake scars had weathered until they and the original water-worn surfaces had precisely the same color and appearance. During the days that followed the discovery of this tool, a large uniface scraper of limestone (Fig. 22d-f) and two bifacially-flaked ovoid implements of metaquartzite and orthoquartzite (Fig. 23) were collected, as were a sturdy chopper of limestone (Fig. 24) and several broken pieces of orthoquartzite and limestone which may or may not have been modified by Man (Fig. 25). These were all recovered from the eroded surface near the ash beds, at the same or slightly lower level. None were found *in* the charcoal deposits on this first trip.

Once we had collected representative samples of the bones, ash and charcoal, it was decided not to excavate further. This was 1933 and already several western American localities had been found in which man-made implements were associated with the bones of extinct Pleistocene animals. The radiocarbon dating technique was unknown and many archeologists still believed that all such sites were about 10,000 years old. Since Tule Springs was yielding so few artifacts, further excavation here did not seem worth while.

NEW SIGNIFICANCE: CARBON-14

by M. R. HARRINGTON

The years passed. Brief reports were published and our attention turned to other localities. A very small sample of the charcoal and bone assemblage remained on exhibition in the Southwest Museum.

Then came the dawn of a new era in American archeology, an era characterized by the close cooperation of prehistorian and nuclear physicist: "Carbon-14" dating methods grew into a vital new science.

In 1952, Ruth Simpson, now our Associate Curator, Mrs. Harrington and I returned briefly to Tule Springs hoping to obtain a

fresh and larger supply of charcoal to submit for a radiocarbon date. While a few badly-eroded patches of charcoal were seen, we could not relocate the main locality and were unable to get satisfactory charcoal samples. This was doubly disheartening since the bulk of the original collection from Tule Springs could not be located in the Museum storage areas. In 1954 Ruth Simpson, aided by volunteer assistant Mrs. Freddie Curtis, found the missing boxes and jars in a locked cupboard. A sample was sent immediately to Dr. Willard Libby at the Institute for Nuclear Studies, University of Chicago. Upon completion of the test, Dr. Libby wrote, asking for additional charcoal. The Southwest Museum contributed some and Hunter contributed some of the sample he had gathered at the time of the original discovery.

The final results of the tests thrilled us all: the charcoal from Tule Springs was "more than 23,800 years old."³ At that time 23,800 years was the maximum age the University of Chicago laboratory was equipped to determine, and it more than doubled the oldest known archeological date in America.

What if artifacts were scarce at Tule Springs? With that age, even if it took months to find it, just one unmistakable flaked stone implement found in place in the charcoal would be tremendously significant.

Although funds would permit only a two-weeks expedition, we decided that it was absolutely necessary to return, relocate the sites and continue excavations. Plans were made, permits obtained from the United States Department of the Interior, the Air Force (whose reserve bordered on the Vegas Wash) and the Nevada State Museum. Dates selected for the field session were May 7 to May 18, 1955. The field crew included both authors and the following volunteers: Stuart Peck, Charles Rozaire, S. M. Wheeler and Georgia Wheeler.

THE SECOND TULE SPRINGS EXPEDITION

by RUTH D. SIMPSON

Before the 1955 expedition left the Southwest Museum I obtained copies of Harrington's and Hunter's photographs and prepared 16x21 inch enlargements of views showing the original sites and their relation to topographic features.

With the Museum's truck, Peck's jeep and Wheeler's station wagon transporting our gear, we arrived in the area early on May 8, set up camp and began searching for the locality. I fastened the most general view of the area beneath the jeep's windshield and

³As noted previously, subsequent tests at Lamont Observatory, Columbia University, have established a minimum age of 28,000.



FIG. 26. Ash Bed 2, Area 1: a, as photographed in 1933; b, as photographed in 1955; c, close-up of Ash Bed 2 in 1955.

Peck and I drove across the lake beds until the photograph agreed with the landscape as we saw it. More localized photographs were placed on view and we drove in and out of the various washes until eroded segments of the lake beds were all properly aligned with the distant hills. Just at dusk we seemed to have found the location of Ash Bed 2. Stepping from the jeep to continue the search on foot, I found the still-visible evidence of Harrington's 1933 excavation beneath the jeep's wheels, and charcoal streaked the clay bank ahead.

It was a happy group that returned to camp that evening for our first major objective was accomplished: we had relocated the charcoal of cooking fires that had blazed at least 28,000 years ago.

The following day it was possible to continue on foot and, aided by photographs, to find other sites discovered in 1933. By the time Dr. Harrington returned to Los Angeles he was able to report that mapping of the original sites was underway, that charcoal was being recovered from known sites and from new deposits we were finding.

Our small crew now had three major objectives: the excavation and recovery of samples from charcoal deposits (hoping of course to find implements in place); complete coverage of the locality through mapping and photography; an intensive survey of the general region which would reveal other fire areas and bone exposures. Rozaire concentrated on excavation. Peck and I mapped and photographed in the morning before the wind acquired velocity which hampered such work. When mapping became impractical, we would continue excavation of charcoal deposits or turn to the extension of the regional survey.

A plane-table map was completed which covered the area from northwest of Ash Bed 1 through the Hunter Site. All known evidences of paleontological and archeological significance were plotted. Later discoveries were added and the map completed by Mr. John Kettl in 1960 (Map 3).

As mapping and photography progressed, it was a never-ending source of amazement to see still extant evidence of the 1933 excavations (Fig. 26) as well as the minor topographic details and floral features visible in the 1933 photographs. One usually thinks of erosion on the desert as being rapid and devastating. However, in 1955, bushes, clusters of rocks and evidences of excavation recorded in 1933 were still readily apparent. The most marked change was a moderate softening of ridge crests. This stability of landforms serves to emphasize the advanced erosional pattern of badlands that has developed, and to make us more cognizant of the time required for the development of that pattern and of the magnitude of forces involved.

Seven major charcoal deposits were excavated during the 1955 expedition. These included further work at Ash Beds 1 and 2 and further unsuccessful attempts to recover the mammoth bones on the knoll adjacent to Ash Bed 2 (Fig. 27). Especially significant was the partial excavation of a charcoal deposit to which Harrington was guided by smears of charcoal at the base of a ridge forming the northeastern boundary of the amphitheater-like side canyon which contains Ash Beds 1 and 2. This new evidence lying between these two sites is designated as Site A, Area 1 on Map 3.



FIG. 27. M. R. Harrington and Stuart Peck uncovering mammoth bones near Ash Bed 2.

It will be seen that Area 2 on our map lies to the east of Area 1. It includes a separate group of erosion basins and drainage channels. Here were made some of the most important finds of the 1955 and 1956 expeditions.

At the outset of the mapping project in 1955 a large exposure of charcoal was noted at the toe of a north-facing erosional spur, and on adjacent lower slopes. That exposure at the base of the erosional spur is designated as Site A, Area 2, and was completely cleared, exposing an excellent basin-shaped charcoal-filled feature (Fig. 28a, b).

Preparation of the plane-table map also led to the discovery of Site C in Area 2. This proved to be a large pit containing charcoal and numerous camel foot and leg bones. Excavation required two days and I was assisted by Peck and Rozaire the second day. The bone concentration here was the densest encountered in any deposit excavated in 1955.

On May 10th, while Harrington and Rozaire directed work in



FIG. 28. Cooking fire, Site A, Area 2: a, general view of the fire area during excavation; b, Charles Rozaire and closer view of Site A, Area 2.



FIG. 29. The Fenley Hunter Site as it looked when relocated in 1955.

Area 1, Ash Bed 2 and Site A, I began an examination of side arroyos extending back from both banks of the Vegas Wash downstream (eastward) from Area 1. Three hours later the Hunter Site (Area 3) was relocated and evidence of the American Museum's original excavation was still visible (Fig. 29). There were traces of charcoal and many scattered bones in the basin. However, there were remains of recent small fires and other camp debris which made us very hesitant to take charcoal samples from this area. Also, except for the original major excavation, there was no sure indication of where previous field crews had dug. Therefore, we restricted our excavation to a reopening and slight extension of Hunter's trench (Site A, Area 3) and to examination of a large exposure of mammoth bones and tooth fragments on the opposite side of the basin (Site B, Area 3). Site B has been mostly destroyed, probably by erosion, and only small samples could be collected in addition to bones lying on the surface. One of these bone fragments bears a series of parallel, possibly tool-made, grooves.

Mapping, which began on May 11, continued until the 14th. While working on this project Peck found a battered piece of quartzite lying on a knoll at the Hunter Site (Site E, Area 3). This specimen strongly suggests modification for use as a hammerstone. I found a flaked piece of orthoquartzite lying with a cluster of bone fragments (Site F, Area 2) during the mapping project. Neither specimen may be definitely classified as an artifact, however.

The jeep survey was extended east and west along Vegas Wash. The area east of the Hunter Site was checked for 2½ miles, the side

canyons being followed on foot when they became too narrow for the jeep. No charcoal was observed and bones were scarce. However, the valley floor is badly eroded and there are many small channels that have not been checked. Exposures of charcoal and bone upstream (west) from Area 1 were much more plentiful and, in view of limited time and personnel, it was decided to concentrate on the western arroyos.

The jeep reconnaissance began May 11 and continued as time permitted until the expedition broke camp on the 18th. During this survey the arroyos visited by Harrington and me in 1952 were re-located and mapped. No further bones had become exposed near the knoll we excavated (Survey Site 1). Shell and bone fragments were found in most of the arroyos Peck and I checked on foot. However, this evidence was extremely fragmentary in most instances. Only in three other side canyons did scattered bones lead us to important outcrops of paleontological material (Map 3, SS. 2-4). One yielded only bones, some of which have been identified as camel; one yielded a small amount of charcoal and numerous bones; one was a most important discovery: the remains of a mammoth (Map 3, SS. 4). This was the last major excavation begun in 1955.

The elephant was found late in the afternoon of May 12 when I saw a fragment of mammoth rib in the main wash. Bone and tusk fragments became numerous as I walked up a narrow side arroyo. Coming around a bend I looked up and saw the crumbling tusk curving over the top of a knoll to the northwest. Several other bones were exposed by erosion on top of the knoll. All were left in place for photographic and mapping purposes. Excavation began in the morning of May 13th. When it became evident that there were more bones buried in the clay, Rozaire began cutting trenches flanking the skeleton. Harrington was contacted and we were instructed to continue excavation by cutting a profile along the southeast edge of the deposit, and by clearing the surface to expose as many bones as possible.

By May 16 all bones on the upper side of the mammoth were uncovered (Fig. 30); seven feet of tusk were exposed; the interior surface of the skull was found imbedded in the clay at the bottom of a small erosion channel west of the tusk. The tip of the tusk and ends of most bones plunged into this tough clay. It was decided that further excavation with our equipment would only result in the destruction of the bones. Harrington returned on the 16th and on the 17th was taken to the mammoth site. He agreed that further excavation should be undertaken only by a paleontologist. The bones were covered with newspapers and then with soil to protect them until further work could be undertaken on a subsequent expedition.



FIG. 30. Excavation of mammoth, Survey Site 4: a, situation of Survey Site 4, near head of small side canyon (photo by J. Kettl); b, mammoth bones.

The remainder of May 17 was spent collecting charcoal samples from small, badly eroded deposits in Area 1. The expedition returned to the Southwest Museum May 18.

In reviewing the 1955 field session and planning for 1956, it became apparent that certain problems had been clarified but that others had developed.

It had now become evident that: a) the charcoal deposits are localized and may be correctly classified as fire areas and cooking fires; b) most definitive of the charcoal deposits then exposed were Site A and the Ash Beds in Area 1, and sites A and C in Area 2; c) throughout Areas 1, 2 and 3 all discoveries of charcoal and associated mammal bones are within 5 feet of the same elevation; d) all the evidence with which we are concerned occurs at the juncture of the old land surface and the younger valley fill; e) whole skeletons were seldom if ever brought into the cooking areas — rather, selected parts were used; f) absence, or at least the paucity of charcoal deposits east of the Hunter Site as compared with numerous exposures west of it, would indicate that the most heavily occupied region of the locality would lie at least as far west as Areas 1 and 2.

We still had not acquired definitive knowledge about the implements used by the early hunters who frequented the Vegas Wash, nor did we know anything about the people themselves. We still were not certain as to the origin of the pluvial period deposit that filled the valley to a depth of more than 20 feet above the old land surface, nor did we know the type of local vegetation used as fuel. In short, we had only snatched bits of information about Man's occupation from the tenacious grip of the Pleistocene clays.

Certainly the greatest problem for the archeologist remained the lack of artifacts. True, a pointed bone tool had been found, pieces of bone split while green were numerous, and, from the arroyo surface near the charcoal deposits, a few stone tools had been collected during the First Expedition. However, the absence of tools and weapons is exceedingly difficult to explain. *If* bone tools constituted the bulk of the artifacts, why have only one obviously fashioned implement and one probable artifact been found? Stone was plentiful in the area, so why do we not customarily find stone tools either in and around the cooking areas or at the kills?

As we looked to 1956, it was with the hope that extensive as well as intensive survey and excavation might answer some of our questions.

THE THIRD TULE SPRINGS EXPEDITION

by RUTH D. SIMPSON

In 1956 the Southwest Museum field crew reached Tule Springs April 3rd and remained three weeks. Charles Rozaire, Stuart Peck and I remained for the entire season. Dr. Harrington directed the opening operations of the crew before returning to Los Angeles. With us for more than a week were Mr. Phil Orr of the Santa Barbara Museum of Natural History and Mr. and Mrs. B. E. McCown of the Archeological Survey Association of Southern California. Assisting us briefly were Mr. Fay Perkins, who had worked with Harrington during the original investigations, his son Mr. R. F. Perkins, Mr. Willis Grafton of the Archeological Survey Association, and his father. Transportation this time included the Museum truck and jeeps brought by Peck, McCown, Orr and Grafton.

Knowing that we would have paleontologist Orr's help in examining the faunal remains, I decided to have the areal reconnaissance recommence at once in an effort to locate as many deposits of bone as possible before Orr arrived. Peck and I furthered this survey for two days. Rozaire resumed work at Site A, Area 1, with Harrington. When Orr arrived all conspicuous occurrences of faunal material had been revisited and four new exposures of bones had been recorded. Three of these proved to be badly eroded with only fragments remaining. At the fourth exposure the bones were those of a mammoth. These were imbedded in the tough clay and recovery was not attempted. Orr identified the bones from Survey Site 5, found in 1955, as being those of a ground sloth.

With the arrival of the McCowns and Orr, the scope of our activity changed and widened. Orr brought his jeep equipped with jeep-dozer, blade and slip. Rozaire and I worked with Orr. Peck continued the jeep survey and the McCowns joined him for two days.

The jeep survey extended beyond the confines of the Vegas Wash and resulted in the discovery of abundant evidence of human occupation at a later prehistoric period, on the wide floor of Las Vegas Valley (see Chapter V).

Orr began work at Site A, Area 1 (Fig. 31), using his jeep and jeep-dozer, the drag-line with slip, and dynamite to remove tough overburden from an area sufficiently large to permit Rozaire to continue work with hand tools in this deposit which contained the heaviest concentration of charcoal uncovered at the locality.

Orr next cleared 4 to 7 feet of overburden from unexcavated portions of Ash Bed 1 so that I could continue work there. Turning his attention to the mammoth bones on the slope above Ash Bed 2, Orr found that it would be impossible to loosen the bones without destroying them, and they were reburied. After Orr had checked the



FIG. 31. Phil Orr and Santa Barbara Museum jeep removing overburden; Charles Rozaire operating drag; M. R. Harrington and Stuart Peck supervising. Site A, Area 1.

various scattered bone deposits reported by the jeep survey in the Wash, he and our entire crew began work at Survey Site 4, the mammoth we partially uncovered in 1955. Orr was able to loosen, coat with plaster, and remove several of the bones. Others only partially exposed in 1955 were further unearthed and identified.

Orr's final effort in our behalf was the general removal of overburden from several eroded basins as we searched for additional fire areas (Fig. 32). It was during this operation that we found a charcoal deposit containing camel bones and the one stone tool recovered *in situ*. This was designated as Site D, Area 2. Charcoal samples from this site were used in obtaining the 28,000 B.P. date.

After Orr left much time was spent by all members of the crew excavating charcoal deposits, large and small, which the jeep and equipment had exposed. However, Fay Perkins' visit a few days later also gave us new sites to excavate for he was able to indicate the locations of mammoth bones he had seen in 1933. Peck and McCown each took charge of one of these new sites, Peck finding mammoth teeth at Site G, Area 2, and McCown finding a mammoth jaw and teeth at Site D, Area 1.

Peck spent the last days of the field session clearing Site B, Area



FIG. 32. Site D, Area 2: a, Orr removing overburden with jeep-dozzer; b, Ruth Simpson continuing excavation as charcoal streaks are exposed. (Photo by Phil Orr).

2, a remnant of a badly eroded fire area in which bone and shell were especially abundant. I opened a long, shallow extension of Site A, Area 2. Here, bone was scarce and charcoal was spotty.

The last major discovery during the 1956 expedition was made by Mr. and Mrs. McCown while extending the jeep reconnaissance up the Vegas Wash and concentrating on side arroyos entering from the north. Survey Site 6 was the largest fire area discovered during the 1955 or 1956 expeditions. Charcoal and broken and burned bones were abundant. This site, more than two miles from the main locality, is strongly suggestive of the important finds which probably await renewal of the investigation of the Tule Springs region. Both the McCowns and Peck found scattered faunal evidence as far as the jeep survey was extended to the west.

On the final day of the session a brief reconnaissance trip was made to Corn Creek where there are lake beds and faunal remains similar to those at Tule Springs and where some charcoal was recovered in 1930 by Mrs. Bertha Cody, Southwest Museum. Peck and I did see some scattered mammoth bones, shells and unidentified fragmentary bones; we also saw much evidence of more recent archeological sites in the Corn Creek dunes and near the springs.

When the field crew left Tule Springs in 1956, it was with the definite feeling that much more work should be done in the lake deposits of the Vegas Wash, but that it would require a large-scale project to afford the scientist even a reasonable chance of recovering further significant data. The thickness of the overburden, the toughness of the clay, the immensity of the area reduce almost to zero the recovery potential of a two-or-three member crew armed with hand tools. It is felt that, while there are probably rich deposits still at and near the main sites, they are beneath the 20-foot uneroded portions of sedimentary fill. All of the deposits we have excavated thus far were partially exposed by erosion, or at least a major portion of the overburden had been removed. Thus, the deposits yet to be dug will be more difficult to uncover—they could also be more rewarding since no aspects of the features have been destroyed by erosion.

CHAPTER III

Summary of Fire Areas and Pertinent Faunal Remains

by RUTH D. SIMPSON

FROM THE PRECEDING REPORT of progress and discoveries made by the various expeditions to Tule Springs it will be readily apparent that the most numerous evidences of human occupation were charcoal deposits and associated faunal remains. Man-made artifacts were reported only upon exceedingly rare occasions, but of course constitute our most crucial data. We shall begin our consideration of the Tule Springs material with an analysis of the three fire areas which had associated artifacts and faunal remains. Then we shall discuss seven large deposits of charcoal associated with faunal remains only. Six of these were in the main locality. Thirdly we will review instances of fire areas without associated faunal remains. Finally, we will consider three significant deposits of faunal material without related charcoal in the main area, and one discovered by the jeep survey. At the close of the section some of the minor discoveries of paleontological specimens found during the jeep survey which resulted in the recording of more than a dozen widely scattered fragmentary faunal occurrences, and innumerable isolated bones in the various side arroyos, will be discussed.

FIRE AREAS WITH ASSOCIATED ANIMAL BONES AND MAN-MADE ARTIFACTS

Three fire areas fall in this category: The original Hunter Site, Site A, Area 3; Ash Bed 2, Area 1; and the charcoal pocket recorded as Site D, Area 2. It is interesting to note that these three sites are widely scattered in the main locality, that each find was made by a different person and on a separate expedition. Certainly, this is by far the most important category to be discussed.

SITE A, AREA 3: This is the original site discovered in 1933 by Mr. Fenley Hunter, and again we are fortunate to be able to present his comments.

During the morning of January 16th (1933) while Frank Bell, Albert Silberling and I were working on two large bison skulls (American Museum of Natural History No. 30051 and No. 30052) in a short coulee 200 yards from Las Vegas Wash, one-half mile east of Buffalo Camp, we discovered some bone fragments

that had been eroded out from a steep slope on the southeast side of the coulee which merited investigation. In quarrying this new bone pocket (Site A, Area 3) (Map 3) with pick and shovel to a depth of 4 or 5 feet, we had to remove many large chunks of hard greyish matrix which rolled down the slope to the floor of the coulee. It was then that the sharp eyes of the late Albert Silberling, looking down the slope, noticed an unusual black object on the upturned surface of one of these chunks of matrix.

This black object caused us to temporarily lose interest in the bone pocket and the three of us slid down the slope for a closer look. We found that the black object firmly imbedded in the matrix was a worked obsidian flake approximately 1½" long by 1" wide (Fig. 16). No other obsidian in any form was found in this region. Also imbedded in the same chunk of matrix were many black specks of charcoal and numerous small fragments of bone. Only then did we fully realize we had in this one chunk of matrix a modified obsidian flake in immediate association with charcoal and bone fragments.

While greatly tempted to dislodge the obsidian artifact so that we could have a look at the other side of it, we decided against doing so, knowing it should remain undisturbed for subsequent laboratory examination by the American Museum. With this decision behind us we at once carefully shellacked, rice papered and bandaged the entire chunk of matrix which we labeled Locality 96, Special 631-A (Simpson, G. G., op. cit., 1933). I then photographed the site of our lucky find with Frank Bell holding a spade and Albert Silberling pointing his pick to the exact site of the artifact (Fig. 15a).

Further intensive work that day in this bone pocket produced only teeth, bone fragments, shells and scattered bits of charcoal—nothing more. This was disappointing as we were hopeful this bone pocket would yield additional evidence of human activity. January 30th, our last working day out of Buffalo Camp, was spent making one more intensive search for another artifact of any kind, but all we found were two small, well-defined areas of charcoal which suggested cooking fires.

A most interesting and comprehensive archeological report on Early Man in this region by Dr. Mark R. Harrington, Curator of the Southwest Museum, was published in the December 1955 issue of *Natural History*.

Dr. M. R. Harrington is entirely responsible for the eventual dating of the charcoal we found in the chunk of matrix containing the obsidian artifact as it was he who remembered, after a lapse of 21 years, our 1933 expedition and suggested that specimens of this charcoal be obtained from the American Museum of Natural History for testing. Thanks to that Museum and Dr. Harrington's suggestion in 1954, I sent 8 or 10 pellets of this charcoal weighing 12 grams for Dr. W. F. Libby of Chicago University to test by his Carbon-14 method. Dr. Libby found our charcoal, as well as Dr. Harrington's samples, to be "more than 23,800 years old" and the same age is assigned to the imbedded obsidian artifact. Twenty-one years elapsed before Dr. Simpson's recognition of the probable association of Pleistocene fauna with Man was confirmed. Like the Mills of God, Science moves slowly but surely.

Erosion has not obliterated the evidence of the 1933 excavations (Fig. 15b). Still present in the site are scattered bone fragments and charcoal. These occur approximately 5 to 8 feet above the floor of the wash and extend approximately 20 feet horizontally. On Map 3, Site A is situated 80 feet southwest of the Area 3 marker.

The horizontal clay beds and masses of tiny shells, so characteristic of the Tule Springs Locality, occur here and throughout Area 3. As noted in Chapter II, Harrington found Site A quite thoroughly excavated when he went to Tule Springs in 1933, and no subsequent intensive work has been done there. Certainly the bones, charcoal and obsidian flake recovered by Hunter's group make this one of the most significant sites in American prehistory.

ASH BED 2, AREA 1: (See Map 3, Fig. 26) This important site lay 12 feet below the present floor of Las Vegas Valley and is 85 feet southeast of the Monument (hub of Area 1 measurements). Excavation by Dr. Harrington in 1933 exposed abundant charcoal and ashes. There were bones of Pleistocene camel, horse and bison, a mammoth tooth and the bones of several other animals including some tentatively identified as belonging to the cat family. There were small lenses of fine white sand in the deposit which generally consisted of firm, but not tough, silty clay. This clay was rather dark in color, a condition which could have resulted from burning or from the thorough admixture of fine charcoal and ash. Excavation, begun in 1933, was continued in 1955, at which time it was noted that small shells were abundant throughout the deposit and that the silt was much looser than in other charcoal deposits uncovered.

The 1933 excavation, as Dr. Harrington reports: "revealed a small 'gully' at the lower end of Ash Bed 2 (Fig. 35). This gully, about 3½ feet deep, contained a bedded deposit of ash and charcoal and a tangled mass of bone fragments. Many of these fragments were burned and split. Most severe burning was noticeable on the extremities. Among these bones in the deposit of charcoal was a piece of pointed bone which may have been fashioned by Man, and one definitely fashioned distal end of a bone implement (Fig. 19). The tip was accurately formed and the tapering edges smoothly polished. Charcoal from here was used by Dr. Libby in obtaining his more than 23,800 date. Three fragmentary bone tools (?) were also found here.

"Excavation in 1933 was conducted mainly in the gully where the heaviest concentration of material occurred. At that time it was also noted that several bones and some charcoal lay in the tough clay underlying the charcoal-bearing stratum. This was a condition that was to become recognized as characteristic of most bone-bearing charcoal deposits."

Certainly the most significant excavations here were made in 1933. Only a small peripheral, undisturbed segment of the deposit remained to be tested in 1955 and digging was limited to the cutting of two trenches along the north and south sides of the remain-

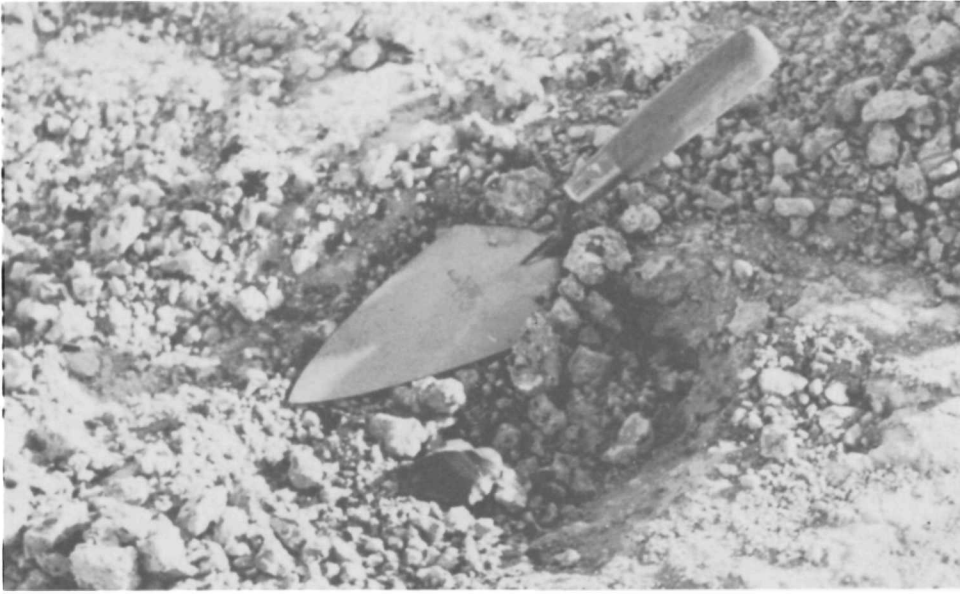


FIG. 33. Site D, Area 2: Charcoal pocket containing scraper and camel bones. Scraper is shown in place in foreground, below blade of trowel.

ing 13 by 10 foot upper portion of the Ash Bed. The northern trench was extended to a depth of 40 inches, the southern trench to 33 inches. Most of the charcoal was found in scattered clusters, but a few well-formed lenses were also uncovered. Bone fragments were numerous and some were burned. The mixed condition of the charcoal and silt supported the 1933 diagnosis that Ash Bed 2 was largely a dump.

