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NEVADA STATE MUSEUM
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Tule Springs Archaeological Surface Survey

By

Margaret L. Susia

CARSON CITY, NEVADA JANUARY 1964

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PREFACE

This report of the Tule Springs Archaeological Surface Survey is the second to appear as a result of the 1962-1963 Nevada State Museum Tule Springs Expedition. The Tule Springs field work was partially supported by a grant from the National Science Foundation (GS-23) to the Nevada State Museum which the Museum gratefully acknowledges.

Margaret L. Susia undertook the archaeological surface survey of the Tule Springs area. She has handled the problems of reconstructing culture history from surface material with imagination and considerable success.

Richard Shutler, Jr.
Curator of Anthropolgy
Nevada State Museum
Principal Investigator
Tule Springs Project

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Dr. C. Vance Haynes and Peter Mehringer of the Geochronology Laboratories, University of Arizona, kept me informed as they worked out the geological and climatic history of the area so that this report could go to press. Their reports will be published in full in Pleistocene Studies in Southern Nevada.

I am particularly grateful to Dr. Richard Shutler, Jr., Director of the Tule Springs Project, for the opportunity to take part in the field work, and for permitting me to prepare this report for publication. Dr. Shutler was a constant source of help and encouragement during preparation of the manuscript.

The artifacts were photographed and the plates made up at the Nevada State Museum.

INTRODUCTION

The culture history of the southern California and Nevada deserts is derived from the stacking of a variety of surface assemblages into a temporal sequence. The desert area produces a few stratified open sites, and with the possible exceptions of Gypsum (Harrington 1933) and Etna (Wheeler 1942) caves and Stuart Rockshelter (Shutler, and others 1960), the early inhabitants seem to have favored open sites near streams, lakes, and springs. Culture history will continue to deal with surface collections in the area, for that is the nature of the evidence. The southern California desert sequence is summarized by Wallace (1962). It begins with Lake Mohave, dated 9,000-7,000 B.P. After an apparent gap, Pinto is placed in the time period 5,000-2,000 B. P. followed by Amargosa at A.D. 1. Only with the arrival of pottery from the southwest is the sequence securely dated.

A surface occupation related to Pinto was present on the surface at Tule Springs. Here for the first time the local geological and climatic history has been worked out in detail and dated by radiocarbon dating in the main project report, Pleistocene Studies in southern Nevada. This paper reports an experiment in handling of a surface collection based on a good geological and climatic sequence, and in constructing culture history based on surface collections.

A broad expanse of caliche rubble, sparsely covered by Lower Mohave desert flora, forms the surface of the Tule Springs site. Tule Springs is located approximately 10 miles northwest of Las Vegas, see Figure I. Rising above the relatively level surface of the land are long, gravel-capped ridges which trend northwest-southeast. These ridges of stream-rounded gravels and cobbles stand five to ten feet high and are the fossilized remnants of a braided system that filled the valley floor with alluvial silt and gravel from 11,500 to 6,000 years ago. Subsequent erosion has stripped away the softer materials which formed the river banks, leaving the coarser material of the central stream channel standing out in positive relief (Pl. 1, *a*). The widespread caliche horizon now form-in the surface at Tule Springs was also exposed during relatively recent cycles of erosion. Other striking evidence of extreme recent erosion may be seen in the current drainage pattern throughout the area (Pl. 1, *b*).

Vegas Wash, entrenched about 20 feet into the floor of the Las Vegas Valley, cuts a steep-walled gash into the hard caliche surface. Normally dry, Vegas Wash carries runoff from infrequent desert rainstorms southeast to the Colorado River. Under the current cycle of intense erosion, feeder gullies to the wash are undergoing severe headward erosion as they cut back through the resistant cap of limestone and caliche fragments. Thus dissection and erosion rather than deposition and sedimentation are the primary geomorphological agents at work in the Tule Springs area. This must be considered when discussion the *in situ* position of artifact collections.

The chipped stone artifacts and detritus recovered at Tule Springs, including projectile points clearly related to Pinto forms, were found on the caliche of the surface. In a few instances concentrations of artifacts extended over the edges of the gravel ridges. Only in area III were artifacts concentrated on a gravel ridge.