SITE D, AREA 2: (See Map 3) In 1956, Phil Orr's stripping of overburden in Area 2 (Fig. 32) made it possible for me to find and clear this small but highly important deposit situated 160 feet east of Site A, Area 2. Over a large section, 4 feet of overburden were removed, including a small clay knoll east of Site C. As the jeep removed the base of the knoll, charcoal streaks began to color the clay. The dozer blade on the jeep was lifted until it barely shaved the surface on each passage across the area. At the last, charcoal became too abundant to permit further use of mechanical aids and I resumed excavation by hand. A small lens or pocket of clay and charcoal became apparent and began to yield bone fragments. Then I exposed the basal portion of the only stone implement recovered thus far *in situ* in the charcoal (Fig. 33). It was a small, uniface, convex-edged side scraper with unifacially retouched edges (Fig. 34). Orr and Grafton witnessed the discovery and the McCowns saw the tool in place. All charcoal and bone fragments in the deposit were collected. The charcoal concentration was 18" long x 11" wide x 11" deep; charcoal streaks were visible over an

area 5' x 7'. It was a sample of charcoal from this deposit that Lamont Geological Observatory (1960) dated at 28,000 years B.P. Had it been possible to completely purify the sample, it is probable that the age determined would have been somewhat greater.¹



FIG. 34. Scraper, Site D, Area 2. Length 4.8 cm. (10-F-76). (Photo by John Kettl).

FIRE AREAS WITH ASSOCIATED ANIMAL BONES

Most numerous of the various types of evidence of human occupation at the Tule Springs Locality were fire areas with associated bones of extinct Pleistocene fauna. Seven large deposits of charcoal and paleontological material were excavated, six within the main area. As in the case of sites reported in pages 72-76, the bones of more than one species of animal have been recovered from the same charcoal deposits. Also, numerous little freshwater-pond shells were present in the charcoal deposits and often were massed beneath the bones.

Before discussing the major sites included in this section let us note briefly the abundant, but exasperatingly fragmentary, minor associations of charcoal and faunal remains.

There were several instances when we felt certain that charcoal deposits had been destroyed by erosion before we found them. Exposed charcoal and bone were observed in the clay walls just above the old land surface or at the contact zone between older and more recent clays. Also, many charcoal smears could be detected in early morning and late afternoon light, or after a rain, on the surfaces

¹The following is an excerpt from a letter to Ruth Simpson from Dr. Wallace Broecker reporting the radiocarbon date: "We at last have completed the analysis of L533-B (your 10-F-77). We obtain an age of >28,000. Actually the result suggests a finite age of about 33,000 years, but we are being conservative and quoting a minimum age. The reason is that we could not pretreat the sample to remove any possible humic contaminants . . ."

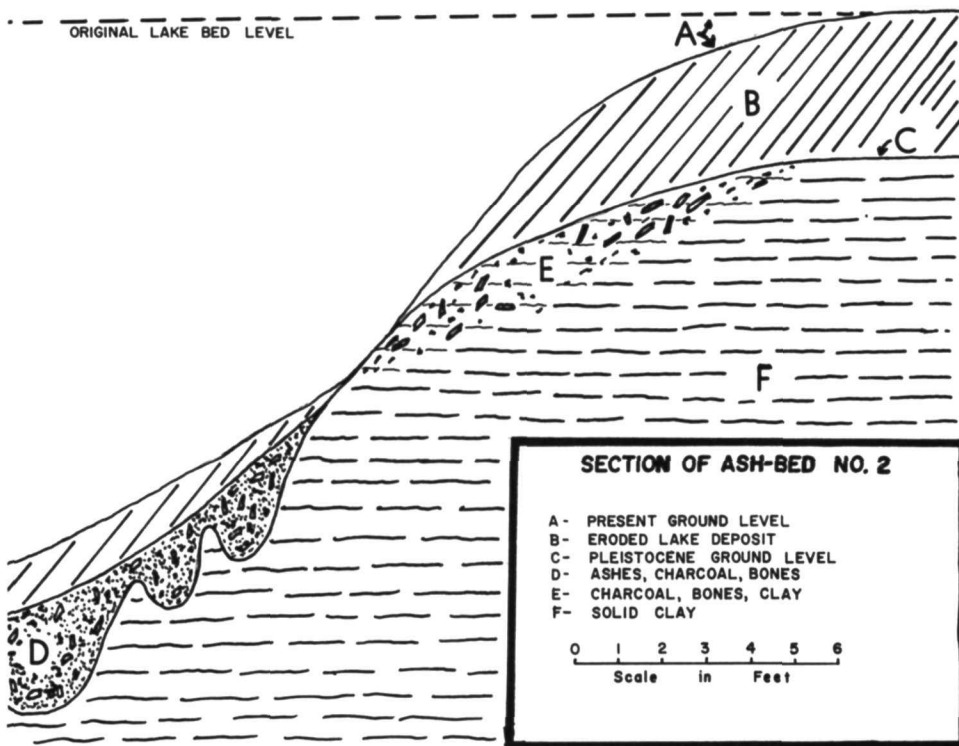


FIG. 35. Ash Bed 2: a, profile; b, close-up of charcoal in deposit, 1933.

of the various erosional basins. Bone fragments strewn down an arroyo or even a small gully often led to evidence of charcoal when traced back to their deposit. Most of these proved to be trace deposits, however—deposits which had been destroyed almost entirely. Frequently evidence at such a site consisted only of two or three bone fragments and a few charcoal smears. Such trace materials were noted in many of the side arroyos explored during the regional reconnaissance. Occurrences were most numerous from ½ mile west of Area 1 to ¼ mile east of Area 3; such vestigial evidence was abundant in and around Areas 1 and 2, suggesting a heavy concentration of activity in this region.

In 1955, during the initial effort to relocate the Tule Springs archeological area, the first indication that we were close to our goal was the finding of two trace deposits with fragmentary bones (see Map 3, Site E, Area 2).

Now let us review the seven major deposits of charcoal and bone.

ASH BED 1, AREA 1: Ash Bed 1 was the first site recorded by Harrington and Perkins in 1933. It is 170 feet northwest of the Monument. Dr. Harrington states: "Against the northwest wall of the major basin encompassing Area 1 there was an exposure of bones and charcoal in the crumbled debris of the bank. Excavation farther into the bank uncovered two charcoal pockets (Fig. 36). In the westernmost of these there were charred bones, including some identified as camel, but most of the deposit had been lost through erosion. The easternmost pocket was five feet, eight inches in length, twelve inches to twenty-eight inches thick. Width could not be determined because of erosion. There were five feet of overburden in the immediate area, but this was apparently only an erosional remnant since overburden forming adjacent banks and hills averaged fourteen feet. This lacustrine deposit was composed of scaly, sandy clay that fractured into small blocks. Minute mollusk shells were scattered through the lower level. Overburden and charcoal-bearing strata rested on a tough clay hardpan which, in the vicinity of the charcoal, was stained orange. Bones and charcoal were imbedded in underlying hardpan, suggesting that it may have been wet when bones and debris came to rest upon it."

Fig. 36 shows that Ash Bed 1 included a sandy deposit rich in charcoal. In 1933, as noted above, this stratum was followed into a pit twenty-eight inches deep where abundant ashes were seen. Bones were more numerous in the shallower portions of the layer, and a mammoth's tooth was found imbedded in the charcoal. In 1955 this rich stratum could not be relocated and we concluded that it had been exhausted in 1933. However, chunks and fine charcoal were found throughout a sandy clay deposit which was 2 feet

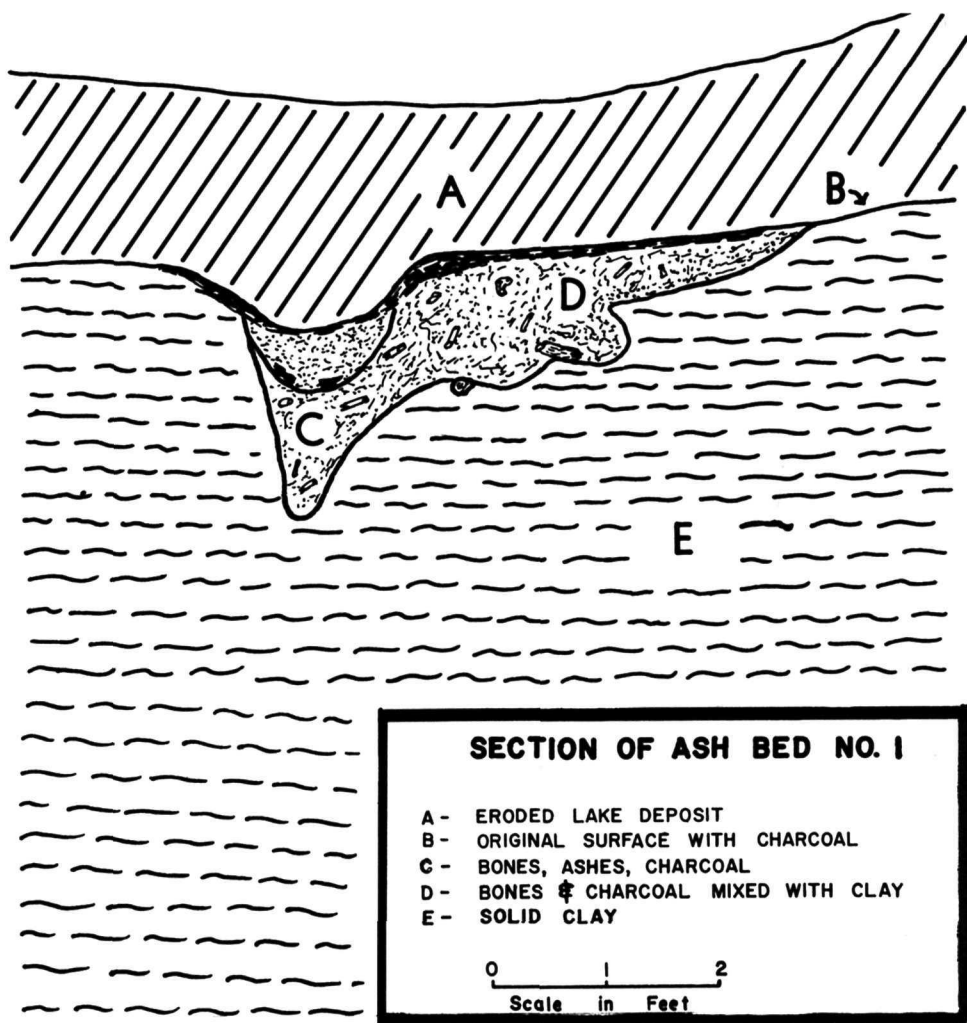


FIG. 36. Ash Bed 1, Area 1: Profile.

thick and which flanked the original excavation. There were bones and teeth (Fig. 37) with the charcoal, and shells were massed in and around it. Many bone fragments, split while still green, were found in the ashes and in the shallower charcoal-bearing stratum.

The extension of Ash Bed 1 in 1956 was made possible by the removal of more than 4 feet of lake-deposited overburden on the ridge by Orr with his drag-line and slip. This enabled me to open a trench 5 feet wide up the slope of the ridge following the contact zone between the two clay strata. This excavation was a continuation of work done in the peripheral zone in 1955. As noted in Chapter II, the charcoal deposit was not exposed in my trench on the *northern* slope of the ridge. As in most Tule Springs sites, bones were poorly preserved and crumbled easily. In many instances only bone splinters remained, outlining where bones had lain in

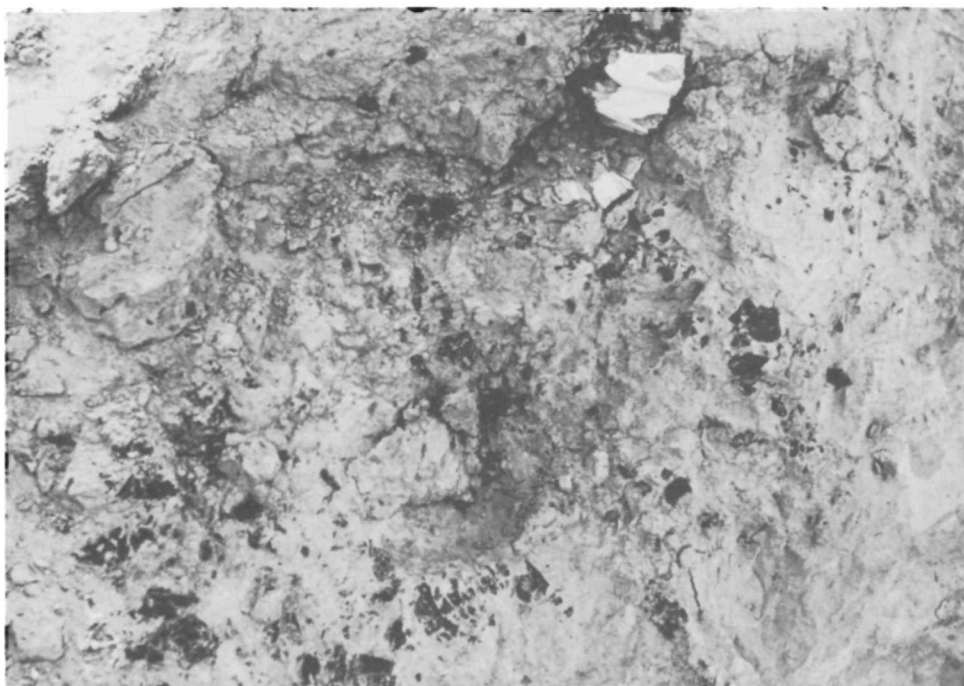


FIG. 37. Charcoal and camel teeth, Ash Bed 1.

the past. Burned bones were in a better state of preservation than unburned.

The charcoal, with its associated mollusk shells and bone fragments, was followed southward 8 feet onto the floor of the basin where the material was covered with only one and a half feet of overburden. Bone fragments were not so numerous here as in that portion of the deposit which arched up the slope of the ridge. Even on the floor of the basin at the periphery of the site, clay underlying and surrounding the feature was stained orange-yellow. As at Ash Bed 2, I found lenses of fine white sand at the base of the feature. Throughout the excavation I saw nothing that could be classed as a dump as there was not a sufficient concentration of material. However, there were small lenses of charcoal which could represent larger pieces of wood that had smouldered after being removed from a fire. Very possibly, much of the debris which originally had lain in the space I cleared, had been thrown, at the time of occupation, into the pit excavated in 1933 at Ash Bed 1. I collected more than a pint of charcoal, bones and one camel tooth. In addition, of course, small samples of material had been taken in 1933.

SITE A, AREA 1: This was the largest and one of the most significant charcoal-bone associations discovered in 1955-56. It is situated 30 feet southeast of the Monument. Charcoal smeared on the



FIG. 38. Site A, Area 1: a, M. R. Harrington beginning excavation; b, recovering a charcoal sample (Peck, Rozaire and Simpson).

eroded surface of the northeastern wall of the basin, between Ash Beds 1 and 2, was noted by Harrington (Fig. 38) in 1955. Rozaire was placed in charge of the excavation.

A trench paralleling the ridge was dug to determine general dimensions of the feature; another trench was cut into the ridge at the western edge of the feature. Large pieces of bone were found in the main charcoal area and side trench. The first trench resulted in a profile of the feature cut parallel to the ridge. This exposed very marked soil changes (Fig. 39) and two pits containing high concentrations of charcoal. The characteristic yellowish-orange coloring of the soil around the charcoal area was very marked. It is believed that this coloring was caused by heat.

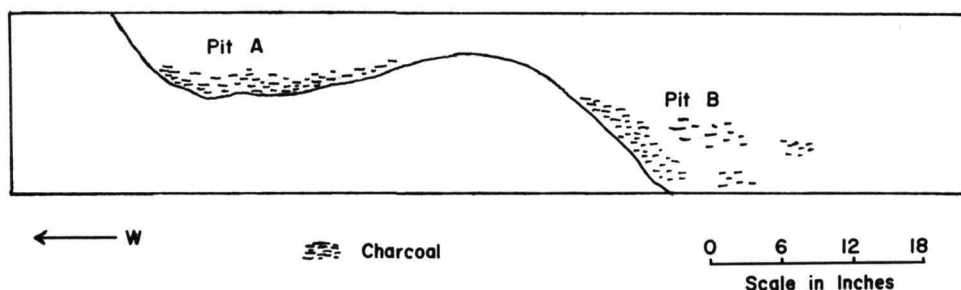


FIG. 39. Profile of Site A, Area 1, showing position of soil profile and charcoal in Pits A and B as exposed in 1955. Pit B is the section which later developed into the basin-shaped feature only partially excavated, part being left in place for future examination.

The westernmost pit (Fig. 39) (Pit A) had a great deal of charcoal at the bottom. Soil was not so compact as in the area surrounding the pits and there was charcoal scattered throughout. Remains of what appeared to be a small log were found near the bottom of Pit A. Conditions in Pit B were similar to those in Pit A.

Work on this important site was not completed in 1955. The deposit was reburied in the hope that further excavation could be made in 1956.

In 1956 this was the first site Orr tried to clear with his jeep and dozer blade. Unable to make any headway with the tough deposits, he resorted to small charges of dynamite strategically placed in the ridge, and to the side of the feature (Fig. 40a, b). This loosened the overburden sufficiently to permit excavation with the drag-line and slip (Fig. 40c). Removal of several feet of clay enabled Rozaire to continue excavation on a much wider scale than was possible in 1955. Rozaire worked here throughout most of the session and uncovered what proved to be our best preserved large fire area. With 4-5 feet of overburden removed, it was possible to extend a trench about 3 feet into the ridge. Here the clay became too tough to remove by hand, but the presence of abundant charcoal and the distinct shape of the feature made further use of dynamite or mechanical equipment undesirable. Excavation was diverted to the right (southeast) along the face of the feature. Just outside of the main concentration of charcoal, but associated with scattered bits of burned wood, were camel bones, including vertebrae. Some of these were removed by Orr. Eventually the trench attained a width of 70 inches. The final exposure of the fire area involved a space 25 inches high and 58 inches in diameter at the bottom. Half of this feature was left intact (Fig. 41). Small chunks of burned wood were scattered through the surrounding lacustrine deposits for a foot or more in the excavations to the west and north. Small shells were abundant in and close to the charcoal. Some camel-bone fragments were found in the fire area. Small shells were massed around



FIG. 40. Use of dynamite on overburden, Site A, Area 1: a, Orr setting charge; b, detonation; c, removing loosened overburden.



FIG. 41. Site A, Area 1: main charcoal deposit: a, one half left in place, one half being removed for samples; b, Simpson collecting and recording charcoal sample. (Photo by Charles Rozaire).

these. Clay mixed with, and lying under, the charcoal appeared to be burned. Overlying the fire area was a thin layer of laminated, fine-grain sedimentary silt. The telltale yellow-orange stain which we found around the fire areas was very apparent.

In 1959 the Geochronology Laboratories, University of Arizona, offered to attempt identification of Tule Springs charcoal. Accordingly, the largest pieces available were sent. These came from Site A and from Site A, Area 2. With the assistance of the Forest Products Research Laboratory identification was made, and the charcoal represents oak and a xerotic conifer, either juniper or cypress (Mr. James Schoenwetter, personal correspondence, 1960).

Obviously neither of these trees grows in the Tule Springs region today. However, juniper and oak do grow several miles to the west and at a considerably higher elevation in the Spring Mountains.

SITE A, AREA 2: During the 1955 mapping project a large exposure of charcoal was seen at the toe of a north-facing erosional spur and on adjacent slopes. On these slopes, areas 3 feet in diameter were stripped of superficial debris, exposing much charcoal with associated shells and scattered bone. The charcoal-bearing deposit lay on the old, tough clay. No excavations were carried out on these slopes in 1955 but they were recorded on the map as Site B, Area 2, and were tested in 1956.

The exposure at the toe of the knoll (Site A) was completely cleared. It is situated 150 feet east-southeast of Ash Bed 2. Charles Rozaire carried out this project (Figs. 28 & 42), in 1955, working an area approximately 5 feet square and 1½ feet deep. Surrounding

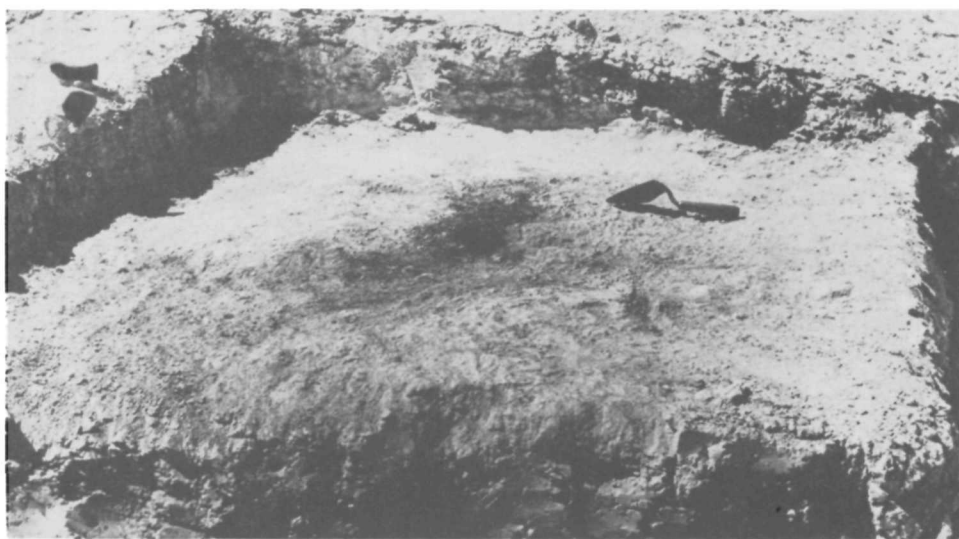


FIG. 42. Site A, Area 2: close view of charcoal; note restricted nature of the deposit.

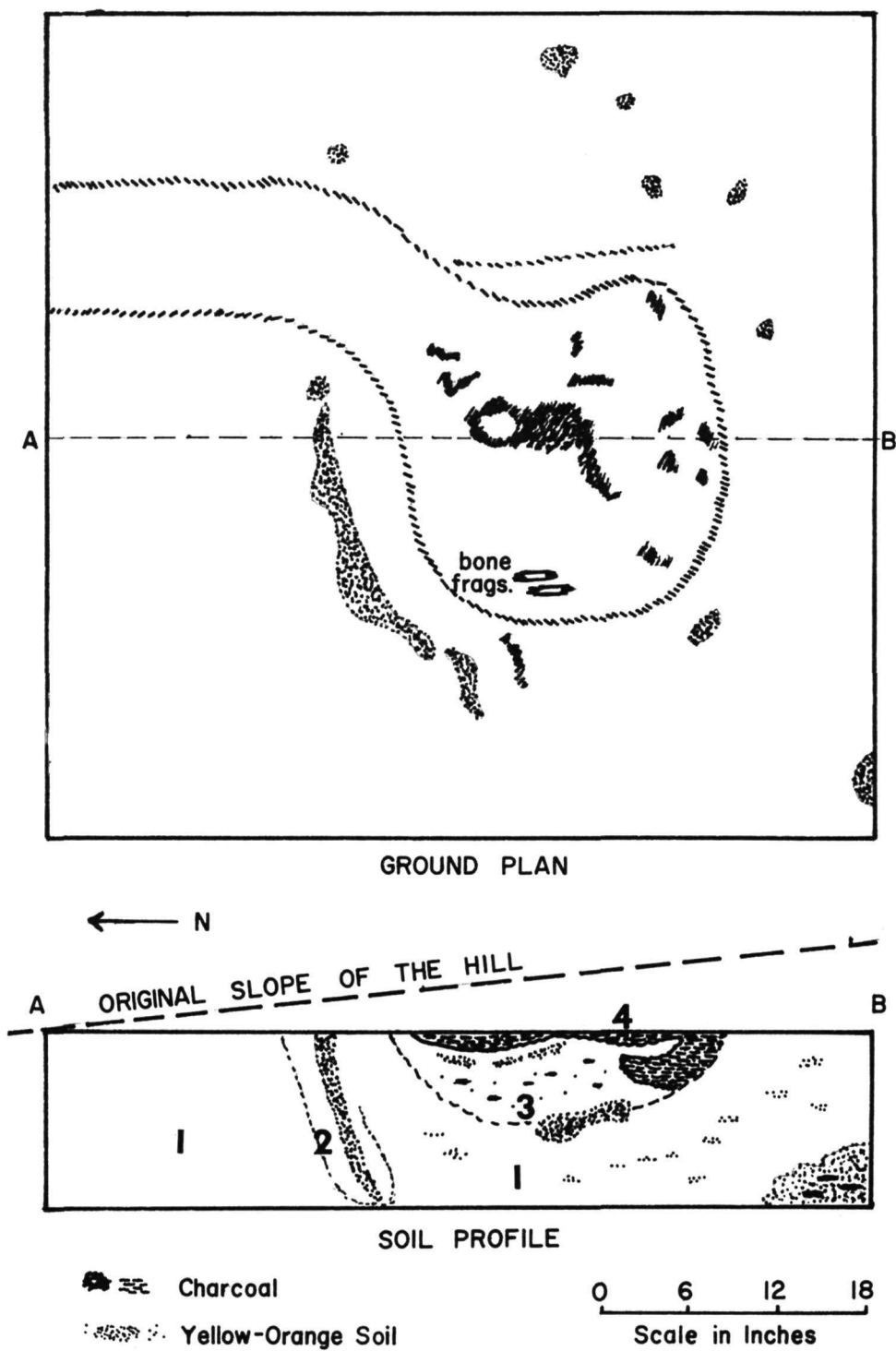


FIG. 43. Ground plan and profile of Site A, Area 2. In soil profile 1 is hard, white, silty clay; 2 is soft, powdery clay; 3 is crumbly, coarse, dark clay with orange-yellow-stained clay, bits of charcoal and lumps of hard white clay; 4 is abundant charcoal and ash, and shells.

the charcoal was hard white clay (Fig. 43) and a layer of soft silt. The feature itself was basin-shaped, containing crumbling clay, scattered charcoal, tiny shells and chunks of the characteristic yellowish-orange soil. Site A may properly be classified as a hearth. Within it were zones (Fig. 43) of concentrated charcoal containing some ash and much shell. Surrounding the hearth were extensive zones of the yellow-orange soil.

Site A in Area 2 was certainly one of the most definitive features uncovered, although bone content was low. The hearth-shape, presence of both ash and charcoal and surrounding zones of yellow-orange soil added much to our knowledge. One reason for the importance of this site was that its configuration had not been destroyed even in small part by erosion. Happily, too, the overburden had been reduced by erosion to the point that excavation could be done scientifically and carefully.

A long, shallow charcoal lens adjoining Site A was tested only in 1955 and then excavated in 1956. This deposit proved to be spotty, with charcoal occurring in small pockets and with very little associated bone. If this had once been part of Site A, erosion or other natural causes had destroyed evidence of its significance. When cleared, the lens proved to be 3 to 5 inches wide, 2 to 2½ feet high and 5 feet long.

SITE B, AREA 2: This site lay 35 feet southwest of Site A and across an erosion channel about 10 feet wide. A secondary channel branched off to the southwest and enlargement of this in 1955 exposed the charcoal. Excavation in 1956 showed that an undetermined amount of the feature had been washed away. Very little charcoal and no bone was uncovered in the northern portion of the deposit, but charcoal, bone and associated shells became more abundant as Peck worked southward toward the head of the southwestern erosion channel. Where the most abundant charcoal occurred, he found a heavy concentration of small shells second in quantity only to Site A, Area 1. Charcoal pockets were found over a zone 3½ feet high, 14 feet long and 4 to 17 inches wide. Fragments of long bones, some of them burned, were scattered through the southern portion of the feature.

SITE C, AREA 2: Preparation of the plane-table map in 1955 led to the discovery of Site C. The surface evidence of this feature was a number of small bone fragments strewn over an area 15 feet by 10 feet in the next erosional basin east of Site A, Area 2, and 130 feet east of Site A. I began excavation here late on the afternoon of May 14, 1955. The quantity of bone fragments increased rapidly as digging progressed and charcoal was exposed immediately below the surface. By dusk a pit 6 feet long (north-south), 4 feet wide (east-

west), and two feet deep had been opened. It contained moderately consolidated clay, an abundance of broken leg and foot bones, a lesser number of other bones, and charcoal that increased in amount as the excavation deepened. Site C had all the appearance of a cooking pit.

Darkness interrupted the work, but it was resumed in the morning. By then, we had identified many of the bones as camel leg and foot bones. Increasingly abundant charcoal was uncovered and minute shells were found packed around the bones. Although the area around the firepit was stripped, only one bone was found outside of the charcoal-and-bone deposit. The bone concentration here was the densest encountered in any deposit excavated in 1955. As well as leg and foot bones, many teeth were removed, also some jaw fragments and pelvic bones. Very few bones were charred, some were slightly burned (Fig. 44) and many others were split. All that could be identified were camel bones.



FIG. 44. Site C, Area 2: fragment of camel pelvis with associated charcoal; bone partially burned; length 20.5 cm.

Immediately beneath the charcoal, at a depth of 39 inches, there was a reddened (probably burned) clay. No charcoal or bones were found beneath that level. The customary yellowish-orange stained soil was found in quantity around the pit. Although partially destroyed by erosion, especially along the southern and eastern margins of the feature, I considered this to be a highly significant site. The quantity of camel bones strongly suggests that



FIG. 45. Excavation of Survey Site 6: Ernest McCown digging, assisted by Ruth Simpson, Hazel McCown and Charles Rozaire. (Photo by Stuart Peck).

selected parts of more than one animal had been brought to this fire. The restricted nature of the pit (6 feet long x 4 feet wide x 39 inches deep), the reddened nature of underlying clay and the concentration of bones within that area are important clues to the story of Tule Springs.

SITE H, AREA 2: While photographing the basins in Area 2 near the end of the 1956 field session, I noticed charcoal smears on a slope leading to the clay hill at the south side of the southernmost amphitheater in Area 2. Excavation showed that there were flecks of charcoal in the clay over a plot extending $3\frac{1}{2}$ feet up the slope and 6 feet along the east-west face. At no point was the zone more than 4 inches thick. The deposit was probably peripheral to some charcoal feature now destroyed by erosion. There were chunks of charcoal $\frac{1}{2}$ inch in diameter and the left half of a camel mandible with teeth in an excellent state of preservation. This was lying on a concentration of small bits of charcoal. No other bones were uncovered. The site is 200 feet east of Site A.

SURVEY SITE 6: The largest fire area reported during the 1955-1956 field work was discovered near the close of the 1956 season by the McCowns. Situated more than a mile upstream from the main locality, Survey Site 6 was close to the gradually sloping flank of a side arroyo cut into the north wall of Vegas Wash.

This feature still measured slightly more than 12 by 7 feet although partially eroded. The western portion of the deposit was ex-

posed, the remainder lay under 6 inches to 2½ feet of overburden (Fig. 45). Our entire crew joined the McCowns in excavating Survey Site 6 and several pounds of broken bones were recovered. Some of the bones were split and/or lightly burned. Very little shell was encountered. Since the overburden was thin, roots were plentiful throughout the deposit, but sizeable samples of charcoal and bones were retained. The average thickness of the feature was 8 inches. Clay was not so tough as at the main locality and all work was done with trowels and hand picks.

FIRE AREAS WITHOUT ASSOCIATED FAUNAL REMAINS

During the jeep survey in the Vegas Wash and its side canyons an occasional charcoal smear was recorded. These usually occurred near the base of clay knobs or erosional-basin walls. Five of these were noted without any bone fragments being present. However, when excavated, none of these charcoal traces led to large pockets. In short, during the jeep reconnaissance, charcoal without evidence of associated bones was noted only at vestigial sites.

In the main locality abundant traces of charcoal could be seen on the floors of the amphitheatres in areas 1, 2 and 3. These are visible especially after rains. Most of these traces were closely, if not directly, associated with bone fragments but proved to be only indications of destroyed deposits. None of the charcoal smears not associated with bones led to larger deposits, or yielded other material of significance.

OCCURRENCES OF FAUNAL REMAINS WITHOUT ASSOCIATED CHARCOAL

In the main Tule Springs Locality fragmentary bones are widely scattered throughout the basins and arroyos. It is logical to assume that these are indicators of eroded deposits, especially since, in many instances, these bones can be followed to vestigial features. Aside from noting the presence of such bones, no further discussion is deemed necessary, nor are they plotted on the map. However, a few more significant deposits of faunal remains were recorded and we may discuss these now.

SITE E_{1,2}, AREA 2: The designation Site E, Area 2, has little value scientifically, as it records merely isolated surface finds of animal bones. However, the designation is important to the Tule Springs Report since the first bones seen during the 1955 search to relocate the locality were here. Site E₁ marks the first bone discovered by Dr. Harrington in 1955 and is situated 240 feet northeast of E₂, the situation of the first bone I found. It is 440 feet southeast of Site A, Area 2.

SITE B, AREA 1: Mention has been made of elephant bones eroding out of the slope 33 feet southwest of Ash Bed 2. In 1955 Peck and I attempted to uncover these. Several well-preserved though fragmentary bones extended through the lower portion of the softer clay deposit and into tough older clay (Fig. 27). With hand picks and trowels it was not possible for us to proceed farther without danger of damaging the bones, so we reburied them.

In 1956 Orr, with more specialized tools, attempted to remove the clay from around the bones. He did not succeed. He then tried to loosen the clay with small charges of dynamite. This too failed, and it was decided again that we could not remove the bones without grave risk of destroying them. Again they were reburied. I revisited Tule Springs in May of 1959 and some of these bones had been broken and strewn over the slope. By February, 1960, this deposit had been destroyed and broken bones littered the area. This was the only evidence of vandalism observed. Apparently the vandals had found little beneath the bones we had seen as the fresh excavation was shallow.

SITE D, AREA 1: This was one of the spots which Fay Perkins suggested that we dig. While I was occupied with Ash Bed 1, the McCowns began work on Site D which lay forty feet to the west, over the ridge against which Ash Bed 1 lay. Site D is in the south wall of the main wash. Overburden on this ridge slope varied from 1½ to 8 feet.

Work the first day yielded only a few scattered bones and many workers would have considered the site worthless, but the McCowns continued the second day, and bones became more numerous and better preserved. By mid-day large bones were being uncovered. Peck and I joined in the excavation of a mammoth's jaw, teeth and other bones (Fig. 46a, b). These appeared to represent a young animal. Although no charcoal was found, the proximity of Ash Bed 1 would suggest a probable association.

SITE E, AREA 1: This site was a disappointment as only one fragmentary camel long bone was recovered. The bone, partially exposed by erosion, lay 40 feet east of Ash Bed 1, and may have been associated with it.

SITE G, AREA 2: This discovery also resulted from directions given by Fay Perkins. Pieces of a mammoth tusk lay in a small erosion channel leading to the knoll involved. Removal of 6 inches of overburden exposed the edge of a mammoth tooth and more bits of tusk. Two pairs of adult mammoth teeth were recovered, one pair being in excellent condition. These teeth apparently belonged to two animals. There was no evidence of associated charcoal and no shells. The Site is fifty feet northeast of Site A.

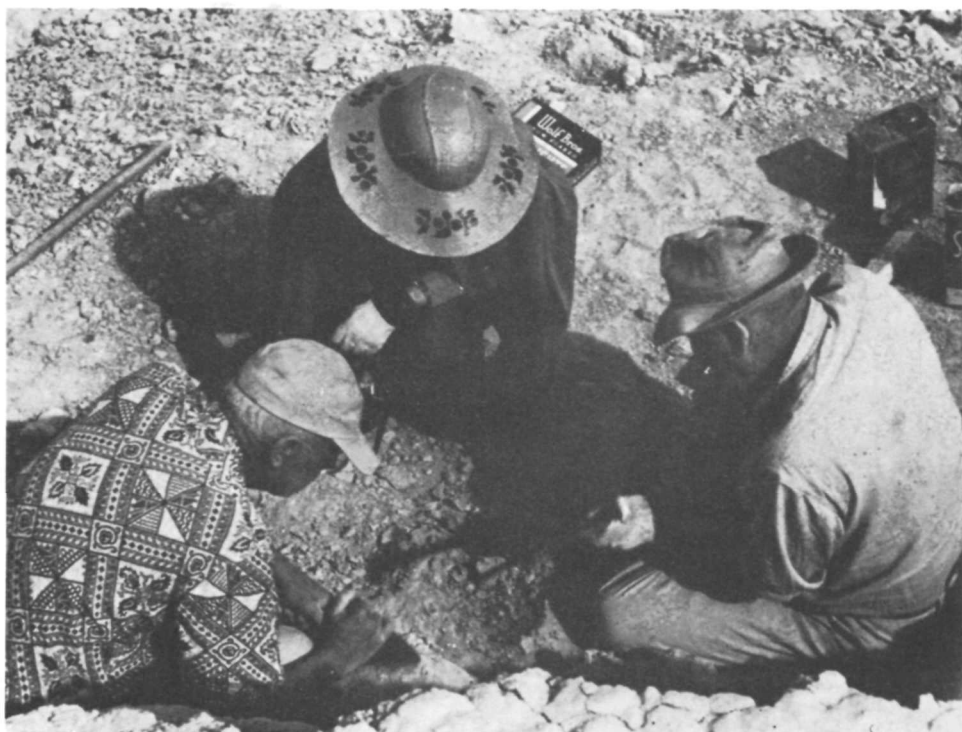


FIG. 46. Site D, Area 1: a, Stuart Peck, Hazel and Ernest McCown excavating mammoth bones and jaw; b, bones partially excavated.

SITE B, AREA 3: At the mouth of a small arroyo emptying into Area 3 is a low clay knoll. This is 105 feet northeast, and across the basin, from Site A, the Hunter Site. On the knoll I found shattered long bones and the large ball from the basal end of a mammoth humerus. The long bones extended 2 to 16 inches into the clay but did not lead to other bones or charcoal. One of the bone fragments bears a series of wide, shallow parallel lines which appear to be too far apart to have resulted from gnawing. There is some possibility that these lines resulted from scraping or other human activity. Site B was excavated in 1955.

SITE C, AREA 3: 70 feet northeast of Site A, in the bottom of the erosion channel leading through Area 3, Peck found a large camel tooth in an excellent state of preservation. No other material was found with the tooth.

SURVEY SITE 1: In a side canyon entering the Vegas Wash from the southwest, about 1.4 miles upstream from the main locality, there is a low clay knoll, on the surface and in the upper portion of which numerous fragmentary mammoth bones were found. There were two water-smoothed pebbles less than 2 inches in diameter with the buried bones, but no certain evidence suggesting Man's presence.

This site was found and excavated by M. R. and Marie Harrington and me in 1952. Scattered camel bones were also found near the mouth of the canyon.

SURVEY SITES 2 and 3: Nearly all of the major side canyons entering the main wash from the southwest contained scattered faunal remains. In two of these canyons, .25 of a mile apart, bone concentrations were observed. There were large pieces, probably mammoth, on the floor of the arroyos but these apparently were vestigial remains of destroyed deposits, since no up-stream source was found for them. In the eastern wall of a south-heading short arroyo and near its mouth, we did find a concentration of fragmentary long bones, part of a pelvis and several broken ribs. These were mammalian, perhaps horse or camel. The site is noted on Map 3 as Survey Site 2.

The second canyon, .25 miles downstream, yielded a small concentration of fragmentary long bones imbedded in the crest of a knoll separating two tributaries. Again, these may have been horse or camel.

Both deposits were opened, but few bones were taken as they were in poor condition and fragmentary. There was some associated shell but no charcoal. It appeared that these deposits had been destroyed by erosion.

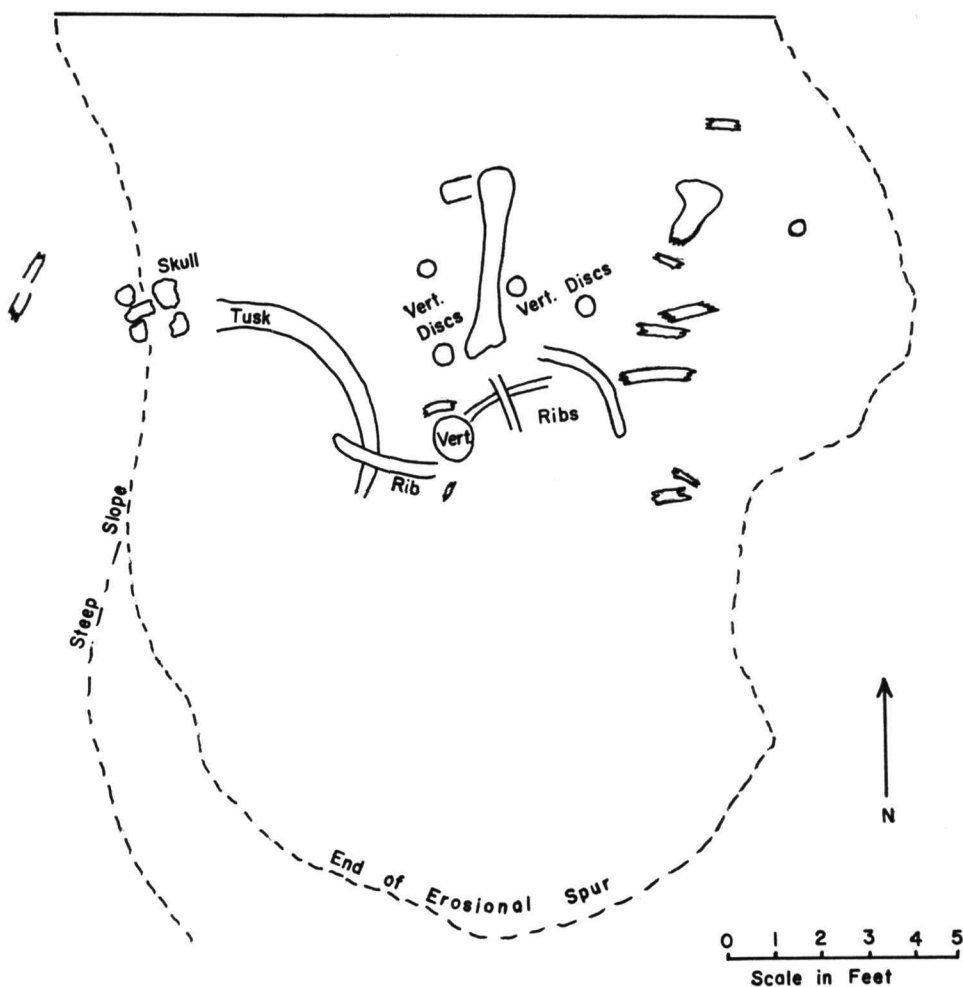


FIG. 47. Survey Site 4.

SURVEY SITE 4: This was the largest and most complete faunal record of the 1955-1956 expeditions. I found Survey Site 4 on May 12, 1955. It is situated in a short draw opening into a major tributary of the Vegas Wash. This tributary and the main wash join $2\frac{1}{2}$ miles upstream from Area 1 in the central locality. Part of one crumbling mammoth tusk and other bones were exposed on top of a knoll less than 100 yards from the mouth of the draw. Site 4 is approximately $\frac{1}{4}$ mile from the junction of the tributary and the main wash.

Removal of loose clay exposed more bones. The knoll was then laid out in 5-foot squares for purposes of excavation. Rozaire and I cut trenches northwest and southeast of the mammoth. At the end

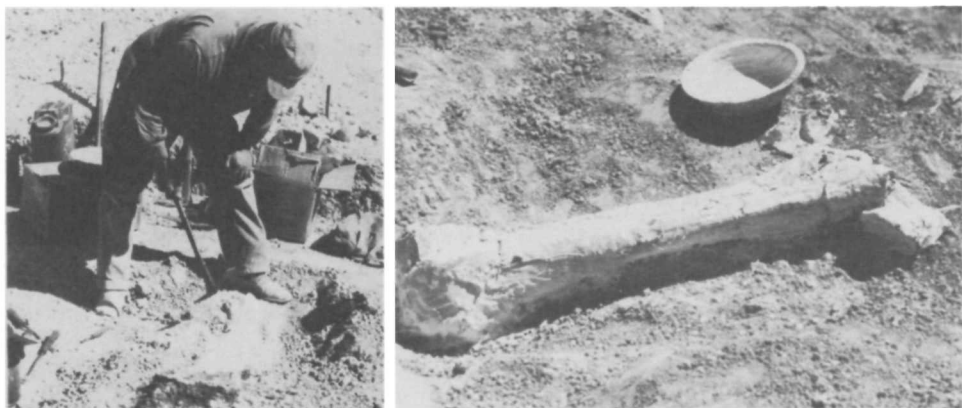


FIG. 48. Survey Site 4: removal of mammoth long bone. a, Phil Orr excavating; b, bone coated with plaster, ready for transportation.

of four days all existing bones of the right side (the upper side as the animal lay) were at least partially uncovered (Figs. 30 and 47). Many of them extended into the hardpan, making it impossible for us to proceed further without specialized equipment. Other mammoth bones were uncovered to the west, or beyond the head of our mammoth. These other bones may have belonged to a second animal. In an erosion channel only 15 inches wide, which separated the two faunal units, I found a portion of the skull. Visible was the interior of its left side. This was badly water-worn and firmly imbedded in the tough clay.

No charcoal was found during our excavations except for a small cluster of particles 93 inches southwest of the center of the bone concentration.

Since the bones were all imbedded in the tough clay, it was decided to seek the services of a paleontologist for the 1956 expedition. The bones were reburied after preliminary drawings and photographs were taken.

In 1956, when Orr went to Survey Site 4 with us, the bones and stakes were found undisturbed when the silt and paper protection were removed. Orr decided that most of the bones could not be removed without damage except after many days of effort. He worked with us to uncover completely all major bones and we cut below them on all sides searching for possible artifacts. Only three small pebbles were found and no modification of these was observed except some battering of the ends which could have been caused naturally. No charcoal was seen, and very few shells.

Orr then went to work undercutting those major bones which could be collected without damage. A humerus, patellas, ribs and other bones were freed and, when necessary, coated in plaster (Fig. 48). The best of these were removed to the Santa Barbara Museum of Natural History.



FIG. 49. Survey Site 7: camel bones found scattered on low central slope and on knoll at left. (Photo by John Kettl).

When we had cleared as much of the tusk as possible, it measured 7 feet from weathered base to the point where it plunged into the hardpan, and there it was still 7 inches in diameter. No effort was made to free the skull, as it had become an integral part of the clay deposit.

The feeling of those working on the skeleton was that the animal had been mired in the wet clay and that he sank partially into it, thus accounting for the position of the bones and the fact that the entire left side of the skeleton was out of sight in the tough clay, if present at all. The position of the skull supported this theory.

At the conclusion of our work we reburied the remaining bones.

SURVEY SITE 5: Situated in a side canyon entering the main wash from the south-southwest just below the confluence of the main wash and the side canyon containing Survey Site 4, Peck and I recorded faunal evidence in 1955. There were bone fragments scattered on the floor of the side canyon which led us to a badly eroded headland. Exposed on the crest between two minor tributaries were numerous bone fragments unlike those seen elsewhere. We returned to this site in 1956 and collected some of the bones which Orr identified as ground sloth. He visited the site and determined that it was merely a vestigial deposit with little significant faunal material remaining unexposed.

SURVEY SITE 7: At the conclusion of excavation at Survey Site 4, Peck continued the jeep survey farther up the side canyon in which we first found evidence of elephant bones. One-quarter mile upstream the canyon divided (Fig. 49) and on the toe of the knoll separating the two branches were more elephant bones and camel bones and teeth. Peck and I excavated an area 6 feet wide and 4 feet long. Some pieces of tusk were recovered and many fragments

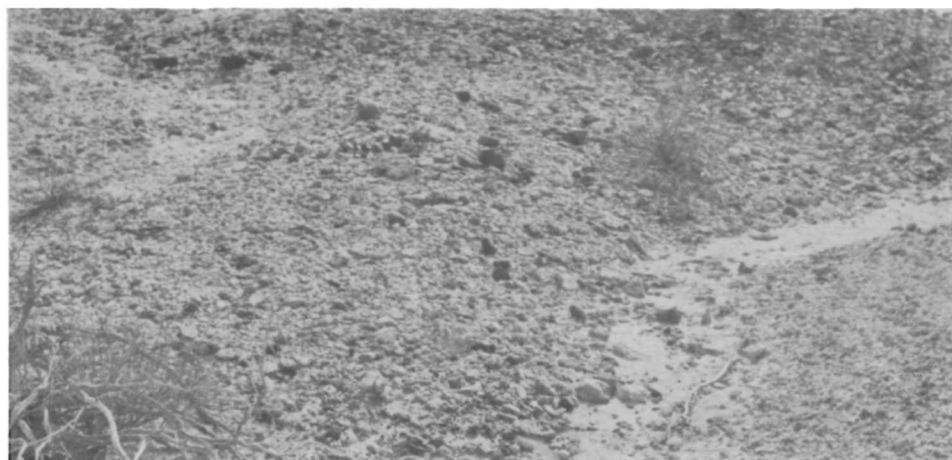


FIG. 50. Rocks in erosion channel a few feet down the wash from Ash Bed 2.

of bone. The deposit had little of significance to add to the Tule Springs record, however.

SURVEY SITE 8: By 1960 erosion had exposed fragmentary bones and a vertebra of a mammoth. These were eroding out of a narrow shelf in a side canyon entering the north side of the Vegas Wash directly opposite Survey Site 5. This appeared to be a vestigial deposit.

ARTIFACTS ON THE SURFACE

In the side canyons, and in the main wash, an intensive search for artifacts has been conducted during each of the Southwest Museum expeditions. It was hypothesized that, since many deposits of charcoal and bone had been washed away, with bone fragments being strewn over the floor of the canyons, possibly stone and bone implements might also be recovered in these areas. To a very limited extent, this idea proved to be correct. However, it obviously cannot be stated with complete certainty that the artifacts recovered came from the charcoal and bone deposits. It is possible that, as erosion proceeded, artifacts tumbled down the slopes from the valley floor above. It is obvious (Fig. 50) that some rocks from the veneer on the valley floor did fall into the side canyons. It is also known (Chapters II and V) that extensive areas along both rims of the Vegas Wash in the vicinity of Tule Springs Locality do yield evidence of more recent human occupation.

Nevertheless, the association of these artifacts with scattered bone fragments on the floor of side canyons in the main locality does suggest that the artifacts discussed in this section and in Chapters IV and VI did come from eroding deposits associated with human occupation within the main areas.

AREA ADJACENT TO ASH BED 2, AREA 1: In the channel draining away from Ash Bed 2 (Fig. 50) Harrington found, in 1933, a few crudely flaked stone implements; five are certainly man-made (Figs. 22, 23 and 24), several more may be. These will be described in Chapter IV. Suffice it to note here that all lay within 50 feet of Ash Bed 2 and, as shown by work in 1955 and 1956, also near Site A, Area 1. No such well defined tools as these definite artifacts were found on erosion surfaces during any of the expeditions in any other part of the locality.

SITE F, AREA 2: As the plane-table mapping project extended into Area 2, a small cluster of bone fragments was observed at the foot of a low ridge separating two Area 2 basins, 95 feet northeast of Site E₂. Among these bones was a small stone exhibiting some edge flaking. I found this evidence and Peck saw the material in place.

The bones and the stone were collected. Extensive excavation failed to produce any additional evidence. There was no charcoal.

SITE E, AREA 3: On a low knoll near the mouth of the canyon containing the Hunter Site, Peck, in 1955, found fragmentary mammoth bones and one small stone exhibiting battering along the edges and over the blunt tip. This specimen does suggest a small hammerstone. Again, the bones and the stone were collected, and extensive excavation failed to uncover any additional material. There was no charcoal. This site is situated 215 feet east of Site B.

MISCELLANEOUS SITES

SITE C, AREA 1: This designation was assigned to a mound of backdirt left from the 1933 excavation of Ash Bed 2. It is actually part of Ash Bed 2, and is not separately indicated on Map 3.

SITE D, AREA 3: Shell samples were taken, for purposes of identification, from the various excavations. However, large univalves, rather scarce in the majority of excavations, were seen in relative abundance in Area 3, and samples of these were also collected. The surface from which they were collected is indicated on Map 3 as Site D, Area 3.

* * * *

Thus we have reviewed the several features that were excavated during the 1933, 1952, 1955 and 1956 field sessions. It is apparent that the charcoal deposits and associated bones, and the very scarce artifacts, are the most important aspects of the Tule Springs record. The significance of these features and artifacts will be commented upon in Chapter VI. Now, however, we present a chart which will summarize the material in the preceding pages; and then we shall offer a closer examination of the artifactual material in Chapter IV.

CHART 1

SITES	CLASSIFICATION, DISTINCTIVE TRAITS	DIMENSIONS	DEPTH OF OVERBURDEN ¹	EXCAVATION DATE
AREA ONE				
A	Basin-shaped feature, burned clay; soil profile, bones, shell, charcoal	36"L x 20"W. 25" deep	48" - 60"	1955-1956
B	Mammoth bones	45"L x 27"W, 15" thick	0 - 24"	1955-1956
C	Loose clay and sand, fine white sand, bone fragments, shell	48"L x 24"W, 18" thick	0	1933, 1955
D	Small mammoth jaws and teeth	132"L x 102"W, 19" thick	18" - 96"	1956
Ash Bed I	Pockets and lenses containing bones, ash, shell, charcoal	312"L x 420"W, 28" thick	18" - 168"	1933, 1955, 1956
Ash Bed II	Pockets and lenses containing bones, ash, shell, charcoal, polished bone artifact, pit of this debris	156"L x 120"W, 40" thick	6" - 24"	1933, 1955, 1956
AREA TWO				
A	Hearth, well-defined range discoloration, bones, shell, charcoal ²	60"L x 60"W, 18" thick	0 - 24"	1955
B	Charcoal pockets, bone concentration, shells	168"L x 4-17"W, 42" thick	36" - 60"	1956
C	Camel leg and foot bones with charcoal confined to pit	72"L x 48"W, 39" deep	0 - 18"	1955
D	Pit containing charcoal, camel bones, stone artifact in charcoal	18"L x 11"W, 11" deep	48"	1956
E	Traces of charcoal and bone, first evidence seen in 1955 (2 areas)	24"L x 6"W	0	1955
F	Stone artifact (?) and bone fragments	18"L x 10"W	0	1955
G	Mammoth teeth	36"L x 30"W, 18" thick	6"	1956
H	Camel jaw with some scattered charcoal	72"L x 42"W, 4" thick	0	1956
AREA THREE				
A	Charcoal deposit containing bones and obsidian flake	84"L x 48"W, 24" thick	66"	1933, 1955
B	Mammoth bones, one possibly scratched	96"L x 54"W, 16" thick	0	1955
C	Camel tooth in small wash near A		0	1955
D	Shell samples collected for identification		0	1955
E	Probable stone artifact (hammer-stone)		0	1955
SURVEY SITES				
1	Mammoth bones collected	144"L x 84"W, 54" thick	On a mound	1952
2	Camel bones	48"L x 24"W, Thick?	108"	1955
3	Camel or horse bones	96"L x 24"W, Thick?	0	1955
4	Mammoth	108"L x 192"W, 15"± thick	0	1955, 1956
5	Ground sloth bones	144"L x 96"W	0	1956
6	Loose soil, abundant charcoal and broken bones, mostly camel	144"L x 84"W, 8" thick	6" - 30"	1956
7	Mammoth bones	72"L x 48"W, 18" thick	0 - 24"	1956
8	Mammoth bones	15"L x 38"W, 16" thick	20"	1960

¹ From a base level established near Site A, Area 1, there is a variation in elevation of less than 5 feet for the various sites in the main locality. At least 20 feet of water-laid deposits once covered the entire area. "Depth of Overburden" indicates the amount of silts and clays which still concealed each site at the time of excavation.

² Plus trailer 60" L x 5" W, 30" deep.

CHAPTER IV

Tule Springs Artifacts

by M. R. HARRINGTON and RUTH SIMPSON

AS WE BEGIN A CONSIDERATION of archeological specimens it is important to emphasize once more that the Tule Springs Locality is restricted to that area encompassing approximately three miles of the Vegas Wash and its tributaries. In this chapter, therefore, we are concerned only with artifacts recovered from deposits excavated, and from the immediately associated erosion channels. Specimens recovered outside of the Vegas Wash will be considered separately in Chapter V.

The Tule Springs artifactual record is logically divided into two elements: material found in place in the charcoal; material found loose on the bottom of side arroyos within the locality.

ARTIFACTS FOUND IN PLACE IN THE CHARCOAL DEPOSITS

Only seven specimens fall into this category: the obsidian flake, two bone implements and three possible fragmentary bone implements found in 1933; the stone scraper found in 1956. However, these are of primary importance. They prove beyond the shadow of a doubt that Man was present when the Tule Springs charcoal was deposited.

Obsidian Flake (Fig. 16): This is a uniface flake of smoky obsidian with diagonal banding. The ventral face is a single fracture surface showing a definite bulb of percussion with slight cone and ripple marks resulting from the blow that detached this flake. There is a narrow striking platform. The dorsal face bears incomplete flake scars which resulted from the removal of flakes over an obsidian surface of which this flake was a part. There is a mild shattering of the edge of the dorsal face at the striking platform. A small corner of the flake was broken off but was found about 3 mm. from it in the matrix.

The artifact is 3.3 cm. in length, 2 cm. in width. There is some evidence of patination. Edges are not retouched but are naturally sharp.

The flake was not exposed by erosion, but was partially uncovered by excavation conducted by Albert C. Silberling. It was left in the charcoal matrix, which was sent as a bandaged block to the

American Museum of Natural History where it was removed and cleaned by Dr. George Simpson in the presence of Dr. N. C. Nelson (Simpson, G. G., op. cit., 1933). Dr. Simpson, in referring to Dr. Nelson's observations, wrote: "Dr. Nelson states that the obsidian flake is not an implement, that is, had not been fashioned to a definite and completed form for use, but that it is with high probability an artifact;—that is, owes its present form to some activity of man."

The obsidian flake was found in a deposit containing charcoal as well as animal teeth and bone fragments, at the original Hunter Site (Site A, Area 3), and is preserved at the American Museum of Natural History.

Pointed Bone Implement (10-F-26): This is a piece of long bone (camel) which was found buried in the ash-and-charcoal-filled gully in Ash Bed 2 (p. 52). Fig. 51 shows this specimen with edges split at an angle to form a sharp point which evidences considerable wear. The edges bear no indication of grinding, polishing or smoothing.

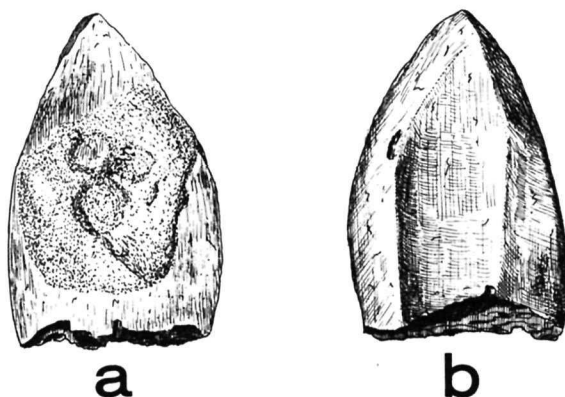


FIG. 51. Pointed bone tool from Ash Bed 2: a, dorsal view; b, ventral view. Length 5.9 cm. (10-F-26).

While it might be possible for a leg bone to break, forming a sharp point, the symmetry of the break and the worn tip suggest intentional modification. 5.9 cm. long and 3.6 cm. wide, this is obviously only a fragment of a longer piece of bone.

Traces of ash cling to the naturally concave interior surface; a large patch of ashy silt and shells covers much of the exterior surface. The break at the posterior end of the specimen appears to be old, and there are traces of silt in crevices of the break. The artifact was found by Harrington and Perkins.

Polished, Pointed Bone Implement (10-F-39): As in the case of the previous specimen, this bone implement (Fig. 19) was found

deeply buried in the charcoal-and-bone-filled hollow associated with Ash Bed 2, Area 1. This, too, was found in the buried deposit by Harrington and Perkins, 1933.

The bone is 9.25 cm. long and 4.25 cm. wide. The proximal end is broken diagonally and the break appears to be old. Furthermore, the silt, deposited on the naturally concave interior surface of the bone, extends over the break. The distal end of the bone, for a distance of 3.5 cm. on one edge and 2.75 cm. on the other edge, is *ground* and *polished*. The exterior surface is very smooth, but this could be due to natural causes. The tip is precisely fashioned, the sides of the implement tapering to the anterior end, and the modification of the edges accentuating the accuracy of proportions and the refinement of tool type. The tip is rounded rather than sharply pointed. For a distance of .6 cm. back from the tip the exterior surface is conspicuously worn; the remainder of the edges and the ventral surface are not modified.

This is indeed one of the rare and truly important finds of cultural material collected at Tule Springs. Happily, it was charcoal found in association with this pointed implement that was sent to Dr. Libby for Carbon-14 analysis.

Fragmentary Bone Implement (10-F-23-a): Found in 1933 in Ash Bed 2, Area 1, the exterior surface of this fragment of bone appears to have been rubbed before it was burned. 2.8 cm. long and .7 cm. wide, this bone was found 12 inches from the surface of the deposit. Ends are rough and were not broken intentionally. One end may have been partially cut before it broke as the outer covering is severed squarely while the inner layer is jagged.

Fragmentary Bone Implement (10-F-23-b): This bone fragment, found in 1933 in Ash Bed 2, has an exterior surface and one edge which appear to have been rubbed and possibly polished before the bone was burned. 3.15 cm. long and .09 cm. wide, this specimen was also recovered at a depth of 12 inches. The proximal end is squarely broken, the distal end has an irregular break.

Fragmentary Bone Implement (10-F-22): Found in 1933 in Ash Bed 2, in direct association with burned camel bones, the exterior surface and one edge appear to have been rubbed and polished. The other edge and both ends were broken and lost. The specimen is 3.1 cm. long, .08 cm. wide, and it is mineralized.

It is obvious that these last three bone fragments are of less significance than the two previously described. By themselves 10-F-23 a and b and 10-F-22 would not be final proof of Man's presence. 10-F-39 affords this proof beyond the shadow of a doubt.

Stone Scraper (10-F-76): This is the only stone implement

found in a charcoal deposit at Tule Springs. I recovered the tool after Orr had cleared overburden from the amphitheater (Fig. 32). Fragments of bone were found with the scraper in the charcoal pocket. Approximately 4 feet of overburden had been removed to expose the charcoal and I had excavated into the deposit 9 inches when the scraper was partially exposed (Fig. 33).

This tool, fashioned of very fine-grained orthoquartzite, may be described as follows: 4.8 cm. long, 4.0 cm. wide, 1.7 cm. thick; a roughly bi-convex flake fashioned as a uniface, convex-edged side scraper, retouched along 7.2 cm. of its circumference (Fig. 34). There are portions of a double fracture composing the ventral surface. There is a naturally-formed medial ridge on the dorsal surface. Retouching along convex edged circumference constitutes the significant modification of the specimen. This is uniface edge flaking and, for the most part, is quite well done. Scars are generally small, although some are broader and more widely separated. The scars and ventral surface are heavily discolored, but they may be distinguished from the patch of cortex on the dorsal surface primarily by a marked difference in texture—the flaked areas being smooth, the cortex rough. The latter is a dark tan in contrast to the yellow-flecked dark brown of the flake scars. It would appear that the posterior portion of the tool has been broken as the edge flaking extends to the terminus of a posterior fracture. This fracture is discolored to the same degree as the flake scars.

This scraper and the polished, pointed bone implement are the two most significant cultural items recovered. While neither is diagnostic to the degree that it permits identification of the hunters who were at Tule Springs, both evidence a rather advanced degree of craftsmanship.

ARTIFACTS FOUND OUT OF PLACE IN SIDE CANYONS

Now we turn our attention to a somewhat larger group of stone specimens which have been collected by Harrington, Peck and me in the side canyons of the district. Harrington found the most, ten, in 1933, while Peck and I each found one in 1955. The most definitive implements are five of those collected by Harrington.

As will be noted at greater length in Chapter VI, there is no way as yet of being certain that the specimens considered here did actually erode from the Tule Springs charcoal deposits. However, the fact that these implements have been found only in the main locality and in the immediate vicinity of its charcoal deposits seems highly suggestive of contemporaneity. The alternative explanation, of course, is that, as the rim of the cliffs flanking these canyons has been eaten back by erosion, artifacts from the sites on the valley

floor (Chapter V) have tumbled down into the eroded basins to lie among the bones weathering out of the lower ancient deposits. If this were the case, it would seem to be a most strained series of circumstances that permitted the artifacts to fall only into canyons where bones were being exposed. In the main section there are many side draws with little or no paleontological evidence. In not one of these has a stone tool, or even a stone which might be classified as a dubious artifact, been found.

The lithic material found in the draws includes choppers, scrapers, modified flakes and dubious artifacts (Figs. 22-25). This last category includes a few stones which were gathered because of the presence of minor random flaking which could possibly be attributed to Man. In view of the scarcity of cultural material it has been deemed desirable to retain even the most amorphous specimens.

CHOPPERS

Archeological specimens classified as choppers include 10-F-1, 10-F-3, 10-F-9. Some of these are illustrated in figures 22 and 24. These were collected by Harrington in 1933 within 50 feet of Ash Bed 2, Area 1. All were recovered at the same or slightly lower elevation than Ash Bed 2 (Fig. 50).

10-F-1 is an excellent artifact, unquestionably purposefully fashioned. It was made from a dolomitic limestone pebble, it is heavily weathered, and flake scars are markedly dulled. 7.5 cm. long, 6.8 cm. wide and 4.5 cm. thick, this implement probably was used as both an end and side chopper. Approximately one half of the convex-edged circumference is flaked. Biface edge flaking and partial face flaking were utilized, and there was some use of step flaking. The base and back of the pebble are naturally flat and their surfaces remain unmodified. The shape, workmanship and nature of the flaking indicate that 10-F-1 was a convex-edged chopper.

10-F-3 is another convex-edged chopper, probably used only as a side chopper. It was fashioned from a limestone pebble, has bold uniface edge flaking along the convex edge, and is so badly weathered that the flake scars have been extensively obliterated. It is 10.9 cm. long, 7.15 cm. wide, and 4.5 cm. thick; it is another unquestionable archeological specimen. Surfaces are unmodified and the base and back are naturally flat. 12.5 cm. of the convex circumference present a sinuous edge shaped mostly by uniface edge flaking. Uniface edge flaking usually suggests use as a scraper. However, the shape of the artifact and the position and angle of the flaking strongly indicate that this tool was a convex-edged chopper.

10-F-9 is a limestone pebble with one crude, bifacially flaked edge and distal end. Heavily weathered, the nearly obliterated

flake scars show that this tool was probably best suited to use as a side chopper. This specimen is 11.25 cm. long, 6.85 cm. wide and 4.5 cm. thick, and was formed by modifying the convex edge with bifacial edge flaking. The surfaces and flat back were left unmodified. Over these areas the cortex is intact and it is interesting to note that cortex and the weathered surfaces of the flake scars are not visibly different.

SCRAPERS

Among the few archeological specimens collected in the side canyons of the Tule Springs Locality, five are scrapers (10-F-2, 10-F-4, 10-F-5, 10-F-6, 10-F-10). Representative specimens are shown in figures 22 and 23. Workmanship is uneven, producing one outstanding tool and two that are very inferior. Irrespective of the material, all five scrapers evidence weathering and patination.

10-F-2: This scraper plane (Fig. 22), with vertical faces and abundant evidence of step flaking, is one of the two most definitive implements found outside of the charcoal and bone deposits; the other significant artifact being the chopper, 10-F-1. Found in 1933, the massive scraper 10-F-2 was associated with fragments of the calcium carbonate crust which covers the rim of the Vegas Wash and large areas of the floor of Las Vegas Valley. The scraper lay near the middle of the amphitheater which is Area 1. The implement was lying down-slope from both Ash Bed 2 and Site A, and about 30 feet west of Site A. 10-F-2 was made from a dolomitic limestone pebble. The back and the dorsal and ventral surfaces were left unmodified while the two sides and the distal end were boldly flaked to create the steep-sided scraper plane. Step flaking is visible around the distal end, and there is evidence of secondary flaking at the base of the vertical sides. Flake scars are badly weathered and, as on all of these limestone artifacts, there is no apparent difference between the cortex and the surfaces of the flake scars. This scraper is 7.4 cm. long, 6.75 cm. wide and 4.05 cm. thick; it is characterized by step and uniface edge flaking along three quarters of the circumference.

10-F-4: This is an irregularly convex-edged side scraper made from a waterworn piece of orthoquartzite. It was found in 1933 among the pebbles in the erosion channel below Ash Bed 2. There is crude, irregular uniface edge flaking which may be man-made or which may only record the use of the object as a scraper by Man. The nature and position of the flaking indicate use as a scraper. 9.8 cm. long, 4.8 cm. wide, and 3.0 cm. thick, this specimen has been moderately weathered since being flaked. Surfaces are unmodified. Only the convex edge has been flaked, and it, primarily, unifacially

along the line of contact with the ventral surface. This flaking forms a concavo-convex working edge.

10-F-5: Collected in 1933, just west of Site A, Area 1, this is a bifacially flaked core tool (Fig. 23a, b) fashioned from meta-quartzite. Cortex remains on the central portion of the dorsal surface; all other surface areas were modified. Both ends and one convex side were flaked; however, there is evidence of final dressing or retouching only along a 3.0 cm. section of the convex edge. 9.0 cm. long, 6.85 cm. wide and 3.5 cm. thick, this specimen was certainly made by Man; however, the purpose or purposes for which the tool was used cannot be determined as readily as in the case of the artifacts discussed above. The bifacial flaking and general appearance of this core tool suggest use as a chopper. However, the only finished edge is uniface and it suggests use as a scraper.

Sharpness of the flake scars reflects the use of a durable material which weathers slowly.

10-F-6: Collected in 1933, this orthoquartzite flake lay in a small erosion channel southeast of Ash Bed 2. Fragmentary flake scars extend over portions of the dorsal and ventral surfaces, but the work done in preparing the tool is evidenced only by edge flaking along several segments of the irregular circumference (Fig. 23c-e). This modification is particularly distinct along the right edge of the specimen as it is illustrated in Fig. 23c, and suggests use as a convex side scraper. There is also a less distinct patch of concave edge retouch.

This specimen is 5.65 cm. long, 5.1 cm. wide and 1.6 cm. thick, and has sharp-edged flake scars, again resulting from the use of a durable material.

10-F-10: Found in 1933, this is a flat pebble of orthoquartzite with inclusions of chert. There is some random light uniface flaking along two thin edges which may have occurred naturally or may have been the result of Man's use. The thick edges and surfaces are not modified. The chert inclusions are battered but this probably occurred naturally. The specimen is 8.0 cm. long, 5.9 cm. wide and 1.35 cm. thick. If used by Man, it was probably as a notched scraper. It was found with scattered pebbles 100 feet southwest of Ash Bed 2.

MISCELLANEOUS IMPLEMENTS

10-F-8: Found to the north of Ash Bed 2, in an erosion channel in 1933 by Harrington, this limestone pebble (Fig. 25) has a thin, sinuous, convex edge. If this edge was once fashioned to form an artifact, weathering has removed the flake scars. Dimensions are:

8.5 cm. long, 6.3 cm. wide. The shape and thinness of the edge suggest 10-F-8 may have been a cutting tool.

10-F-11: Collected by Harrington in 1933, just 20 feet north of Ash Bed 2 and at a slightly lower level, this limestone pebble was unmodified except for slight uniface random flaking along a mildly convex edge. This flaking could have resulted from use. 10.15 cm. long and badly weathered, this object may have been used as a scraper, its use resulting in the modified edge. There is no other indication of utilization, and no evidence of intentional preparation.

10-F-65: This chert pebble was collected by Peck in 1955 on a knoll (Site E) at the east end of the original Hunter Site (Area 3). 6.8 cm. long, 5.2 cm. wide and 3.7 cm. thick, this pebble bears numerous facets, the edges of which are battered. It tapers naturally to a thick point which is severely battered and this bruised condition extends back from the anterior end for 3.2 cm. Shape and battering suggest use as a hammerstone.

10-F-53: This fine-grained quartzite flake bears flake scars on the dorsal and ventral surfaces. I collected it in 1955 in a side canyon near the west end of Area 2. Ten unidentifiable fragments of animal bone were clustered with the stone at what is referred to as Site F, Area 2.

Both dorsal and ventral surfaces bear portions of flake scars, indicating that this specimen may have been part of a larger flake while it was in the process of being fashioned. 10-F-53 has no well-defined shape; there is no retouch of the irregular edges. Scars and cortex are the same color. At best, we might classify this specimen as a piece of workshop material.

We have now considered all the specimens found in the erosion channels of the main Tule Springs Locality. It will be obvious that those collected near Ash Bed 2 include several that are well defined and deliberately fashioned.

While association with the charcoal deposits, animal bones and artifacts *in situ* cannot be proved, that interpretation, in light of present data, appears most plausible. This problem will be discussed further in Chapter VI.

In summary, it can be stated that two groups of artifacts must be considered from the Tule Springs Locality: those found *in situ* in the charcoal deposits with the bones of extinct animals, and those found in the nearby erosion channels. Though few in number, the implements found in the charcoal afford the proof that establishes the contemporaneity of Man and Pleistocene fauna.

CHAPTER V

Regional Archeological Survey

by RUTH SIMPSON

NOW LET US LEAVE the Tule Springs Locality, climb past the lake beds deposited on top of the charcoal and animal bones, and, having reached the modern floor of the broad valley between Sheep and Las Vegas Mountains, consider evidence of more recent prehistoric human occupation to be found in the Tule Springs region (Charts 2-6).

There had been reports of Pinto Basin-type artifacts being found in the Las Vegas Valley by Mrs. Elizabeth Campbell and S. M. Wheeler, but we had seen none of this material and it remained for the 1956 expedition to discover the sites and make the collections reported here.

Also, in 1930, Mrs. Bertha Cody had reported evidence which, in light of the Tule Springs discovery, suggests that lake beds in the Corn Creek region northwest of our locality might contain a similar prehistoric record. Corn Creek was checked briefly by Harrington in 1933 and by Peck and me in 1956.

LAS VEGAS VALLEY SITES, TULE SPRINGS REGION

In 1955 the possibility of including a surface survey of the valley never passed the discussion stage. There was no time; there were no indications that such a project would yield evidence of value. However, a surface survey was included in the 1956 plans and, as we established camp, the need for such a project became apparent: Harrington found a stemmed, notched-based dart point while setting up his tent. The second afternoon Peck began the survey, working on the north side of the Vegas Wash. Travelling first in an easterly direction, he found no diagnostic material, but did find flakes of jasper and chert as well as some nondiagnostic scrapers and other tools. The farther east he went, the scarcer evidence became. Therefore, Peck turned his attention to the west and within a quarter of a mile of the Tule Springs Locality he began to find well-made implements including weapon points, specialized scrapers, drills, choppers, etc. He extended the survey $2\frac{1}{2}$ miles up the valley and specimens were found all the way. The occupied area varied from 100 yards to $\frac{1}{4}$ mile in width, extending to the rim of the Vegas Wash at many points.



FIG. 52. a, Surface site, regional survey (north side). b, Knolls of sedimentary material rising above floor of Las Vegas Valley near Southwest Museum camp. (Photos by S. Peck and J. Kettl).

A major side canyon entered the Vegas Wash from the north $2\frac{1}{2}$ miles upstream and, while scattered artifacts and flakes were found beyond that arroyo, the main concentrations lay east of it. The larger choppers and scrapers found on the north side came from the vicinity of that arroyo.

The McCowns worked with Peck in extending the regional survey and the remainder of the crew joined them during the late afternoon hours when the sun caused specimens to gleam in the low-angle light.

On the south side of the Vegas Wash, in the area immediately around the Southwest Museum camp, the McCowns found several choppers and other implements when the regional survey was extended to the south rim. Specimens of various types were widely scattered here, and were collected over a larger area: from a point opposite Area 3 of the Tule Springs Locality, westward to within $\frac{1}{4}$ mile of the Tule Springs Ranch; and from the rim of the Vegas Wash southward for $\frac{1}{2}$ mile. On both sides of the Wash, most artifacts were found in zones of lightly consolidated desert pavement (Fig. 52a). No specimens were recovered from draws, even near

their heads where the channels have been recently cut. However, it must be assumed that erosion is gradually destroying the artifact-bearing floor of Las Vegas Valley and that the implements are being washed down the channels at least a short distance.

Unfortunately, Stuart Peck and Ernest McCown have passed away and we cannot turn now to them for a report on details of the survey. However, we can quote here from Stuart Peck's report written for *The Masterkey* (Peck 1957: 116-120):

. . . the specimens around camp were made of limestone. Knolls 8 to 10 feet higher than the valley floor and representing remnants of an old, higher land surface were strewn with this limestone, but no artifacts were found on these hills. This limestone is similar to that which constitutes the mountains to the north and south, and probably washed down from Gass Peak, spreading across the valley before the Vegas Wash began to down-cut.

There are many smaller tools and weapon points on the sites, some uniface, many biface. Many materials were used in making these implements: chert, rhyolite, chalcedony, obsidian, etc. . . .

Among the many projectile points picked up on the surface of what we call Playa Sites, we were able to recognize many old friends: Pinto Basin, Lake Mohave, Silver Lake types. Others were complete strangers to us, and apparently they were not frequently found in the region, because local collectors to whom we showed the specimens had no names for them.

No animal bones, house rings or fire pits were found at the Playa Sites, but there were many clusters of camp rocks. Indeed, these larger stones often guided us to workshops and artifact areas. . . .

With this general review as a background, let us now turn to a survey of the archeological material.

SPECIMENS FROM LAS VEGAS VALLEY SITES, TULE SPRINGS REGION

The artifacts fall into several categories and thus present a rather gratifying picture of the lithic industry or industries involved. There are two major subdivisions into which the artifact assemblage must first be separated: refined and massive. It is possible, though not probable, that these two divisions complement each other. In view of marked differences in workmanship, classification, size, etc., we shall review the two major units separately. First we shall consider the various categories of refined implements.

The Playa Complex¹ would seem to be the major factor involved, perhaps the only one, although several types of weapon points occur which have not, thus far, been recognized as part of that assemblage. The material all seems to be of approximately the same age;

¹This term is understood to encompass the several desert lithic industries associated, during Pluvial times, with the lakes and streams of the inland basins. Most prominent elements of the Playa Complex are Gypsum Cave, Lake Mohave and Pinto Basin. The term Playa Complex was regarded as obsolete by the late Malcolm Rogers, who would place this material in his San Dieguito Sequence (see Chapter 1).

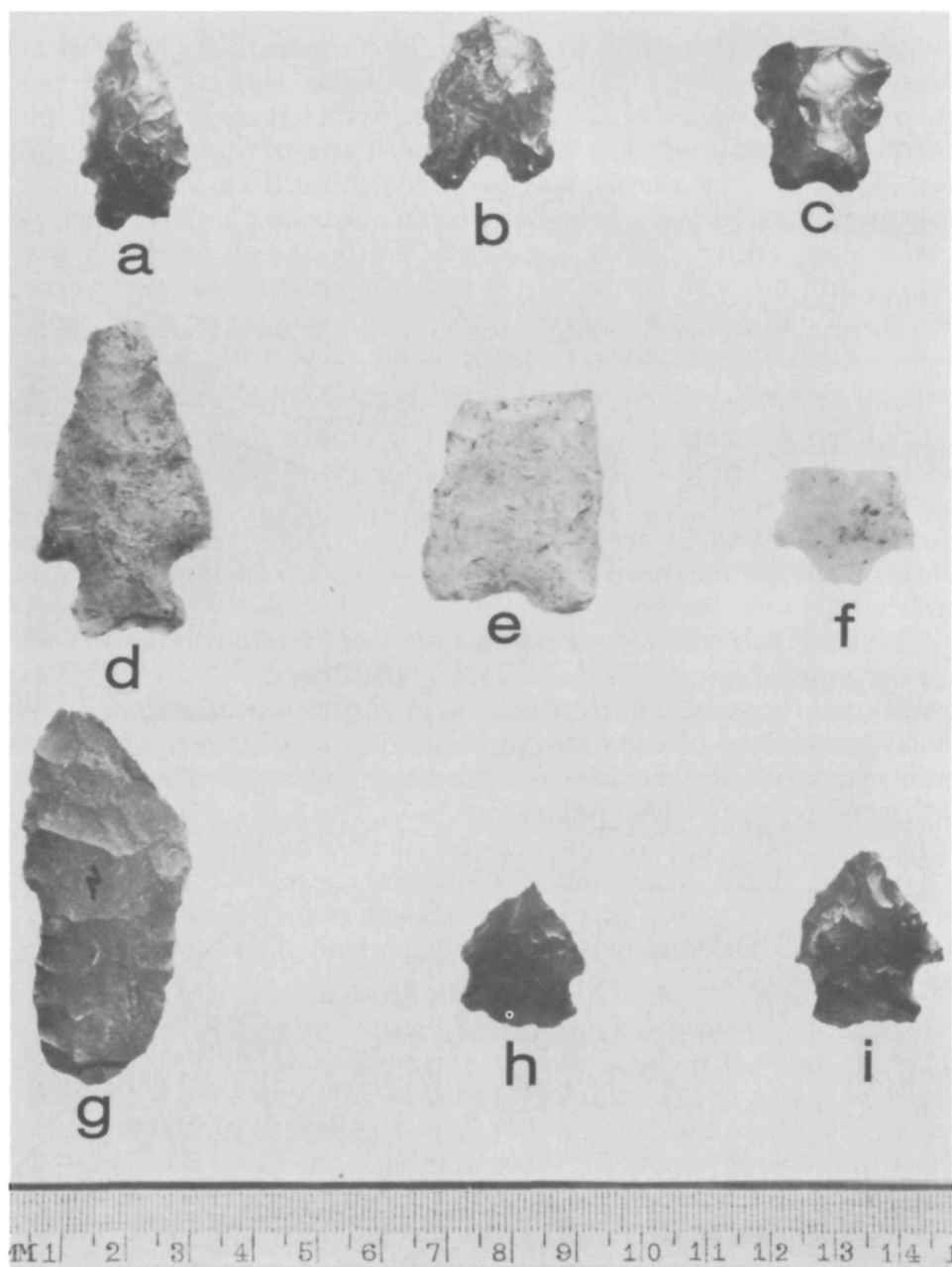


FIG. 53. Regional survey projectile point types: a-c, Pinto Basin; d, points with lobed bases; e, leaf-shaped points with notched bases; f, Gypsum Cave; g, Lake Mohave; h, Silver Lake; i, Basketmaker. (Photo by John Kettl).

certainly there are no characteristic recent artifacts such as pottery, arrowpoints or shell ornaments.

Most diagnostic of the lithic assemblage collected are weapon points, graveurs or incising tools, and certain specialized scrapers. We shall, therefore, consider those three categories first.

WEAPON POINTS

Weapon points (Chart 2) were found in comparatively large numbers on sites on both sides of the Vegas Wash. However, only two broken points were collected near the western extremity of the northern survey and none at the western end of the southern survey. Although the survey was extended more than a mile to the east no projectiles were found down-stream from the Tule Springs Locality on either side of the Vegas Wash. It can be stated that points, and all other types of refined implements, were scattered, perhaps a half-dozen being recovered in a pavement area 100 yards across. Such a pavement area was considered as a site.

Group 1 (Pinto Basin Points) (Fig. 53a-c): Nine projectile points fall within this category; six from the northern survey, three from the southern. Three are of the classic shape with side notches, lobed bases, and characteristic outline. Two of these are from the southern survey and all three are of obsidian. Two others are shoulderless Pintos from the northern survey. One each is made of obsidian and quartzite.

Three of the remaining four Pinto points are from the northern survey. One, of chert, has short sloping shoulders; two diverge from traditional forms in that they have very short stems surmounted by lobed bases. Two of these are of obsidian, one of chert. The Pinto point with sloping shoulders found on the southern survey is fashioned from mottled chalcedony.

Of these nine Pintos four are complete. The largest of these is 3.6 cm. long by 2.1 cm. wide. The smallest complete Pinto is 2.5 cm. long by 2.0 cm. wide. Three of the broken points are much larger, one being 3.9 cm. long, with the lower portion of the blade missing, by 3.15 cm. wide.

Group 2 (Stemmed, lobed-based points) (Fig. 53d): There are three points in this class, all from the north-side survey. Only one, made of quartzite, is complete and it is 5.05 cm. long by 2.7 cm. wide. The other two are smaller. One of these is of metamorphic shale and one of jasper. All three approach the Pinto Basin classification, but the formation of the stems is too divergent to permit inclusion with specimens of that type. They do meet the qualifications of the little-known Paradise Pinto points of Mrs. Elizabeth Campbell's classification (1937).

Group 3 (Leaf-shaped, notched base) (Fig. 53e): Although all of the weapon points and other artifacts collected during this survey of Las Vegas Valley are sandblasted, weathered and moderately patinated, two are markedly patinated. These were collected during the north-side survey, and have broken, leaf-shaped blades. The bases are characterized by stubby, wide lobes and distinct

basal notches. Both specimens suggest possible relationship to shoulderless Pintos. One is made of chalcedony, one of chert. Both are thin, well-made and apparently retouched by pressure-flaking. Dimensions are 3.4+ cm. long by 2.2 cm. wide; 3.65+ cm. long by 2.85 cm. wide. It is suggested that these two weapon points may be the oldest of the series being reported.

Group 4 (Gypsum Cave) (Fig. 53f): One point falls in this category. It was found on the south-side survey. Only the base was recovered. Length is 1.9 cm., width is 2.2 cm. It is made from chert and shoulders are straight, stem short and tapering.

Group 5 (Lake Mohave) (Fig. 53g): Two points fall within this group. Both were recovered on the north side. Made of chert, both are broken but still retain the diagnostic characteristics of a long tapered stem and comparatively short broad blade. One appears to have been unusually large since, with most of the blade gone, it is 6.0 cm. long by 2.6 cm. wide. The other specimen is 2.3 cm. wide.

Group 6 (Silver Lake) (Fig. 53h): Three points are included in this group, all from the north side. Two are of obsidian, one of chert. Only one is complete, being 2.35 cm. long by 2.0 cm. wide. The other two are larger and are crude while the small complete artifact is precisely fashioned and appears to have been resharpened. All have short stems, convex bases and broad blades.

Group 7 (Basketmaker) (Fig. 53i): Two distinctive projectile points, one of obsidian and one of chert, were collected during the north-side survey. These appear to be only slightly divergent from true Basketmaker forms. 2.85 cm. long by 2.3 cm. wide and 3.3 cm. long by 1.9 cm. wide, these two points have shoulders that slope slightly, short stems and flaring bases that are moderately concave. Both are well fashioned.

If these are Basketmaker in origin, they may be the most recent of the points recovered. The only other point which seems to be of comparatively recent origin is in Group 8.

Group 8 (Diagonal Side-notched) (Fig. 54a): The largest weapon point found on either survey came from the south side. Made of mottled chalcedony, this is really a work of art. Thin, symmetrical, precisely flaked and notched, this artifact is 9.0 cm. long by 2.95 cm. wide. The outline of a laurel leaf blade is perfect, interrupted only by diagonal notches. Barbed shoulders carry the curve of the basic shape almost to the down-turned tips of the convex base. Blade and tip are lightly serrated. Undoubtedly, pressure flaking was employed in fashioning this point.

This single representative of Group 8 of our Las Vegas Valley weapon points was discovered by Peck more than a quarter mile

from the nearest site and $\frac{1}{2}$ mile away from the Wash—farther south than any other specimen. Absence of evidence of weathering, presence of sharp edges, refinement of shape and technique suggest that the artifact may represent a later industry than that attested to by the general assemblage of implements.

This unusual notched weapon point is strongly suggestive of those Dr. Gerald Smith obtained from Newberry Cave, San Bernardino County, California (Smith, *et al.*, 1957: 19). There, these artifacts occurred in deposit and were not associated with pottery, arrowpoints or other markedly late articles.

Group 9 (Miscellaneous Weapon Points) (Fig. 54b-d): We come, finally, to a group of nine weapon points which do not fall within the accepted classification of Great Basin projectile points known to the authors. Six of these have been badly broken and/or resharpened

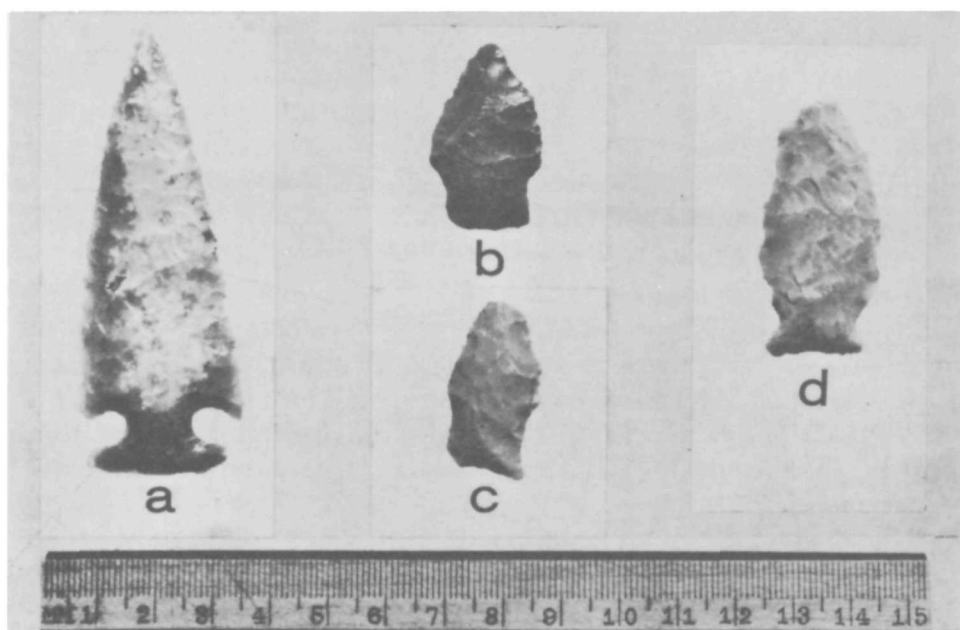


FIG. 54. Regional survey projectile points: a, diagonal side-notched; b-d, miscellaneous forms. (Photo by John Kettl).

ened until the original shape is, at best, uncertain. All six were collected during the northern survey; at least in their present form, five are crude. Workmanship shows little resemblance to that of other specimens in the collection of refined artifacts.

Of the three remaining unclassified projectile points, one (Fig. 54b) approaches the conventional “pine-tree” form, has a straight base and is made of basalt. The other two (Fig. 54c, d) are shoulderless, have moderately flaring lobes, concave bases and are stemmed.

Both were made from chert. There is a superficial resemblance to Paradise Pinto points, but closer examination shows that the points illustrated in Fig. 54 c and d have blades which are too asymmetrical and bases without proper concavity to permit use of the Paradise Pinto category.

In addition to the projectile points we have discussed, there were numerous fragmentary points, bases being the most numerous fragments (14 from the north side and four from the south). Mid-sections and miscellaneous fragments numbered two on the north and seven on the south. One tip was returned from the north side and eight (including a very crude reject) from the south. Thus 36 fragments of weapon points were collected, 17 from the northern survey, 19 from the southern. Of these, five northern pieces were of obsidian and one southern piece. The preponderance of bases indicates use of the valley floor as camp sites as well as for workshops and hunting areas. All of these fragmentary implements were too badly broken to permit even partial classification.

Now that we have reviewed the weapon points, it is quite apparent that the majority (26-6) were on north side sites. Also, more numerous varieties were represented there. However, it is evident that the Vegas Wash, if present when these artifacts were being made, used and abandoned, was not a barrier to the hunters. Now let us review the remainder of the classes of artifacts and see what story they tell.

INCISING TOOLS OR GRAVERS

We are considering now a category well represented in such early lithic industries as Clovis, Folsom, Eden Valley, Lake Mohave and Pinto Basin, but not yet known to the authors from late desert or late Great Basin complexes.

These gravers consist of small, carefully fashioned needle-like points which protrude from the edges of flakes—flakes which may or may not have been chipped to form scrapers. Ten of these gravers were recovered (Chart 3) (Fig. 55a, b); six from the north side of the Las Vegas Wash; four from the south side. Nine are made of chert, one of jasper.

Group 1 (One Graver Point): Four of the six gravers collected on the northern survey bear only one graver point. Two of these were fashioned on flakes that had no other use. One was formed by re-touching the tip of a broken, bifacially-flaked, pointed blade. One was made in combination with a multiple scraper—a tool which could be used *both* as a notched and a concave scraper. Dimensions are 2.1 cm. long by 1.5 cm. wide to 4.3 cm. long by 3.15 cm. wide.

Two of the four gravers collected on the southern survey have one graver point each. Both are combined with scrapers—one be-

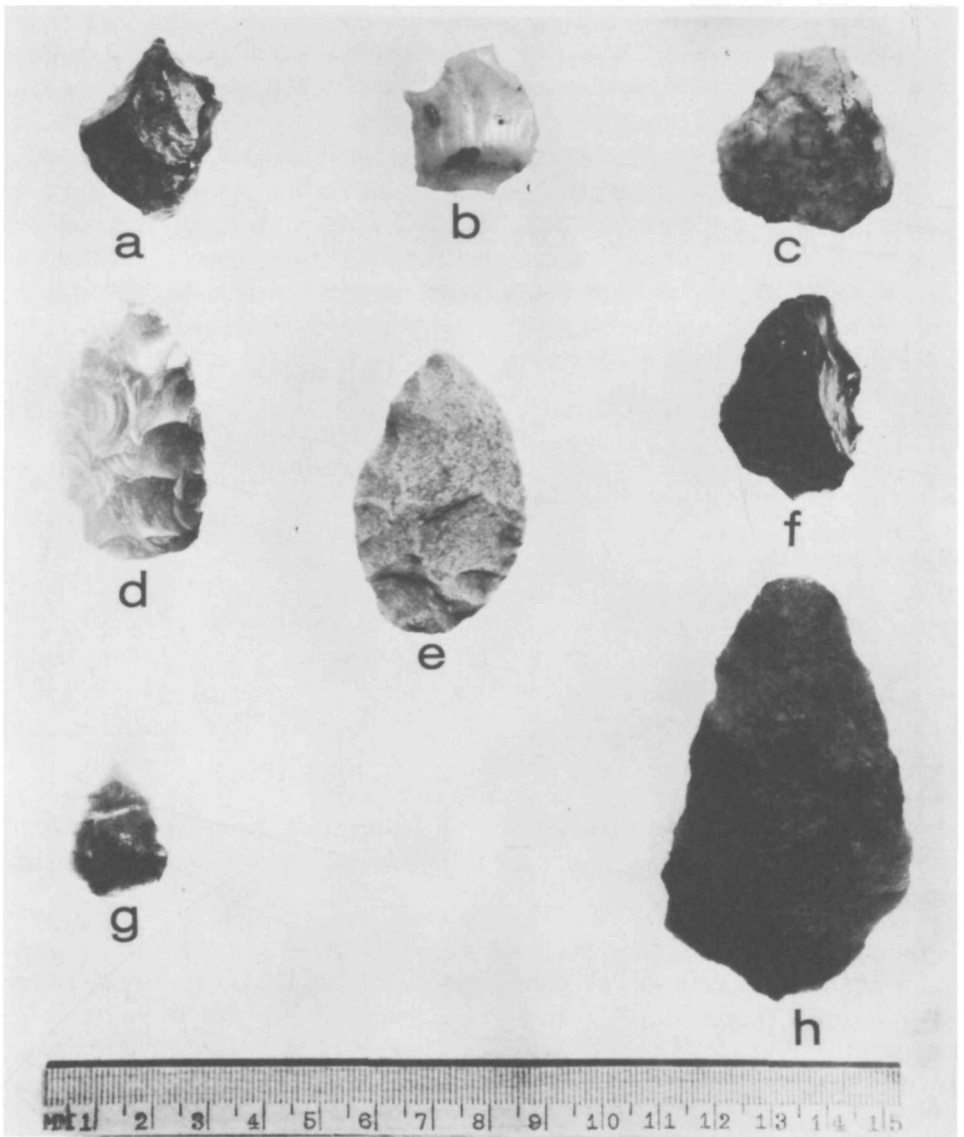


FIG. 55. Miscellaneous tools from regional survey: a, b, gravers or incising tools; c, broken drill (shaft missing); d, e, h, blades; f, small core; g, cutting tool. (Photo by John Kettl).

ing useable as a straight-edged scraper, the other as a multiple (straight-and-convex-edged) side scraper. Dimensions are 3.3 cm. long by 2.5 cm. wide to 3.4 cm. long by 2.6 cm. wide.

Group 2 (Multiple Graver Points): Two of the six north side engraving tools have two graver points. These are set rather close together on flakes also used as scrapers, one as a double-convex side scraper, one as a double-straight and convex-edged side scraper. Dimensions are 3.1 cm. long, 2.3 cm. wide, and 3.4 cm. long by 3.0 cm. wide.

Two of the south side gravers have more than one point, one having two points and the other having three. The three-pointed tool was used only as a graver while the two-pointed tool was also a convex-edged side scraper.

Excluding the single-pointed specimen made from a broken blade, the incising tools were finished by uniface pressure flaking and often evidence excellent technical ability.

SCRAPERS

As is so frequently true of lithic industry material from open sites, scrapers compose the most numerous category of implements represented. The Tule Springs regional survey yielded 37 scrapers—24 from the north side and 13 from the south.

Chert, jasper, quartzite and obsidian were utilized. In our collection scrapers of chert are by far the most numerous, 31, and only one is of obsidian. Of 24 northern scrapers, 23 are on uniface flakes and one was made from tabular chert. All 13 southern scrapers were made on uniface flakes. 15 northern scrapers bear only edge-flaking while nine have uniface face-flaking as well. Unless otherwise specified, all specimens in the various groups of scrapers are formed on comparatively thin flakes measuring less than 1.4 cm. and averaging approximately 1.0 cm. in thickness.

While the above figures indicate a relatively impressive assemblage of scrapers, the following breakdown will show that very few have been collected in any one subdivision, except in the case of convex scrapers (Chart 4).

Group 1 (Convex Side Scrapers) (Fig. 56a): 10 specimens having convex scraping edges were found in the northern area. They vary from 2.6 cm. long by 1.55 cm. wide to 5.4 cm. long by 3.45 cm. wide. The southern survey yielded four ranging in size from 3.5 cm. long by 2.8 cm. wide to 4.7 cm. long by 4.0 cm. wide. Each of the 14 has a single convex edge. On some this edge encompasses the end, while others bear the convexity only on a side. Flaking is uniface, surfaces are not modified. Two are of quartzite. While common to many lithic industries, the best of these rather small tools are typical of the Pinto and Lake Mohave Complexes.

Group 2 (Double Convex Side Scrapers) (Fig. 56b): Two specimens, each having two convex scraping edges were collected. The only obsidian scraper came from the northern survey and falls in this group. The dorsal surface and both edges were unifacially flaked. It is the only Group 2 scraper collected in that region and is 3.5 cm. long by 2.3 cm. wide. One was also reported from the south and is 3.1 cm. long by 1.65 cm. wide, and made of chert. It bears only uniface edge flaking.

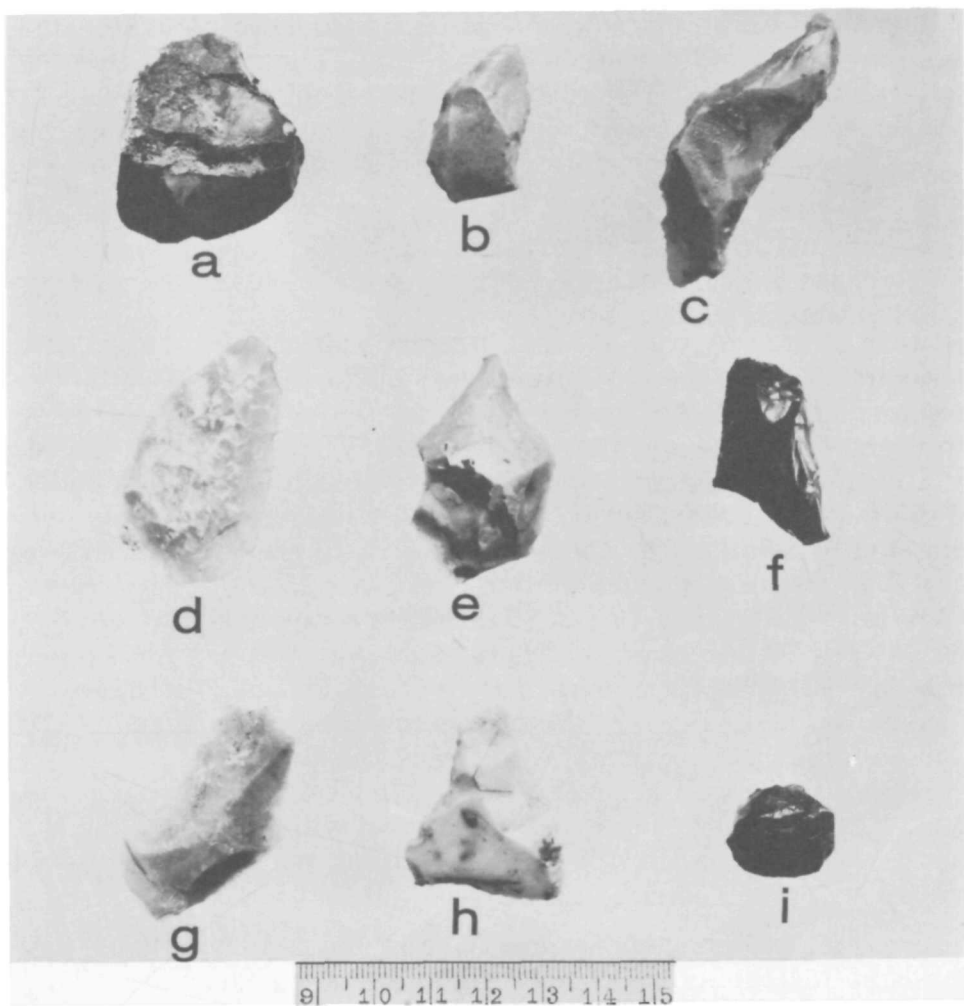


FIG. 56. Regional survey scraper sub-types: a, convex side scraper; b, double convex side scraper; c, concavo-convex side scraper; d, straight-edged side scraper; e, pointed scraper; f, straight-edged keeled scraper; g, concave side scraper; h, triple concave side scraper; i, round scraper. (Photo by John Kettl).

Group 3 (Convex-notched Side Scraper): A naturally high-backed specimen, 3.3 cm. thick, falls in this category which is characterized by a convex and a notched scraping edge. Working edges are formed by uniface edge flaking involving both sides and the distal end. 5.65 cm. long by 4.0 cm. wide, only this one Group 3 tool was reported, and it was collected during the northern survey.

Group 4 (Concavo-convex Side Scrapers) (Fig. 56c): Four specimens of this class were found, two on each survey. These tools each have both a concave and a convex working edge. These four are among the most refined and precisely fashioned tools recovered. Although formed by uniface edge flaking, the scars do mount well onto the dorsal surface. They are typical of the Pinto Complex. The

northern specimens are 5.6 cm. long by 1.8 cm. wide, and 5.35 cm. long by 3.6 cm. wide; the southern specimens are 2.5+ cm. long by 2.8 cm. wide and 3.0 cm. long by 2.5 cm. wide.

Group 5 (Straight and Convex Scrapers): Made of chert, three artifacts of this category were found on the northern survey. Two have a modified straight and a convex edge each; one has a straight edge and a convex end. Dimensions range from 3.3 cm. long by 2.3 cm. wide, to 5.4 cm. long by 1.8+ cm. wide. (This latter reading is inaccurate due to a fracture).

Group 6 (Straight-edged Side Scraper) (Fig. 56d): Four straight-edged side scrapers were collected, two from each survey. All four were fashioned on uniface chert flakes by uniface edge-flaking only. One specimen from the northern survey has two edges straightened and retouched; each of the other three has only one shaped. The refinement of flaking is typical of Pinto tools.

Dimensions of the northern tools are 3.35 cm. long by 2.5 cm. wide, and 4.5 cm. long by 1.9 cm. wide; straight scrapers from the southern survey are 3.35 cm. long by 2.4 cm. wide, and 4.85 cm. long by 2.8 cm. wide.

Group 7 (Pointed Scrapers) (Fig. 56e): Only one pointed scraper was collected and that was from the southern survey. Edges are retouched so that they taper to form a blunt point useful for detail work. Fashioned from a uniface chert flake by excellent uniface edge-flaking, this delicate tool, typical of the Playa industries, is 4.35 cm. long by 2.5 cm. wide.

Group 8 (Pointed, Straight-edged Scrapers): Only one scraper combining a straight edge and a point was found. This was on the northern survey. Made from a uniface chert flake and retouched by uniface edge-flaking, we have another typical Playa specimen 2.65 cm. long by 2.7 cm. wide. On this tool there is exceptionally heavy desert varnish.

Group 9 (Straight-edged Keeled Scrapers) (Fig. 56f): Two of these tools were recovered, both on the northern survey. Both are expertly fashioned and are typical Playa artifacts. One is of jasper and is 3.7 cm. long by 1.9 cm. wide; one is of chert and is 3.9 cm. long by 1.7 cm. wide. Both are made on high-backed uniface pieces, probably small cores. Face-flaking is excellent, as is the preparation of the edges. In addition to the straight edge, the jasper tool is also an end scraper.

Group 10 (Concave-edged Side Scrapers) (Fig. 56g): Three concave-edged side scrapers were collected, one on the northern survey, two on the southern. All three are fashioned on uniface chert

flakes by use of uniface edge-flaking only. Workmanship is rather crude; chipping along the edges is very light and may be due largely to use rather than to preparation. Dimensions of the northern specimen are 4.5 cm. long by 2.2 cm. wide; of the southern tools, 3.9 cm. long by 2.0 cm. wide, and 4.7 cm. long by 3.5 cm. wide.

Group 11 (Triple Concave-edged Side Scraper) (Fig. 56h): One of these specialized Playa tools was recovered during the southern survey. Made on a uniface chert flake, careful retouch was used in forming two working edges. The third also shows some crude retouch. Appearance suggests that there was subsequent retouching and that step flaking was used along the crude edge. Dimensions are 3.7 cm. long by 2.9 cm. wide.

Group 12 (Round) (Fig. 56i): Only one round scraper was found, on the northern survey. Made of chert, and with the dorsal surface flaked, this again is a Playa specimen. 2.0 cm. long by 1.8 cm. wide, this little tool has only one unworked segment in its circumference. It is a small, specialized convex scraper. Step-flaking and edge-flaking were utilized in its preparation.

Reviewing the preceding classes of scrapers, it will be seen that the average size is small; that most of the categories contain specimens typical of the Playa Complex; that expert workmanship was often practiced. Certainly pressure-flaking was used in creating the double concave, concavo-convex and several of the other specialized scrapers.

DRILLS

The bases of two drills were collected during the northern survey. Both are of the flanged variety, fashioned of chert, bifacially flaked. However, neither was well made. Flaking is crude, uneven and only the retouched edges are precisely shaped (Fig. 55c). Drills are not numerous in the Playa Complex but they do occur. It is possible that these two implements could be associated with the Basket-maker-type points, and they were recovered in the same area. However, several of the Playa-type points and scrapers came from that same district as well.

BLADES

In addition to projectile points, which constitute a specialized form of blade, eight less specialized blades were collected, all on the northern survey. All of these were bifacially shaped. Two are obsidian, one is quartzite (the largest and most crude, Fig. 55h), five are chert. Apparently only percussion-flaking was used in the preparation of these implements. Uses are obscure; possibly they were cutting tools, at least in four instances (Fig. 55d). Only one has a definite leaf shape and carefully chipped edges (Fig. 55e).

Dimensions range from 3.7 cm. long by 2.0 cm. wide, to 7.6 cm. long by 4.4 cm. wide.

CUTTING TOOL

From the southern survey came the only blade that can be classified with some certainty as a cutting tool. Made of obsidian and characterized by an asymmetrically convex edge, this little implement is roughly leaf-shaped, 2.8 cm. long by 1.8 cm. wide, and was rather crudely fashioned by biface percussion-flaking (Fig. 55g).

CORES

Cores, most of them comparatively small, were numerous in both areas surveyed. As a sample, three were collected in the south and 10 in the north. Two of the southern specimens and eight of the northern are small, pyramidal cores with flat unmodified bases (Fig. 55f). The other northern cores are generally flaked while the other southern core is a shapeless nubbin. Dimensions range from 2.6 cm. by 2.4 cm. to 4.1 cm. by 2.9 cm. for southern specimens and, for northern, from 3.9 cm. by 2.0 cm. to 6.9 cm. by 3.1 cm. Thickness ranges from 2.0 cm. to 3.3 cm. for northern cores, 2.3 cm. to 2.9 cm. for southern.

MISCELLANEOUS MATERIAL

In addition to the artifacts summarized above sample collections were taken of flakes representing various materials found in areas surveyed. Also, a few pieces of "workshop material" were preserved—pieces of chert, obsidian, quartzite, evidencing some modification—mostly pieces which had broken before completion. There was not a great deal of this type of material available. That which we collected included fragmentary scrapers, broken blades, etc. Seven pieces were retained, all from the northern survey.

* * * *

This completes the review of smaller artifacts and we must turn now to a series of massive, cruder implements which are different in every respect from those just noted. These were recovered mostly in the vicinity of the Southwest Museum camp (south rim of Vegas Wash) and at the far western extension of the northern survey.

15 specimens are included in this series, five from the northern survey, 10 from the southern.

HAMMERSTONES

Two hammerstones were collected, one from each area. The northern specimen is rather dubious, being merely an unretouched segment of a pebble, but the convex end does show a slight degree of battering. There is no other indication of modification. The southern specimen is a much-used chert pebble which had been battered

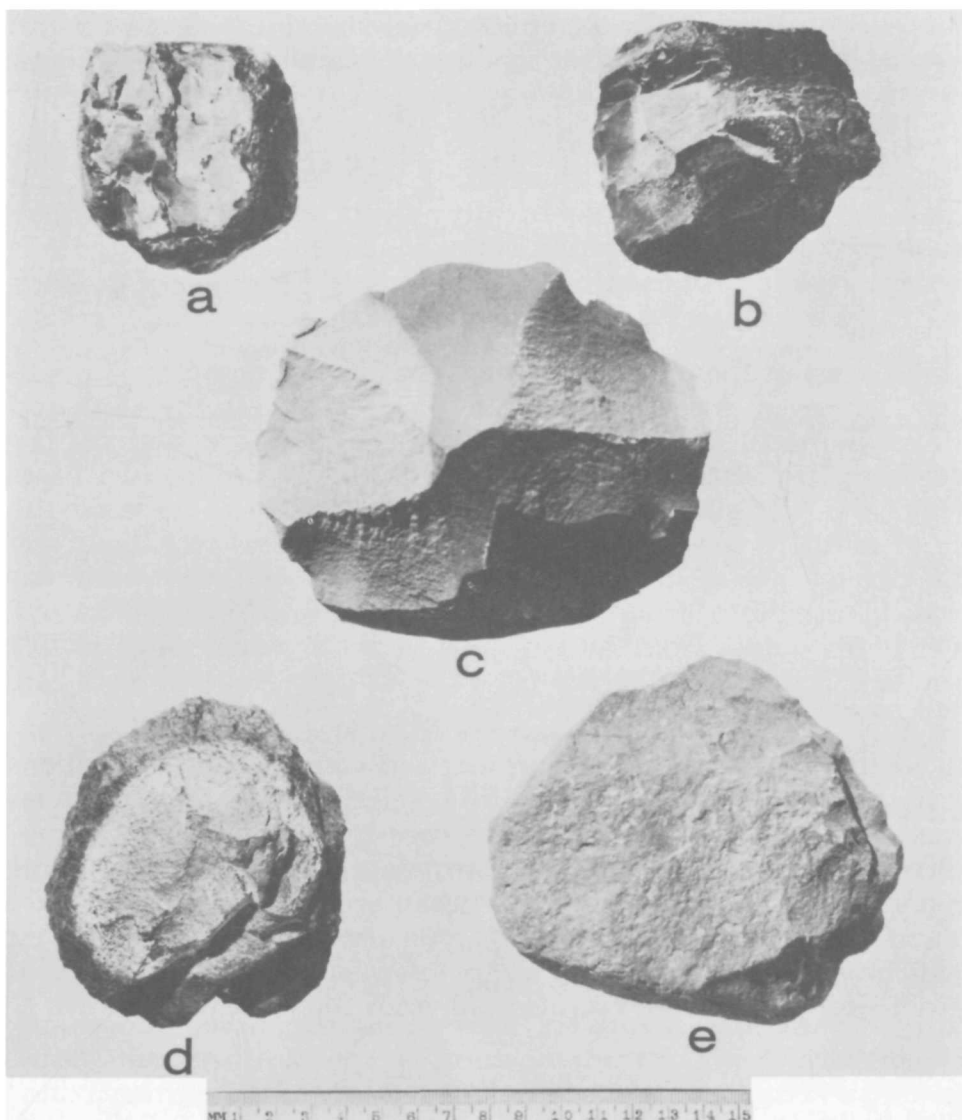


FIG. 57. Massive implements from regional survey: a, hammerstone; b, side chopper (flaking at left edge); c, core; d, e, scrapers (note weathered flake scars on e along upper right edge). (Photo by John Kettl).

and worn along all edges of its various facets (Fig. 57a). There can be little doubt that this was a hammerstone and that it saw much service. The broken pebble from the north is 5.7 cm. by 9.85 cm. and is made of quartzite; the chert pebble from the south side 6.8 cm. long by 6.1 cm. wide.

SIDE CHOPPER

Only one chopper was collected during the Tule Springs regional survey (Fig. 57b). It was found just east of camp in a small erosion basin between two protuberances of lake clay. Made from a chert-

and-dolomite pebble which had been partially struck away leaving a body that constricts bifacially to a sharp chopping edge, this implement was boldly flaked for 3.55 cm. back from the edge on both the dorsal and ventral surfaces. Overall dimensions are 7.3 cm. long and 5.3 cm. wide. The naturally-rounded back and adjoining portions of the surfaces are unmodified.

It seems rather odd that such a useful tool apparently played such a minor role in the economy of the people who occupied the sites of Las Vegas Valley floor. Choppers are usually relatively numerous in early lithic industries.

CORE

One most unusual core was found during the southern survey, just west of camp on the low ridge at the base of which we lived (Fig. 58). This superb specimen was the only definitely formed massive core that was recovered (Fig. 57c). The unusual fact is that it is of dolomitic sandstone—apparently unrelated to any of the material found in the region.

Dimensions are: 12.75 cm. long, 12.85 cm. wide, 7.1 cm. high. The specimen shows very little weathering, edges of flake scars are distinct in spite of the soft material. The dorsal surface is completely flaked except at one edge. Long scars extend from the lower edge to the peak; the ventral surface is flaked back from two edges, as though in an effort to create a chopper. However, the edge is irregular, jagged, and had not been used. A patch of cortex at the edge could have been utilized in gripping the instrument, had it seen service as a chopper, but the appearance of the specimen and lack of wear force us to leave it classified as a core.

SCRAPERS

Six massive scrapers were recovered during the surveys, one from the northern area, five from the south (Fig. 57d, e). All were fashioned from chunks of rock; two chert (one from the northern and one from the southern survey); two sandstone; one limestone; one basalt. All were made with the posterior areas unmodified except as may have been necessary to flatten them; three are not modified at all on the ventral surfaces. All six are convex scrapers, the re-touched edge extending along at least 50% of the circumference on four of the specimens and encompassing both edge and end on two tools. The sandstone tools are weathered, edges of flake scars being markedly softened. There is face flaking generally over the dorsal surface of three specimens; edge flaking only on two and partial face flaking on one.

The north side scraper is 8.3 cm. long by 7.8 cm. wide. The south side scrapers range from 8.4 cm. long by 5.8 cm. wide to 11.7 cm. long by 10.65 cm. wide.

MISCELLANEOUS

As in the case of the series of small, refined implements, there is, among the boldly-flaked, massive specimens, a group of unfinished or broken tools, and there is "workshop material" which shows modification, but affords little in the way of definitive clues to the purpose of that modification. Three of these specimens (one each of sandstone, limestone and quartzite) possibly were unfinished scrapers, or were scrapers broken in use and partially retouched.

Thus we have reviewed the specimens collected during the regional survey conducted during the 1956 field session. It will be apparent now that the Playa-type of small, specialized implements were much more prevalent on the north side of the Vegas Wash than on the south side, but that the occupation was essentially the same from a cultural point of view.

This review also has served to emphasize the fact that the majority of lighter, specialized specimens are typical of the Playa Complex (or San Dieguito Central Aspect, Phase II). While it is true that, individually, many of the tools, such as convex scrapers, graters, drills, etc. are found in other lithic industries, it is the assemblage of traits that supports the Playa classification. Furthermore, there are characteristics which are distinctively Playa: the delicate pressure-flaking on such specialized tools as the multiple-use scrapers; the very existence of such refined, specialized implements which in the Pacific and Great Basin regions are known as yet only in the Playa Complex. Therefore, in the opinion of the authors, this aspect of Las Vegas material does represent the Playa Complex.

In analyzing this *specialized* material found on the valley floor and the *unspecialized* artifacts found beneath the lake beds which constitute that valley floor, we are struck immediately by the *complete* dissimilarity of the two prehistoric records. There is no basis for comparison. However, there is similarity between the *massive* limestone scrapers and choppers found by Harrington in the erosion channels within the Tule Springs Locality (Chapter IV) and the *massive* artifacts collected near the Southwest Museum camp. Similarity in surface conditions must be considered with caution because all of the limestone came from the same source: Gass Peak to the north. Significantly, we believe, the flake scars on the specimens Harrington found are far more weathered than are those on most specimens from the valley floor above. If we were to assume that the limestone tools found in Vegas Wash are of Playa age and did wash down from the upper sites and come to rest *only* in side canyons adjacent to and just below the Tule Springs sites, we are forced to wonder why Nature was so selective; why none of the weapon points or other definitive implements washed down;

and why Nature chose to have the massive specimens wash only into the side canyons behind whose walls lay the much older record of human occupation.

It is much more logical to believe that the tools found by Harrington within 100 feet or so of Ash Bed 2 came from it, and are unrelated to those on the floor of Las Vegas Valley. For further discussion of this problem see pp. 103 and 136.

CORN CREEK SURVEY

For the final report of activity in Las Vegas Valley we turn to work done 19 miles north of Tule Springs in the Corn Creek Springs area. As early as 1930, before the Tule Springs Locality was reported, Mrs. Bertha Cody, Harrington's niece and one of his assistants at Gypsum Cave, checked the lake deposits south of Corn Creek Ranch. She found bone, including some tentatively identified as camel, weathering out of the lake beds.

Excavation in the areas where bones were visible yielded more fragmentary bone and scattered charcoal. In one place charcoal was recovered in quantity, suggesting that sizeable pieces of wood had been burned. No implements were found, and no further work was done.

The problem at Corn Creek was more confused than at Tule Springs. Several factors contributed to this: the absence of a clearly defined line of contact between older and more recent lake deposits; the presence of bone fragments and bits of charcoal in positions suggesting an irregular slope and/or redeposition; the absence of defined charcoal pockets, fire areas or positive bone-charcoal associations. The most significant deposit was one mentioned above in which charcoal was of sufficient quantity to suggest that wood had burned in place there. Beneath this charcoal was part of a camel's jaw with a few teeth in place.

Harrington reports that some of the bone fragments recovered may have been split but that they were too badly preserved to permit positive determination of this fact. It was also believed that some of the bone fragments were burned.

In 1956 Peck and I went to Corn Creek in an effort to obtain more definitive information. In the one day available for this survey little could be accomplished. Lying close to the highway and crossed by a good graded road, these lake beds, in marked contrast to those at Tule Springs, are readily accessible to visitors. There has been much random digging in the Corn Creek lake beds and pieces of bone are scattered throughout the area. Small shells similar to those found at Tule Springs were seen, but in markedly fewer numbers. Scattered charcoal was visible in the slumping walls of side canyons, and in backdirt of the random digging. We collected



FIG. 58. Southwest Museum Camp, 1955-1956; Las Vegas Valley and Charleston Range in background. Rozaire, Orr and Peck standing by breakfast fire.

no specimens. It is to be hoped that this area may, some day, receive the careful examination it deserves. Mrs. Cody found enough evidence to warrant this in 1930.

Leaving the Corn Creek lake beds, Peck and I visited the Corn Creek Ranch and there it was suggested that we check the area west of the ranch. A series of dunes were visited first and there we saw evidence of several recent Indian camps. Burned rocks and chippings littered the area and a few artifacts were seen. Just beyond these dunes, on a mud flat, we found an entirely different record of prehistoric occupation. Here were scattered crude lithic tools, most of which are suggestive of those uncovered in Topanga Canyon and described as scraper planes and choppers (Treganza & Malamud 1950; Treganza & Bierman 1958).

This all too brief visit to the Corn Creek area ended the 1956 Tule Springs field session.

ARTIFACTS FROM CORN CREEK

As noted, no artifacts were recovered from the lacustrine beds in 1930 nor in 1956. Although camprocks, flakes and broken specimens were observed among the dunes at the Corn Creek Ranch (1956), none were collected. However, a sample of tools and workshop material was picked up on flats just northwest of the dunes and these are described here.

All specimens collected appear to represent a single lithic industry, one suggestive of Topanga I.

The amount of weathering, type of flaking, crudeness of form are uniform among the artifacts observed, and of which this assemblage is but a sample. All were collected from very shallow depressions, formed by water and/or wind erosion.

CHOPPERS

Two choppers were found. These were made from limestone and

metamorphic shale; both are bifacially, though crudely, flaked and have sharp convex cutting edges. One specimen has a butt that has been extensively battered to make it more easily held in the hand. Dimensions are 7.1 cm. long by 5 cm. wide, 3.8 cm. thick; 7.9 cm. long by 6.7 cm. wide (Fig. 59).

HAMMERSTONES

Three hammerstones were collected, one each being fashioned from quartzite, metamorphic shale and sandstone. Convex edges of the quartzite specimen are battered, as is the convex end of the sandstone pebble. Very little definite use is apparent on the tool of metamorphic shale, although the various facet edges show slight battering. Dimensions are: 6.8 cm. long by 7.3 cm. wide (sandstone); 7.2 cm. long by 7.0 cm. wide (metamorphic shale); 6.8 cm. long by 7.7 cm. wide (quartzite). There is no face modification and edges are shaped by battering rather than by flaking (Fig. 59).

SCRAPERS

As appears to be so often the case in early and moderately early lithic industries, scrapers constitute the largest category of implements. Five were taken in this Corn Creek sample; three are convex-edged side scrapers, one is a concave-edged side scraper, one is a convex end scraper. Two were made from limestone, two were made from metamorphic shale, one from chert.

The concave-edged specimen was fashioned exclusively by edge-flaking. Formation of the end scraper required step-flaking and the extension of the edge-flaking back well onto the dorsal surface. One of the convex-edged side scrapers has uniface flaking over the entire dorsal surface, one has partial face-flaking, and the third has the dorsal face completely flaked and the ventral face partially modified. Eliminating one convex-edged side scraper which is badly broken, dimensions range from 8.0 cm. long by 6.8 cm. wide to 10.1 cm. long by 8.3 cm. wide, and from 2.5 cm. to 6.5 cm. in thickness (Fig. 59).

PECKING STONE

Only one of these tools was found. Made of metamorphic shale, it was fashioned by uniface edge-flaking which extends back onto the dorsal surface. Edges are battered, but most use is evidenced over the blunt point formed by the tapering sides (Fig. 59). This tool is 7.45 cm. long by 8.1 cm. wide.

CORES

Many cores were seen but only four were taken. These are of quartzite and metamorphic shale; have comparatively flat bases or platforms and are at least partially pyramidal in outline. Dimensions range from 8.2 cm. long by 6.75 cm. wide and 6.4 cm. high, to 11.8 cm. long by 9.4 cm. wide and 7.4 cm. high.

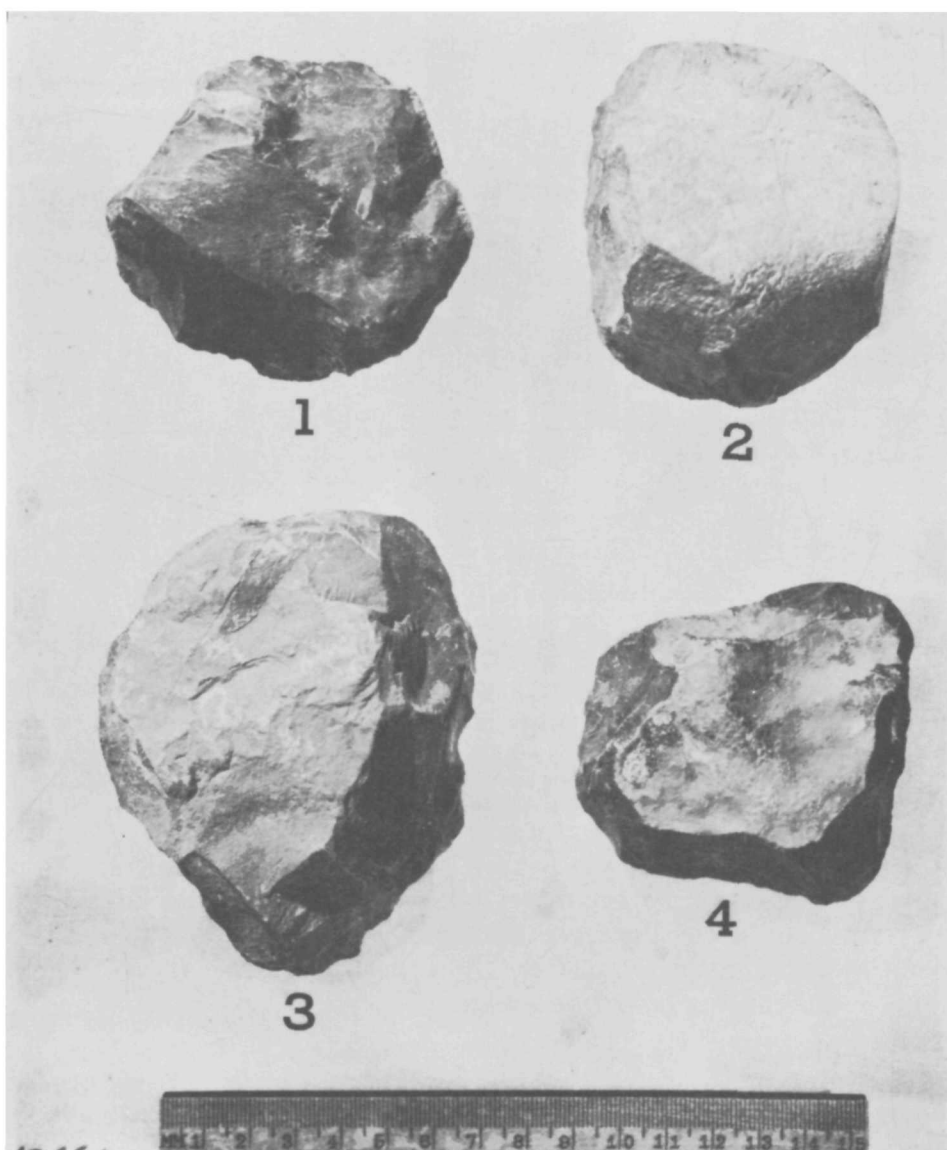


FIG. 59. Corn Creek Survey. a, the central locality; b, massive specimens from site west of Corn Creek Ranch: 1, end chopper; 2, hammerstone; 3, convex side scraper; 4, pecking stone. (Photo by John Kettl).

Chart 2

PROJECTILE POINTS

	GROUP 1 PINTO	GROUP 2 STEMMED LOBE-BASED	GROUP 3 LEAF- SHAPED	GROUP 4 GYPSUM CAVE	GROUP 5 LAKE MOHAVE	GROUP 6 SILVER LAKE
Northern Sites	6	3	2	—	2	3
Southern Sites	3	—	—	1	—	—
	GROUP 7 BASKET- MAKER	GROUP 8 DIAGONAL SIDE-NOTCHED	GROUP 9 MISCELLA- NEOUS	WHOLE POINTS	BROKEN PROJECTILE POINTS	TOTAL PROJECTILE POINTS
Northern Sites	2	—	8	26	17	43
Southern Sites	—	1	1	6	19	25

Chart 3

INCISING TOOLS

	NO. OF TOOLS	NO. WITH ONE POINT	NO. WITH 2 OR MORE POINTS	NO. WITH SCRAPER EDGES
Northern Sites	6	4	2	3
Southern Sites	4	2	2	3

Chart 4

REFINED SCRAPERS

	GROUP 1 CONVEX	GROUP 2 DOUBLE CONVEX	GROUP 3 CONVEX & NOTCHED	GROUP 4 CONCAVO- CONVEX	GROUP 5 STRAIGHT & CONVEX	GROUP 6 STRAIGHT	
Northern Sites	10	1	1	2	3	2	
Southern Sites	4	1	—	2	—	2	
	GROUP 7 POINTED	GROUP 8 POINTED & STRAIGHT	GROUP 9 STRAIGHT KEELED	GROUP 10 CONCAVE	GROUP 11 3-WAY CONCAVE	GROUP 12 ROUND	TOTAL SCRAPERS
Northern Sites	—	1	2	1	—	1	24
Southern Sites	1	—	—	2	1	—	13

Chart 5

REFINED MISCELLANEOUS IMPLEMENTS

	DRILLS	BLADES	CUTTING TOOLS	CORES
Northern Sites	2	8	—	10
Southern Sites	—	—	1	3

Chart 6

MASSIVE ARTIFACTS

	HAMMER- STONES	SIDE CHOPPERS	CORES	CONVEX SCRAPERS
Northern Sites	1	—	—	1
Southern Sites	1	1	1	5

MISCELLANEOUS MATERIAL

There was abundant workshop material in the area and samples of flakes and broken pieces of quartzite and metamorphic shale were collected as well as the cores noted above.

* * * *

Thus we have completed a survey of the artifacts collected by the various survey projects in the vicinity of Tule Springs. While none of the Corn Creek material apparently influences the Tule Springs Locality and its story in any way, the data are important to the archeological picture of Las Vegas Valley and serve to emphasize the fact that much more detailed work remains to be done throughout the region.

CHAPTER VI

Summarization and Analysis

by M. R. HARRINGTON and RUTH D. SIMPSON

THE DETAILED EVIDENCE derived thus far from archeological excavations at Tule Springs has now been examined. Undeniably, the material-culture basis for interpretations is fragmentary and sparse. Although our excavations have opened 27 sites and features within the locality, we find ourselves dependent primarily upon eight charcoal deposits of major significance, and three crucial artifacts found *in situ*, each in a separate fire area.

Actually, we have learned more about the conditions faced by Man at Tule Springs than we have learned about his methods of meeting these conditions. We know, from identification of charcoal left in the cooking fires, that oak and juniper grew near enough to the area to permit their use as fuel. The presence of so many grazing animals and the general topography indicate a well watered flood plain probably characterized by plentiful vegetation. We know that Las Vegas Valley held a series of shallow lakes, each formed behind coalescing alluvial fans that spread out from mountain ranges to the north and west. We believe that the lakes, fed largely by streams from those mountains, fluctuated in size and location. At times in the early stages of their development these lakes probably existed only as small, scattered ponds that attracted animals. Man pursuing the animals would camp on the flood plain between ponds. Eventually these small bodies of water would coalesce, forming a large shallow lake. One such lake filled the valley in the vicinity of Tule Springs.

We see evidence for this interpretation of the local geology in the multi-hued lacustrine strata which vary markedly in color from one part of the locality to another; in the undulating configuration of the old land surface; the deposition of charcoal and broken bones in natural gullies subsequently buried by water-laid clays, sands and gravels; the penetration of some of the bones, and even of some charcoal, into the underlying clay. Such penetration could not have occurred unless the ground had been soft and soggy, at least in places.

We know the fauna with which Man was associated at Tule Springs. Briefly, in review, we may state that: the animal most used as a source of food was the *Camelops hesternus*, or large

American camel; but bones of a species of American horse (*Equus pacificus*) and the large, long-horned *Bison occidentalis* were recovered from many of the cooking fires. Fragmentary bones of the mammoth elephant *Parelephas columbi* (Fig. 60) and a few of a ground sloth (probably *Nothrotherium shastense*) tell us that even parts of these strange creatures were cooked in the ancient fires. Although bones of deer are usually numerous in archeological sites, they are rarely identified at Tule Springs. Those which have been recognized are *Odocoileus* sp.

Persons who have not visited the area might suggest that charcoal could have resulted from fires started by lightning. However, there is proof of Man's presence, once the concentration of charcoal in pits and fire areas is recognized, and once we become aware that in the charcoal are mixed broken, burned, and split bones representing different individual animals, often different species. If further proof is necessary it lies indisputably in the numerically small, but tremendously important, trio of artifacts: the obsidian flake; convex-edged side scraper; and polished, pointed bone implement. Nor should we forget the four other probable artifacts in the charcoal.

While these artifacts are not diagnostic, in the sense of being capable of identifying the culture complex, they do establish beyond any shadow of a doubt the presence of Man.

Who were the people camping at Tule Springs while bison, horses, camels and elephants grazed nearby? We have no idea. We believe that they were *Homo sapiens*, nomads, hunters traveling in small groups, following the animals. Beyond that we cannot formulate opinions as yet.

When did these hunters stop here? We have several lines of evidence helping us solve that problem. First the faunal remains are mainly those of extinct species of late Pleistocene animals; second, and most important, Carbon-14 tests have dated the cooking fires at "between 28,000 and 33,000 years"; third, the local geology would seem to indicate that the people camped near lakes and streams on a well-watered flood plain. This is reflected by the formation of the fans and ponds, and by the presence of abundant small fresh-water shells. Age is also attested to by the amount of clay, silt and sand which accumulated—lacustrine and fluvial material which still constitute a deposit about 20 feet thick, and which once was probably thicker.

The fresh-water pond shells present a most interesting and important sidelight. They are found, sometimes in large numbers, through most of the lake-deposited overburden. However, as we have noted throughout this report, these shells are *massed* in the charcoal, especially around the bones. Sometimes, when a bone is

lifted out of the clay-and-charcoal matrix, the tiny shells constitute a major portion of the cast of the bone. The concentration of these shells in the fire areas would indicate that water covered most of the cooking sites quite quickly—before there was time for fine charcoal to blow away or for wind-blown sand to settle over the dead embers. The fact that fine charcoal and ashes remained and were not washed away as the waters came in suggests that encroachment occurred quietly. It could also suggest that ashes, charcoal and bones were dumped into spots that were already soggy. This agrees with the evidence afforded by the bones imbedded in the underlying clay.

The Carbon-14 date and the geological record attest to the fact that Man was at Tule Springs during a period of glacial and pluvial conditions in Wisconsin times.

Now, as we picture our hunters of 28,000 or more years ago, we are confronted with a major problem: what were their weapons? We have found no weapon points, nothing that could have served as a projectile or other aid to a hunter. Shall we therefore assume that Man, at least in this region, was dependent upon wooden spears with points hardened by fire?

There is another approach to the problem of how Man met the challenge of the hunt. If we assume that Man as yet had no efficient lances or spears—and perhaps even if he had them—he could have occupied the role of a scavenger, at least insofar as large game was concerned. Waiting until predatory animals had slain a bison, for example, and until the predators had eaten their fill, Man could then move in and take what was left.

It must be noted that here, as at many other Pleistocene archaeological localities, bones recovered are mostly those of young and aged animals. It is very likely that Man could follow a herd, see one of these weaker individuals drop away from the group, and force it into a swamp where, bogged down, it would die or could be killed even with inferior weapons. The mammoth bones imbedded in hardpan at Survey Site 4 support this theory.

Since only portions of animals—mainly leg and pelvic bones, jaws, etc.—are found in the fire areas, it is apparent that these segments were transported from the kill to camp. This, we remember, has been suggested in connection with utilization of dwarf-elephant meat on Santa Rosa Island.

We may assume that the selected pieces of meat were broiled or roasted at Tule Springs. Since the majority of burned bone fragments are burned predominantly at the ends, it would appear that exposure to fire occurred while meat was still on the bones. Only bones with burned surfaces should be regarded as having been tossed back into the fire after the meat was removed. Associated

charcoal and unburned bones imply mixture in a convenient gully or other natural refuse dump. This supports the original interpretation of Ash Beds 1 and 2.

As we have seen, our knowledge of the old landforms and evidence of human occupation has all been made possible by comparatively recent erosion which has re-exposed the ancient land surface.

We have seen, too, that this erosion has been a destructive agent, for it has obliterated fire areas and bone deposits of unknown numbers and importance. Many of the features we have seen were partially obliterated. This has made it difficult, often impossible, to determine the extent and form of fire areas which remain. Even the important Site A, Area 1 was partly destroyed. However, enough of it remains to permit at least a partial interpretation of the shape. It is clearly evident that Site A, Area 1, Sites A and C, Area 2, and Survey Site 6 retain much of their original size and form. It is these features that enable us to speak of hearths (Site A, Area 2) and fire pits (Site A, Area 1; Site C, Area 2; and Survey Site 6). As previously indicated, Ash Beds 1 and 2 are classified as dumps.

The comparatively limited size of the exposed uneroded charcoal deposits indicates only brief occupation, permanent abandonment being forced by spreading waters of the lake.

While we are able to thus make definitive statements about the features, the dearth of stone implements poses our most disturbing problem. It makes impossible, at this time, the formation of a cultural classification or the interpretation of cultural relationships. After four expeditions, one by the American Museum of Natural History and three by the Southwest Museum, we have, from the deposits, only three unquestionable artifacts, one probable and three possible specimens; and, from washes adjacent to the sites, especially near Ash Bed 2, a small surface collection of artifacts. Certainly this sparse representation from one of America's oldest known occupation areas drives home the realization that large-scale excavations aided by mechanical equipment must be done before final interpretation of the Tule Springs data can be considered. Indeed, such a project should be carried out ultimately in the several lake basins of Las Vegas Valley.

Looking out across the silent landscape, we cannot help but wonder if, beneath the miles of uneroded, unexcavated lake beds, there may not be much diagnostic cultural material. Are we not justified in wondering what answers to our questions might be afforded if we could field a large-scale expedition?

The three dubious specimens, all from Ash Bed 2, are, as we have seen, little more than bone splinters whose exterior surfaces sug-



FIG. 60. Artist's conception of the Columbian Mammoth, the species found at Tule Springs.

gest artificial polishing. The probable artifact, also from Ash Bed 2, is a pointed end of a bone which appears to have been polished. The tip of that bone may have been purposely split to form the point. However, this is problematical, especially in view of the fact that no polishing or other alteration of the split and no wear are indicated.

The three definite artifacts were recovered from three different deposits, each by a different person and each on a different expedition.

The obsidian flake (Site A, Area 3) is not retouched, but even now the thin, sharp edge would serve as a cutting tool. The incomplete flake scars on the dorsal surface indicate that, before this flake was struck, it was part of a core or larger artifact in process of being manufactured. The bulb of percussion, striking platform, etc. are clearly visible.

The polished bone implement with pointed and ground tip may have been part of a perforator. The shape, the thickness of the tip, the unmodified concave ventral surface are not suggestive of use as a weapon point. Found in Ash Bed 2, in the deepest part of the dump, may we not wonder if this broken implement was tossed away with other trash from an adjacent camp?

The uniface, convex-edged side scraper (Site D, Area 2), is a complete tool, similar in shape, size and flaking to other convex scrapers found in many early sites, and, indeed, it would not be out

of place in any simple lithic industry. Thus, although we have here a complete artifact, the very thing the expedition wished most to find, it is non-diagnostic.

Happily, however, non-diagnostic artifacts are as good as any other in establishing Man's presence. Found in the charcoal, there can be no question of contemporaneity.

In view of the scarcity of implements it is important to take note of the scrapers and choppers found in the immediate vicinity of Ash Bed 2 and described in Chapter IV. If tools were numerous *in* the charcoal features, the disassociated artifacts to be discussed now could be dismissed with but brief reference. The crucial character of the Tule Springs Locality, the need for culture data and the potential significance of these tools demand more careful consideration. Since they were lying on the surface in an erosion channel adjacent to and just below Ash Bed 2, there is a strong possibility that they could be residual material washed out of that portion of the ash bed destroyed before 1933. However, it seems strange that not one such artifact remained in place to be recovered through excavation in 1933 or 1955.

If these tools did not come from Ash Bed 2, what was their source? We know that two scrapers, similar to one of those recovered near Ash Bed 2, have been collected on the floor of Las Vegas Valley near the south rim and about $\frac{1}{4}$ mile upstream from the main Tule Springs area (Chapter V) (Figs. 22 and 57). Limestone and dolomitic limestone were used in fashioning the specimens found on the higher valley floor and also those in the side canyon near Ash Bed 2, but this is not significant since these materials are native to the area and would be available at any time. It is possible, however, that erosion permitted those specimens Harrington found in 1933 to tumble down from the crumbling edge of the valley floor. If so, why did they all come to rest near Ash Bed 2?

In Chapter V we noted also the Pinto Basin sites the regional survey recorded in Las Vegas Valley—sites situated on both sides of the Vegas Wash. Why were none of the Pinto points and other artifacts washed into the side canyons of the Tule Springs Locality?

If the canyons existed much as they do today, when the Pinto and other artifacts were left on the upper sites, it could be argued that people of that period came down into the canyon, perhaps seeking shelter, and left the scrapers, choppers, etc. Again, it seems to be a most fortuitous and unlikely set of circumstances that would guide them to stop only by the still-buried ash dump and leave there only these large, crude scrapers and choppers.

Obviously, we cannot state with certainty the source of these tools. We can say, however, that the bifacially flaked specimens (Figs. 22, 23) would have served as choppers, probably for break-

ing and splitting bones. The equally crude uniface tools probably served as scrapers for working hides.

The authors are inclined to the belief that the artifacts recovered near Ash Bed 2 did erode out of that site. This seems to be the most plausible explanation.

The small assemblage of massive tools found on the valley floor above the Tule Springs campsite poses some crucial problems beyond those just discussed. We should note that all but one of the heavy tools came from the southern bank of Vegas Wash and were concentrated near the Southwest Museum's 1955-1956 camp.

If we suggest that the massive scrapers and choppers are of the same lithic industry as the similar implements near Ash Bed 2, the proximity of the tools found near the Museum camp and the Tule Springs Locality assumes added significance. This hypothesis makes it important to remember that the massive implements found on the valley floor lay among the vestigial ridges of lake deposits which rise above the general level of Las Vegas Valley and which M. R. Harrington suggests were part of the undulating landforms of this valley when men hunted Pleistocene animals here more than 28,000 years ago. It is Ruth Simpson's contention, however, that these massive choppers and scrapers are of generalized form, and that, although this form is similar to that of the specimens recovered in 1933, this is not sufficient evidence to associate the two series. Furthermore, weathering—although admittedly a poor criterion—is much more pronounced on the specimens from the side canyon than on those from the upper valley floor. Simpson would continue to separate all of the specimens found on the floor of Las Vegas Valley from those recovered in the lower side canyons.

* * * *

The archeological, climatic and paleontological data as we know them today have now been examined and reviewed. It remains for us to ask ourselves: what is the significance of the Tule Springs Locality in the general story of Early Man in western North America?

In spite of the sparse nature of the record Tule Springs remains an outstanding element in the story. Here we have the combination of a very early date, a few undeniable stone and bone artifacts, and abundant skeletal material of extinct Pleistocene animals.

When first dated by Carbon-14 at 23,800 years or more, Tule Springs became the oldest dated archeological area in the New World. Now the dwarf elephant kills on Santa Rosa Island and the hearths at Lewisville have older established dates. However, Tule Springs, now dated at 28,000 years, still remains one of America's oldest known campsites, and the oldest in the Basin and Range Province.

Cultural data is extremely sparse at each of these oldest dated localities and Tule Springs contributes information on several significant details: 1) there is evidence of a well-developed bone-tool trait; 2) there is proof of grinding and polishing of bone implements; 3) there is indication of skillful flaking when we see the light chipping on the convex-edged side scraper; 4) there is the suggestion of transport of material foreign to the region when we recall the obsidian flake.

We know, too, that with little or no equipment Man was a successful hunter; that he was able, at least to a limited degree, to cope with his environment and derive from it the basic essentials of life.

The question may profitably be asked: May Tule Springs be compared with any other known American archeological localities, and, if so, what are the areas of similarity?

There are similarities between Tule Springs and sites of greater or unknown age. With Lewisville, Tule Springs shares in common a large and diverse late Pleistocene fauna, a sparse artifact inventory, classification as a campsite, an abundance of individual cooking fires and animal bones split for marrow. The custom of taking selected portions of its slain animals from the kill site to camp is shared with the Santa Rosa Island hunters. Similar to the polished pointed bone tool from Tule Springs are the bone tools at Tequixquiác in the valley of Mexico and Potter Creek Cave, California. At both of those localities the artifact assemblage is sparse. There are also simple stone scrapers at Tequixquiác.

It is interesting to observe the use of bone implements, then, in several of America's oldest archeological localities, and to bear in mind that simple bone and stone industries were both evolving on this continent during the Wisconsin Glacial Period.

At Tule Springs, as at most of these early sites, the archeological and geological data supplement and support each other.

In the preceding pages the authors have attempted to present an objective, factual report of the data derived thus far from Tule Springs. They hope that, at some future date, additional investigations may be carried out in the area which will permit more complete analysis and interpretation. In the meantime, it is hoped that this report and the information contained here will make available to scientists and interested laymen all known facts about one of the earliest American campsites yet recognized by archeologists.

The information here is but a group of clues—scarcely more than isolated words and phrases in the dramatic story of Man's Ice-Age occupation of western North America. The authors hope that the readers will find in these pages useful information, clues which will be helpful to others joining in the effort to wrest history from silent campfires of the past.

Bibliography

ANTEVS, ERNST

- 1955 "Geologic-Climatic Dating in the West." *American Antiquity*, Vol. 20, No. 4, Pt. 1, pp. 317-335.
- 1955 "Varve and Radiocarbon Chronologies Appraised by Pollen Data." *The Journal of Geology*, Vol. 63, No. 5, pp. 495-499.
- 1957 "Geological Tests of the Varve and Radiocarbon Chronologies." *The Journal of Geology*, Vol. 65, No. 2, pp. 129-148.
- 1959 "Geological Age of the Lehner Mammoth Site." *American Antiquity*, Vol. 25, No. 1, pp. 31-34.

ARNOLD, BRIGHAM A.

- 1957 "Late Pleistocene and Recent Changes in Land Forms, Climate and Archaeology in Central Baja California." University of California, *Publications in Geography*, Vol. 10, No. 4, pp. 201-318. Berkeley and Los Angeles, California.

ASCHMANN, HOMER H.

- 1958 "Great Basin Climates in Relation to Human Occupance." University of California Archaeological Survey *Reports*, No. 42, pp. 23-36. Berkeley.

AVELEYRA-ARROYO DE ANDA, LUIS

- 1956 "The Second Mammoth and Associated Artifacts at Santa Isabel Iztapan, Mexico." *American Antiquity*, Vol. 22, No. 1, pp. 12-28.

AVELEYRA-ARROYO DE ANDA, LUIS and MANUEL MALDONADO-KOERDELL

- 1953 "Association of Artifacts with Mammoth in the Valley of Mexico." *American Antiquity*, Vol. 18, No. 4, pp. 332-340.

BARBOUR, E. H. and C. BERTRAND SCHULTZ

- 1932 "The Scottsbluff Bison Quarry and Its Artifacts." Nebraska State Museum, *Bulletin* 34, Vol. 1, Lincoln, Nebraska.

BLACK, GLENN A.

- 1949 "'Tepexpan Man,' A Critique of Method." *American Antiquity*, Vol. 14, No. 4, pp. 344-346.

BLACKWELDER, ELIOT

- 1931 "Pleistocene Glaciation in the Sierra Nevada and Basin Ranges." Geological Society of America, *Bulletin*, Vol. 42, pp. 865-922.

BLACKWELDER, ELIOT, CARL L. HUBBS, ROBERT B. MILLER, ERNST ANTEVS

- 1948 "The Great Basin, with Emphasis on Glacial and Postglacial Times." University of Utah, *Bulletin*, Vol. 38, No. 20. Salt Lake City.

BOTELHO, EUGENE

- 1955 "Pinto Basin Points in Utah." *American Antiquity*, Vol. 21, No. 2, pp. 185-186.

BRAINERD, GEORGE W.

- 1953 "A Re-examination of the Dating Evidence for the Lake Mohave Artifact Assemblage." *American Antiquity*, Vol. 18, No. 3, pp. 270-271.

BROECKER, W. S., and J. L. KULP

- 1957 "Lamont Natural Radiocarbon Measurements IV." *Science*, Vol. 126, No. 3287, pp. 1324-1334.

- BRYAN, KIRK and LOUIS L. RAY
 1940 "Geologic Antiquity of the Lindenmeier Site in Colorado." *Smithsonian Miscellaneous Collections*, Vol. 99, No. 2.
- BYERS, DOUGLAS S.
 1954 "Bull Brook, A Fluted Point Site in Ipswich, Massachusetts." *American Antiquity*, Vol. 19, No. 4, pp. 343-351.
 1955 "Additional Information on the Bull Brook Site, Massachusetts." *American Antiquity*, Vol. 20, No. 3, pp. 274-276.
 1957 "Ipswich, B.C." Massachusetts Archaeological Society, *Bulletin*, Vol. 18, No. 3, pp. 49-61. Mansfield, Massachusetts.
 1959 "Radiocarbon Dates for the Bull Brook Site, Massachusetts." *American Antiquity*, Vol. 24, No. 4, pp. 427-429.
- CAMPBELL, ELIZABETH W. CROZER and WILLIAM H.
 1935 "The Pinto Basin Site." Southwest Museum, *Papers*, No. 9. Los Angeles, California.
- CAMPBELL, ELIZABETH W. CROZER, WILLIAM H. CAMPBELL, ERNST ANTEVS, ET AL.
 1937 "The Archeology of Pleistocene Lake Mohave." Southwest Museum, *Papers*, No. 11.
- CAMPBELL, ELIZABETH W. CROZER
 1949 "Two Ancient Archeological Sites in the Great Basin." *Science*, Vol. 109, No. 2831, p. 340.
- CARTER, GEORGE F.
 1957 *Pleistocene Man at San Diego*. The Johns Hopkins Press, Baltimore, Maryland.
 1958 "Archaeology in the Reno Area in Relation to the Age of Man and the Culture Sequence in America." American Philosophical Society, *Proceedings*, Vol. 102, No. 2, pp. 174-192.
 1958 "Is There an American Lower Paleolithic?" *Miscellanea Paul Rivet*, pp. 227-243. Mexico City.
- CHARD, CHESTER S.
 1956 "The Oldest Sites of Northern Siberia." *American Antiquity*, Vol. 21, No. 4, pp. 405-409.
 1959 "New World Origins: A Reappraisal." *Antiquity*, Vol. 33, No. 129.
- CLEMENTS, THOMAS and LYDIA
 1953 "Evidence of Pleistocene Man in Death Valley, California." Geological Society of America, *Bulletin*, Vol. 64, pp. 1189-1203.
- CLOKEY, IRA W.
 1951 *Flora of the Charleston Mountains, Clark County, Nevada*. University of California Press.
- COLE, FAY-COOPER, ET AL.
 1956 "Papers of the Third Great Basin Archeological Conference." *Anthropological Papers*, No. 26, pp. 74-81. Department of Anthropology, University of Utah.
- CRANE, H. R.
 1955 "Antiquity of the Sandia Culture: Carbon 14 Measurements." *Science*, Vol. 122, No. 3172.
- GRESSMAN, L. S., HOWEL WILLIAMS and ALEX D. KRIEGER
 1940 "Early Man in Oregon: Archeological Studies in the Northern Great Basin." University of Oregon, *Monographs, Studies in Anthropology*, No. 3. Eugene, Oregon.

- 1942 "Archeological Researches in the Northern Great Basin." Carnegie Institution of Washington, *Publication* 538.
- CROOK, WILSON W., JR. and R. K. HARRIS
 1957 "Hearths and Artifacts of Early Man Near Lewisville, Texas and Associated Faunal Material." *Texas Archeological Society, Bulletin*, Vol. 28, pp. 7-97. Austin.
- DAUGHERTY, RICHARD D.
 1956 "Archeology of the Lind Coulee Site, Washington." *American Philosophical Society, Proceedings*, Vol. 100, No. 3, pp. 223-278.
 1956 "Early Man in the Columbia Intermontane Province." University of Utah, Department of Anthropology, *Anthropological Papers*, No. 24. Salt Lake City, Utah.
- DE TERRA, HELMUT, JAVIER ROMERO and T. D. STEWARD
 1949 "Tepexpan Man." Viking Fund *Publications in Anthropology*, No. 11. New York.
- ENGERRAND, JORGE
 1912 "La huella más antigua quizá del hombre en la Península de Yucatán." *XVII Congreso Internacional de Americanistas*, pp. 89-99. Imp. del Museo N. de Arqueología, Historia y Etnología, Mexico.
- FIGGINS, JESSE D.
 1927 "The Antiquity of Man in America." *Natural History Magazine*, Vol. 27, pp. 229-239. American Museum of Natural History, New York.
- FLINT, RICHARD F.
 1953 *Glacial Geology and the Pleistocene Epoch*. John Wiley & Sons, New York.
 1959 "Radiocarbon Supplement." *American Journal of Science*, Vol. 1. Yale University.
- FOWLER, MELVIN L. and HOWARD WINTERS
 1956 "Modoc Rock Shelter, Preliminary Report." *Report of Investigations* No. 4, Illinois State Museum, Springfield, Illinois.
- GIDDINGS, J. L., JR.
 1951 "The Denbigh Flint Complex." *American Antiquity*, Vol. 16, No. 3, pp. 193-203.
- HACK, J. T.
 1943 "Antiquity of the Finley Site." *American Antiquity*, Vol. 8, No. 3, pp. 235-241.
- HARRINGTON, MARK R.
 1933 "Gypsum Cave, Nevada." Southwest Museum, *Papers*, No. 8. Los Angeles, California.
 1934 "A Camel Hunter's Camp in Nevada." *The Masterkey*, Vol. 8, No. 1, pp. 22-24. Southwest Museum, Los Angeles.
 1948 "An Ancient Site at Borax Lake, California." Southwest Museum, *Papers*, No. 16. Los Angeles.
 1955a "A New Tule Springs Expedition," *The Masterkey*, Vol. 29, No. 4, pp. 112-114. Southwest Museum, Los Angeles.
 1955b "Man's Oldest Date in America." *Natural History Magazine*, Vol. 64, No. 10, pp. 512-517, 554-555. American Museum of Natural History, New York.

- 1956 "The Latest From Tule Springs." *The Masterkey*, Vol. 30, No. 4, pp. 108-109. Southwest Museum, Los Angeles.
- 1957 "A Pinto Site at Little Lake, California." Southwest Museum, *Papers*, No. 17. Los Angeles.
- HAURY, EMIL W.
- 1950 *The Stratigraphy and Archaeology of Ventana Cave*. The University of Arizona Press, Tucson; The University of New Mexico Press, Albuquerque.
- 1953 "Artifacts with Mammoth Remains, Naco, Arizona: Discovery of the Naco Mammoth and the Associated Projectile Points." *American Antiquity*, Vol. 19, No. 1, pp. 1-14.
- 1956 "The Lehner Mammoth Site." *The Kiva*, Vol. 21, Nos. 3 and 4, Arizona Archaeological and Historical Society, Tucson.
- HAURY, EMIL W., E. B. SAYLES and WILLIAM W. WASLEY
- 1959 "The Lehner Mammoth Site, Southeastern Arizona." *American Antiquity*, Vol. 25, No. 1, pp. 2-30.
- HEIZER, ROBERT F. and EDWIN M. LEMERT
- 1947 "Observations on Archaeological Sites in Topanga Canyon, California." University of California, *Publications in American Archaeology and Ethnology*, Vol. 44, No. 2. Berkeley.
- 1950 "The Stanford Skull, A Probable Early Man from Santa Clara County, California." University of California Archaeological Survey, *Report No. 6*, pp. 1-9. Berkeley.
- HIBBEN, FRANK C.
- 1937 "Association of Man with Pleistocene Mammals in the Sandia Mountains, New Mexico." *American Antiquity*, Vol. 2, No. 4, pp. 260-263.
- 1941 "Evidences of Early Occupation in Sandia Cave, New Mexico, and Other Sites in the Sandia-Manzano Region." Smithsonian Institution, *Miscellaneous Collections*, Vol. 99, No. 23. Washington, D.C.
- HOWARD, EDGAR B.
- 1935 "The Occurrence of Flints and Extinct Animals in Pluvial Deposits Near Clovis, New Mexico." *Proc., Acad. Nat. Sciences of Phila.*, Vol. 87, Pt. 1.
- 1943 "The Finley Site: Discovery of Yuma Points In Situ Near Eden, Wyoming." *American Antiquity*, Vol. 8, No. 3, pp. 224-234.
- JENNINGS, JESSE D.
- 1957 "Danger Cave." Society for American Archaeology *Memoirs*, No. 14. The University of Utah Press, Salt Lake City, and the Society for American Archaeology.
- JEPSEN, GLENN L.
- 1953 "Ancient Buffalo Hunters of Northwestern Wyoming." *Southwestern Lore*, Vol. 19, No. 2, pp. 19-24. Colorado Archaeological Society, Boulder, Colorado.
- KIDD, KENNETH E.
- 1951 "Fluted Points in Ontario." *American Antiquity*, Vol. 16, No. 3, p. 260.
- KRIEGER, ALEX D.
- 1958 A Review of *Pleistocene Man at San Diego* by George F. Carter, *American Anthropologist*, Vol. 60, No. 5, pp. 974-978.

- LANCE, JOHN F.
1959 "Faunal Remains from the Lehner Mammoth Site." *American Antiquity*, Vol. 25, No. 1, pp. 35-39.
- LIBBY, WILLARD F.
1955 *Radiocarbon Dating* (Second Edition). The University of Chicago Press.
- LOBECK, A. K.
1948 *Physiographic Provinces of North America* (Map). The Geographical Press, Columbia University, New York.
- LONGWELL, CHESTER R.
1936 "Geology of the Boulder Reservoir Floor." Geological Society of America, *Bulletin*, Vol. 47, pp. 1393-1476.
1946 "How Old is the Colorado River?" *American Journal of Science*, Vol. 244, pp. 817-835.
- LOPATIN, IVAN A.
1939 "Fossil Man in the Vicinity of Los Angeles, California." Sixth Pacific Science Congress, *Proceedings*, Vol. 4, pp. 177-181.
- MAXEY, G. B. and T. W. ROBINSON
1947 "Ground Water in Las Vegas, Pahrump and Indian Spring Valleys." Nevada State Engineer Water Resources, *Bulletin* 6.
- MAXEY, G. B. and C. H. JAMESON
1948 "Geology and Water Resources of Las Vegas, Pahrump and Indian Spring Valleys, Clark and Nye Counties." Nevada State Engineer Water Resources, *Bulletin* 5.
- MCCOWN, B. E.
1954 "Archeological Survey of Beach Line." Archeological Survey Association of Southern California, *Newsletter*, Vol. 1, No. 3, pp. 10-11.
- MCGEE, W. J.
1955 "An Obsidian Implement from Pleistocene Deposits in Nevada." University of California Archaeological Survey, *Report* No. 32, pp. 30-38. Berkeley.
- MILLER, CARL F.
1956 "Life 8000 Years Ago Uncovered in an Alabama Cave." *National Geographic Magazine*, Vol. 110, No. 4, pp. 542-558. National Geographic Society, Washington, D.C.
- MOSS, JOHN H.
1951 "Early Man in the Eden Valley." The University Museum, University of Pennsylvania, *Museum Monographs*. Philadelphia.
- ORR, PHIL C.
1952 *Report on Santa Rosa Island 1952, Sixth Santa Rosa Island Expedition*. Santa Barbara Museum of Natural History, Santa Barbara, California.
1955 *Annual Report of the Director, 1954-1955*. Western Speleological Institute, Santa Barbara, California.
1956 "Pleistocene Man in Fishbone Cave, Pershing County, Nevada." Nevada State Museum, Department of Archeology, *Bulletin* No. 2. Carson City, Nevada.
1956 "Radiocarbon Dates from Santa Rosa Island, I." Santa Barbara Museum of Natural History, Department of Anthropology, *Bulletin* No. 2.
1956 "Dwarf Mammoths and Man on Santa Rosa Island." Papers of the

- Third Great Basin Archeological Conference, Department of Anthropology, University of Utah. *Anthropological Paper* No. 26, pp. 74-81.
- 1958 *Annual Report of the Director, 1957-1958*. Western Speleological Institute, Santa Barbara.
- PECK, STUART L.
 1957 "Playa Artifacts From Sites Near Tule Springs." *The Masterkey*, Vol. 31, No. 4, pp. 116-120.
- RENAUD, E. B.
 1932 "Yuma and Folsom Artifacts, New Material." Colorado Museum of Natural History, *Proceedings*, Vol. 11, No. 2. Denver.
 1936 "The Archaeological Survey of the High Western Plains." University of Denver, Department of Anthropology, *Seventh Report*, 21 pp. Denver.
 1938 "The Archaeological Survey of the High Western Plains." University of Denver, Department of Anthropology, *Tenth Report*, 54 pp. Denver.
 1940 "The Archaeological Survey of the High Western Plains." University of Denver, Department of Anthropology, *Twelfth Report*, 93 pp. Denver.
- RITCHIE, WILLIAM A.
 1953 "A Probable Paleo-Indian Site in Vermont." *American Antiquity*, Vol. 18, No. 3, pp. 249-258.
 1957 "Traces of Early Man in the Northeast." New York State Museum and Science Service, *Bulletin* No. 358.
- ROBERTS, FRANK H. H., JR.
 1935 "A Folsom Complex, Preliminary Report on Investigations at the Lindenmeier Site in Northern Colorado." *Smithsonian Miscellaneous Collections*, Vol. 94, No. 4. Washington, D.C.
 1936 "Additional Information on the Folsom Complex." *Smithsonian Miscellaneous Collections*, Vol. 95, No. 10.
- ROGERS, DAVID B.
 1929 *Prehistoric Man of the Santa Barbara Coast*. Santa Barbara Museum of Natural History.
- ROGERS, MALCOLM J.
 1929 "Report of an Archaeological Reconnaissance in the Mohave Sink Region." San Diego Museum of Man. *Archaeology*, Vol. 1, No. 1.
 1939 "Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas." San Diego Museum of Man, *Papers* No. 3.
 1958 "San Dieguito Implements from the Terraces of the Rincon-Pantano and Rillito Drainage System." *The Kiva*, Vol. 24, No. 1, pp. 1-23. Tucson.
- ROOSA, WILLIAM B.
 1956 "The Lucy Site in Central New Mexico." *American Antiquity*, Vol. 21, No. 3, p. 310.
- RUSSEL, I. C.
 1885 "Geological History of Lake Lahontan, A Quaternary Lake of Northwestern Nevada." U.S. Geological Survey *Monograph* 11, 288 pages. Washington, D.C.
- SATTERTHWAITE, LINTON
 1957 "Stone Artifacts At and Near The Finley Site, Near Eden, Wy-

- oming." University of Pennsylvania, University Museum, *Museum Monographs*. Philadelphia.
- SAUER, CARL O.
 1956 "Time and Place in Ancient America." *Landscape*, Vol. 6, No. 2, pp. 8-13.
 1957 "The End of the Ice Age and Its Witnesses." *The Geographical Review*, Vol. 47, No. 1, pp. 29-43. New York.
- SAYLES, E. B.
 1935 "An Archaeological Survey of Texas." *Medallion Papers* No. 17. Globe, Arizona.
 1941 "The Cochise Culture." *Medallion Papers* No. 29. Globe, Arizona.
- SCHULTZ, C. BERTRAND and W. D. FRANKFORTER
 1946 "The Geologic History of the Bison in The Great Plains." University of Nebraska State Museum, *Bulletin*, Vol. 3, No. 1, pp. 1-10.
 1948 "Preliminary Report on the Lime Creek Sites: New Evidence of Early Man in Southwestern Nebraska." University of Nebraska State Museum *Bulletin*, Vol. 3, No. 4, Pt. 2, pp. 43-62.
- SCHULTZ, C. BERTRAND, GILBERT C. LUENINGHOENER and W. D. FRANKFORTER
 1951 "A Graphic Resumé of the Pleistocene of Nebraska." University of Nebraska State Museum *Bulletin*, Vol. 3, No. 6.
- SELLARDS, ELIAS H., GLEN L. EVANS and GRAYSON E. MEADE
 1947 "Fossil Bison and Associated Artifacts from Plainview" (with Description of Artifacts by Alex D. Krieger). Geological Society of America *Bulletin*, Vol. 58, pp. 927-954.
- SELLARDS, ELIAS H.
 1952 *Early Man in America*. Texas Memorial Museum. Austin, Texas.
- SIMPSON, GEORGE GAYLORD
 1933 "A Nevada Fauna of Pleistocene Type and Its Probable Association with Man." *Novitates* No. 667. American Museum of Natural History, New York.
- SIMPSON, RUTH D.
 1954 "A Friendly Critic Visits Texas Street." *The Masterkey*, Vol. 28, No. 5, pp. 174-176. Los Angeles.
 1955 "Hunting Elephants in Nevada." *The Masterkey*, Vol. 29, No. 4, pp. 114-116.
 1956 "An Introduction to Early Western American Prehistory." Southern California Academy of Sciences *Bulletin*, Vol. 55, Part 2, pp. 61-71. Los Angeles.
 1956 "Finding the Scraper at Tule Springs." *The Masterkey*, Vol. 30, No. 4, p. 110. Los Angeles.
 1958 "The Manix Lake Archeological Survey." *The Masterkey*, Vol. 32, No. 1, pp. 4-10.
 1960 "Archeological Survey of the Eastern Calico Mountains." *The Masterkey*, Vol. 34, No. 1, pp. 25-35.
- SINCLAIR, WILLIAM J.
 1903 "A Preliminary Account of the Exploration of the Potter Creek Cave, Shasta County, California." *Science* (N.S.) Vol. 17, No. 435, pp. 708-712.
 1907 "The Exploration of Potter Creek Cave." University of California, *Publications in American Archaeology and Ethnology*, Vol. 2, No. 1, pp. 1-27. Berkeley.

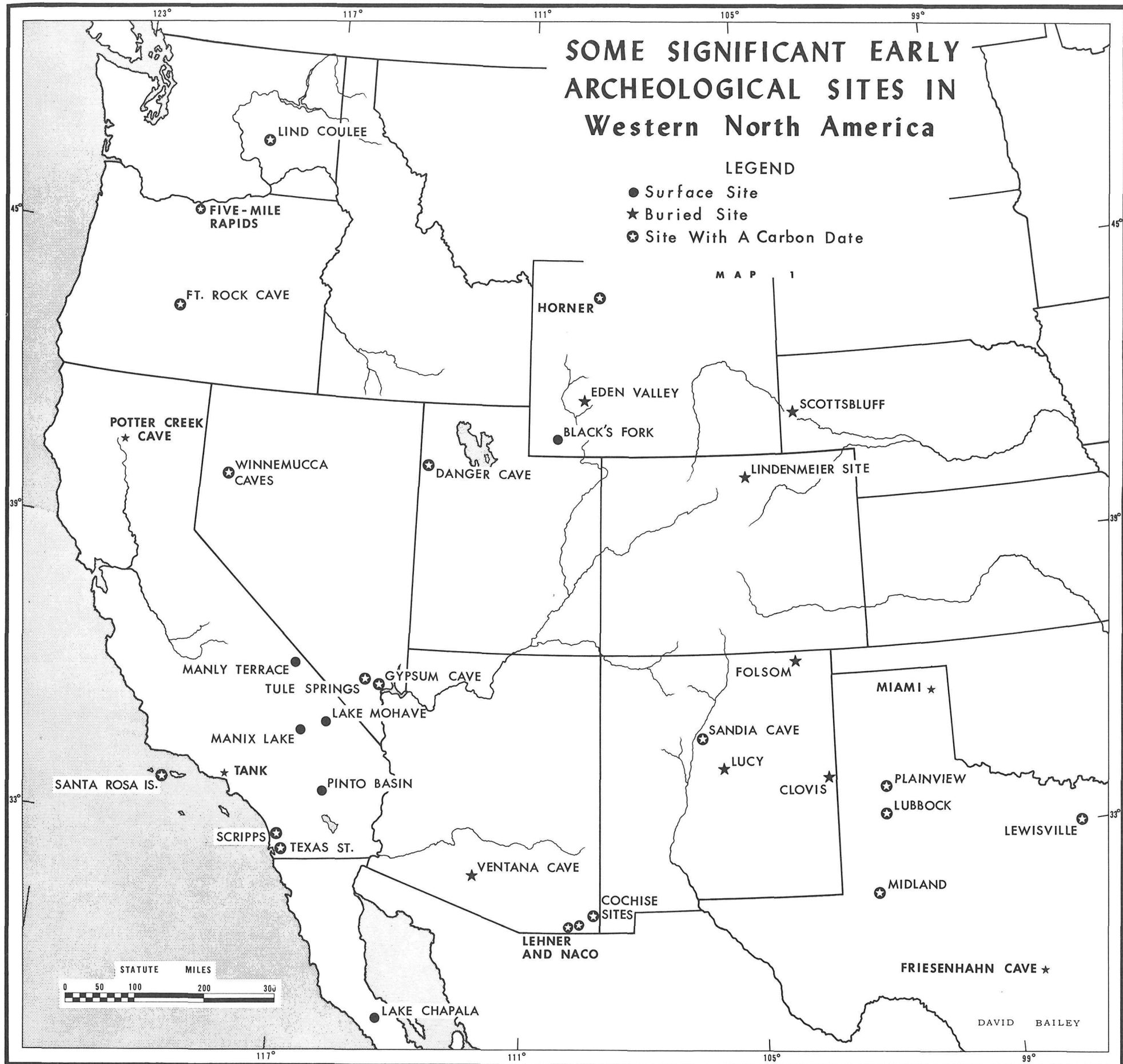
- SMITH, GERALD A., WALTER C. SCHUILING, LLOYD MARTIN, RITNER J. SAYLES,
PAULINE JILLSON
1957 "Newberry Cave, California." San Bernardino County Museum
Association, *Scientific Series* No. 1. Bloomington, California.
- SODAY, FRANK J.
1954 "The Quad Site: A Paleo-Indian Village in Northern Alabama."
The Tennessee Archaeologist, Vol. 10, No. 1, pp. 1-20. Knoxville.
- STUDER, FLOYD
1935 "Folsom Point with Fossil Mammals." *Science News Letter*, Vol. 27,
p. 92.
- SUHM, DEE ANN and ALEX D. KRIEGER
1954 "An Introductory Handbook of Texas Archeology." Texas Archeo-
logical Society *Bulletin*, Vol. 25. Austin.
- TREGANZA, A. E.
1952 "Archaeological Investigations in the Farmington Reservoir Area,
Stanislaus County, California." University of California Archaeo-
logical Survey, *Report* No. 14. Berkeley.
- TREGANZA, A. E. and C. G. MALAMUD
1950 "The Topanga Culture, First Season's Excavation on the Tank Site,
1947." University of California, *Anthropological Records*, Vol. 12,
No. 4. Berkeley.
- TREGANZA, A. E. and A. BIERMAN
1958 "The Topanga Culture, Final Report of Excavations, 1948." Uni-
versity of California *Anthropological Records*, Vol. 20, No. 2.
Berkeley.
- WEBB, WILLIAM S.
1951 "The Parrish Village Site: Site 45, Hopkins County, Kentucky."
University of Kentucky, *Reports in Anthropology*, Vol. 7, No. 6.
Lexington.
- WENDORF, FRED, ALEX D. KRIEGER, CLAUDE C. ALBRITTON and T. D. STEWART
1955 *The Midland Discovery*. University of Texas, Austin.
- WENDORF, FRED and ALEX D. KRIEGER
1959 "New Light on The Midland Discovery." *American Antiquity*, Vol.
25, No. 1, pp. 66-78.
- WISE, E. N. and D. SHUTLER, JR.
1959 "University of Arizona Radiocarbon Dates." *Science*, Vol. 127, No.
3289, pp. 72-74.
- WITTHOFT, JOHN
1952 "A Paleo-Indian Site in Eastern Pennsylvania: An Early Hunting
Culture." American Philosophical Society, *Proceedings*, Vol. 96, No.
4, pp. 464-495. Philadelphia.
- WORMINGTON, H. M.
1948 "A Proposed Revision of Yuma Point Terminology." Colorado Mu-
seum of Natural History, *Proceedings*, Vol. 18, No. 2. Denver,
Colorado.
1957 "Ancient Man in North America." Denver Museum of Natural
History, *Popular Series* No. 4 (Fourth Edition). Denver, Colorado.

SOME SIGNIFICANT EARLY ARCHEOLOGICAL SITES IN Western North America

LEGEND

- Surface Site
- ★ Buried Site
- ⊙ Site With A Carbon Date

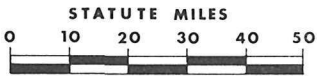
M A P 1



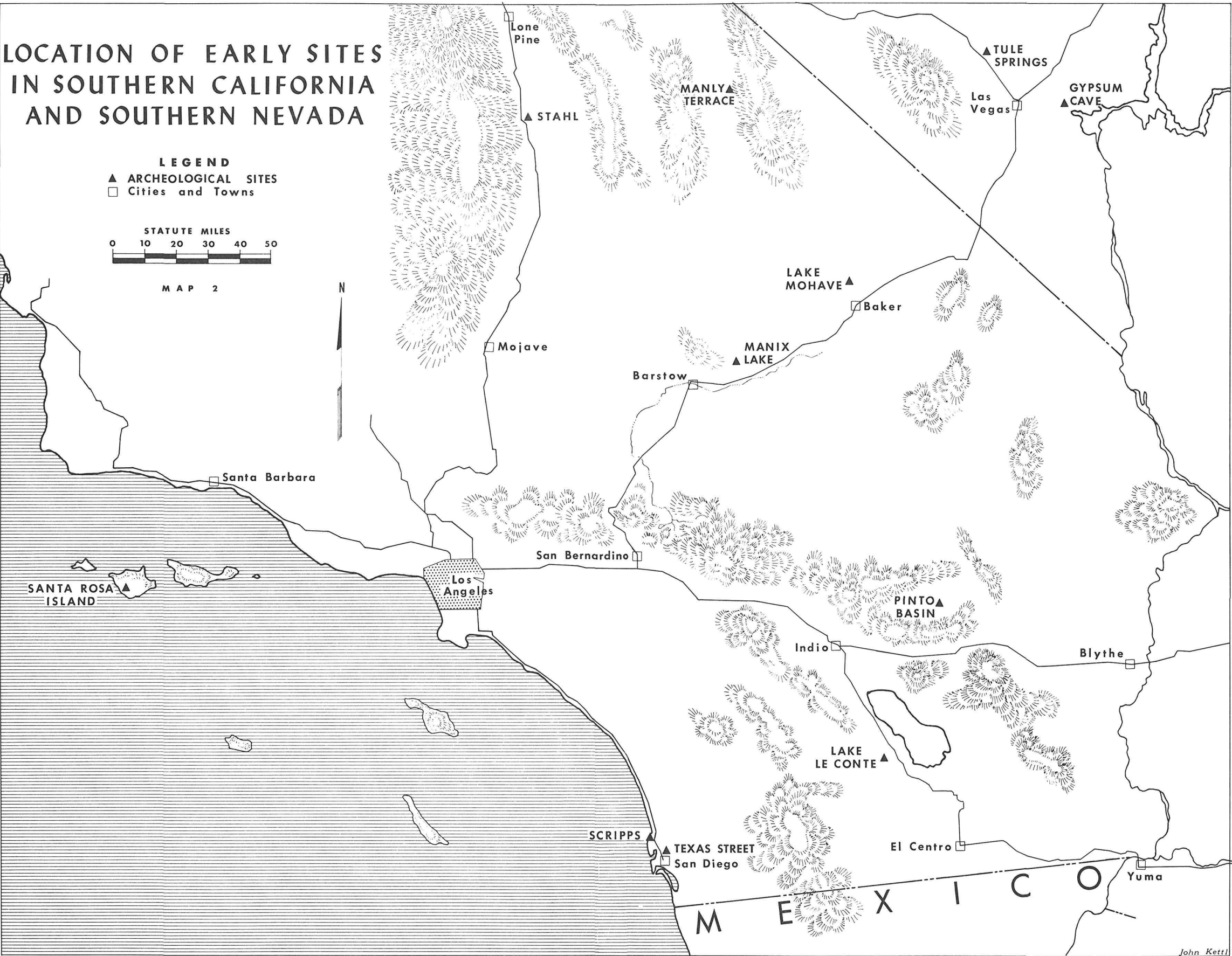
DAVID BAILEY

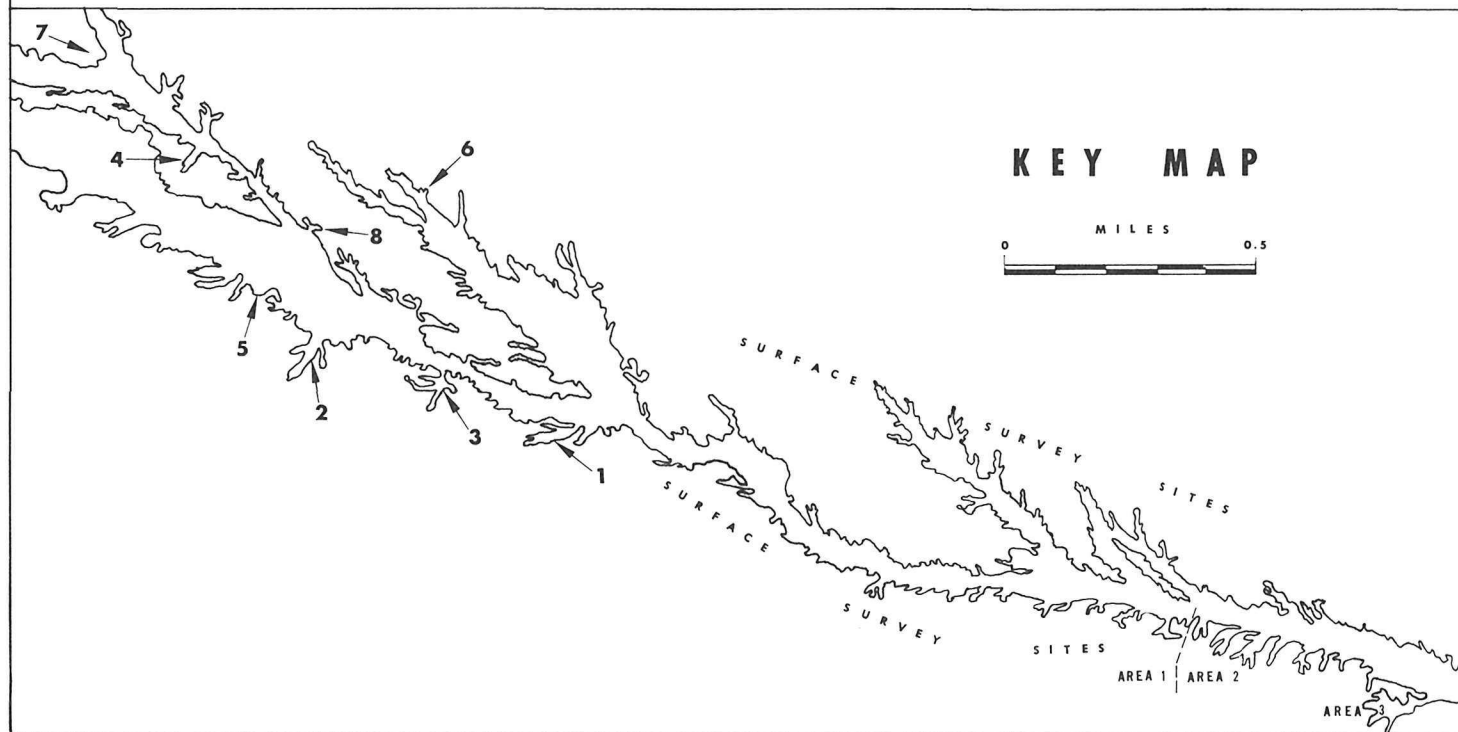
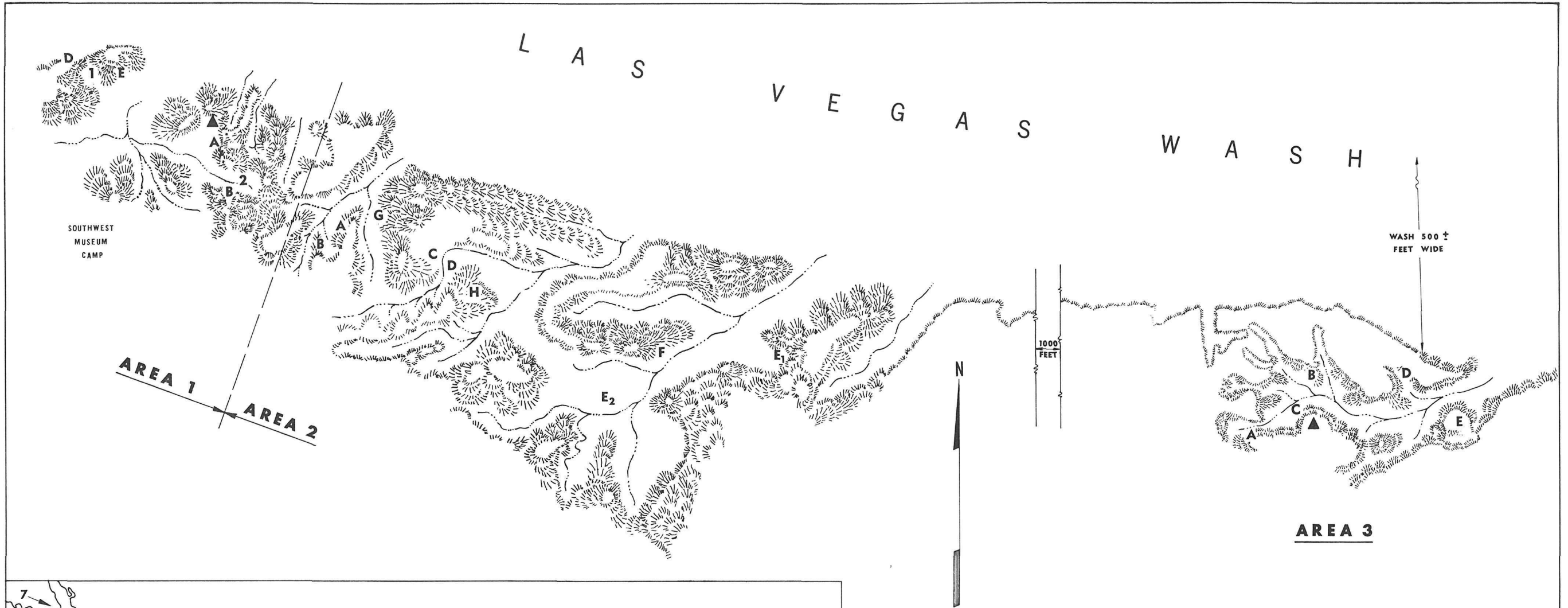
LOCATION OF EARLY SITES IN SOUTHERN CALIFORNIA AND SOUTHERN NEVADA

- LEGEND**
▲ ARCHEOLOGICAL SITES
□ Cities and Towns

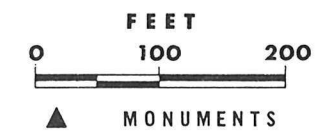


MAP 2





THE TULE SPRINGS LOCALITY



MAP 3

SOUTHWEST MUSEUM STAFF

Carl S. Dentzel, Director
Mark Raymond Harrington, Curator
Ruth DeEtte Simpson, Associate Curator
Charles E. Rozaire, Assistant Curator
Madeleine Amsden, Secretary and Assistant Treasurer
Ella L. Robinson, Librarian
Bruce Bryan, Docent
Bernice E. Johnston, Docent
Margaret M. Colvin, Bookkeeper
Marie Shibe, Office Assistant
Luisa Espinel, Hostess and Asst. Curator, Casa de Adobe
Robert Brammer, Superintendent of Buildings and Grounds
John Aldocano, Eusebio Hernandez, Alexander Logatcheff, Elwood Gregory, John Van Eyk, Assistants

ASSOCIATES

Dr. Frances E. Watkins, Consultant
Elizabeth W. Crozer Campbell, Fellow in Archeology
Phil C. Orr, Associate in Archeology
Dr. Emory W. Thurston, Associate in Archeology
Hasso von Winning, Associate in Archeology

ADVISORS

Dr. Alfred Vincent Kidder, Honorary Curator of American Archeology,
Peabody Museum of Harvard University
Dr. Emil W. Haury, Chairman, Department of Anthropology,
University of Arizona and Director, Arizona State Museum

SPECIAL COMMITTEES

CASA DE ADOBE

Señora Florencia Sepúlveda de Schoneman, Chairman Emeritus
Dr. M. R. Harrington, General Chairman
Mrs. Thomas E. Curtin, Mr. Carl S. Dentzel, Señorita Luisa Espinel,
Mrs. Marie Walsh Harrington, Señora Marcella Wolfskill de Palethorpe,
Mrs. George Alfred Paloheimo, Señora Gabriela Quiroz de Temple,
Mrs. Patricia Lummis de los Reyes, Mrs. Helen Jordan Rollins, Señora
Josefina Rendon de Sánchez.

MUSEUM HILL

Mr. David C. Allison, Dr. George P. Clements, Mr. Ralph D.
Cornell, Mrs. Charles Francis Saunders

RUSKIN ART CLUB

Mrs. David J. Witmer, Representative

LIBRARIES

Miss Laura C. Cooley, Representative

SOUTHWEST MUSEUM PAPERS

A complete list will be sent on application

- No. 1—*Archaeological Reconnaissance in Sonora*, by Monroe Amsden. 1928. 51 pp., 8 ill. (*Out of print*)
- No. 2—*Excavations at Casa Grande, Arizona*, by Harold S. Gladwin. 1928. 30 pp., 11 ill. (*Out of print*)
- No. 3—*The Tragedy of the Blackfoot*, by Walter McClintock. 1930. 53 pp., 16 ill. (*Out of print*)
- No. 4—*Archaeological Explorations in Southern Nevada (Report of the First Sessions Expedition. 1929)*. Papers by M. R. Harrington, Irwin Hayden and Louis Schellback III. 1930. 126 pp., 45 ill. (*Out of print*)
- No. 5—*The Skeleton from Mesa House*, by Bruno Oettking. 1930. 48 pp., 18 ill.
- No. 6—*The Seri*, by A. L. Kroeber. 1931. 60 pp., 12 ill.
- No. 7—*Archeological Survey of the Twenty Nine Palms Region*, by Elizabeth W. Crozer Campbell. 1931. 93 pp., 48 ill., map. (*Out of print*)
- No. 8—*Gypsum Cave, Nevada*, by M. R. Harrington. 1933. 206 pp., 96 ill. (*Out of print*)
- No. 9—*The Pinto Basin Site—An Ancient Aboriginal Camping Ground in the California Desert*, by Elizabeth W. Crozer Campbell and William H. Campbell. With a Geologic Introduction by David Scharf and a Description of the Artifacts by Charles Avery Amsden. 1935. 51 pp., 17 pl. (*Out of print*)
- No. 10—*Cheyenne and Arapaho Music*, by Frances Densmore. 1936. 111 pp., 8 ill., 72 songs
- No. 11—*The Archeology of Pleistocene Lake Mohave—A Symposium* by Elizabeth W. Crozer Campbell, William H. Campbell, Ernst Antevs, Charles Avery Amsden, Joseph A. Barbieri, and Francis D. Bode. 1937. 118 pp., 57 pl., 3 fig. (*Out of print*)
- No. 12—*Music of Santo Domingo Pueblo, New Mexico*, by Frances Densmore. 1938. 103 songs with music, 16 pl., 18 fig.
- No. 13—*The Black Pottery of Coyotepec, Oaxaca, Mexico*, by Paul Van de Velde and Henrietta Romeike Van de Velde. 1939. 43 pp., incl. 15 pl.
- No. 14—*Costumes and Textiles of the Aztec Indians of the Cuetzalán Region, Puebla, Mexico*, by Donald Bush Cordry and Dorothy M. Cordry. 1940. 60 pp., 9 pl., 22 fig.
- No. 15—*Costumes and Weaving of the Zoque Indians of Chiapas, Mexico*, by Donald Bush Cordry and Dorothy M. Cordry. 1941. 130 pp. incl. 23 pl., 40 figs.
- No. 16—*An Ancient Site at Borax Lake, California*, by M. R. Harrington. 1947. 121 pp., incl. 33 pl. and 45 figs.
- No. 17—*A Pinto Site at Little Lake, California*, by M. R. Harrington. 1957. 91 pp., 54 ill.
- No. 18—*Tule Springs, Nevada, with other Evidences of Pleistocene Man in North America*, by M. R. Harrington and Ruth DeEtte Simpson.