The collection recovered from the surface at Tule Springs poses a basic question; does sufficient evidence exist to interpret the group of artifacts recovered as a true assemblage, i. e., artifacts left on an occupation site by a people with an established culture during a limited span of time? The caliche rubble forming a base for the artifacts is the crumbling surface of a lacustrine unit with a date of formation approximately 20,000 to 23,000 years ago (UCLA-520 and UCLA-536). Without careful evaluation, one might suspect that the material recovered from Tule Springs does not constitute an assemblage at all, but merely a random assortment of objects accumulated over the past 23,000 years. Only after answering this question can we go on to date the surface collection and to relate it to the prehistoric sequence in the desert regions of southern California-Nevada.

FIELD WORK

Initially all artifacts were left in place and their locations marked. During the last six weeks of the project, the author devoted full time to the recording of locations and the collection of the artifacts. By this time the extent of the artifact concentration was known. With the aid of a baseline and aerial photos, the locality was broken up into spatial units convenient for sketch mapping at a consistent scale. Prominent features distinguishable both in aerial photos from the ground supplemented the baseline in forming boundaries of the spatial units, called surface areas. Each area was given a roman numeral designation in the order in which it was recorded and collected. Before each surface area was examined in detail, it was resurveyed to insure adequate coverage. Then the area was mapped, and the artifact, detritus, and limestone debris locations recorded.

A sketch map was made for each area. The maps recorded prominent features such as washes and eroded areas, gravel-capped ridges, and anomalous concentrations of limestone in addition to the artifacts and chipping detritus. Each artifact received a catalog number as it was collected. The catalog numbers are binominal and include the roman numeral designation of the surface area of origin and an arabic number in the series from that area.

SURFACE AREAS

A brief summary of the pertinent features of each surface area follows. These areas are the basic spatial units of the survey. Data are presented in terms of these areas, and synthesis is dependent upon interpretation of the artifact distributions in these areas. Location and major geographic features are shown on Figure 2.

I

Surface area I is a flat surface of broken caliche rubble bounded on the north by Vegas Wash, on the south by the base line, and by arbitrary boundaries on the east and west (Pl. 1, *a*). A few scattered artifacts were collected from the caliche rubble surface which did not occur in specific concentrations nor in unusual associations with limestone. Cutting across the southwest corner of area I is a low gravel-capped ridge that rises to a maximum of seven feet above the flat. The gravel is subangular to rounded, three-four inches in diameter, and contains angular lumps of spongy caliche. Along the north and northwest edges of the area is a patch of subangular to round gravels up to seven inches in diameter resting on the flat. The north edge is cut by lateral gullies that feed into Vegas Wash.

II

Surface area II lies directly south of surface area I. It is bounded by the baseline on the north, and includes in the northwest corner, part of the same gravel ridge that cuts the southwest corner of surface area I. Extending down into it from a ridge on the west is a thin lens of gravel less than three inches in diameter which contained a rolled knife. The remainder of the surface is broken caliche rubble (Pl. 1, *c*).

III

Surface area III was bounded by the wash on the north and the baseline on the south, with arbitrary east and west boundaries (Pl. 1, *b*). It is dominated by a gravel-capped ridge, the crest of which is about five and one-half feet lower than the tops of the main ridges to the southeast. The gravels are subangular to rounded and are interspersed with occasional cobbles six inches in diameter. To the north the broken caliche surface is extremely dissected by lateral feeders to Vegas Wash. All artifacts collected from area III came from the gravel ridge, the only case where artifacts were concentrated on a ridge.

IV

Surface area IV is a basin bounded on the north, west, and south by gravel ridges, and on the east by area II. Most of the surface in area IV is covered with gravels washed down from the ridges. Very few artifacts were collected in the area and they were widely scattered. No limestone concentrations were noted.

V

Surface area V is bounded on the southeast by a raised gravel ridge. Its surface is broken caliche rubble, and it is dissected by erosion gullies up to five feet deep at the northeast end. Very few artifacts were collected from area V and they were widely scattered. Again, no limestone was noted.

VI

Surface area VI lies to the west of V and is, geographically, a continuation of it. Its southern edge is a gravel-capped ridge that is cut by an erosion gully, and its southern edge is dissected by shallow gullies. The surface of area VI is broken caliche rubble containing no limestone (Pl. 1, *d*). In one small gravel patch were concentrated four core tools and two flakes. Several other artifacts were scattered over the area.

VII

Surface area VII is bounded on the west by the 350 W bulldozer trench and on the east by area VI. Its

southern edge is a gravel-capped ridge cut by erosion gullies. In the southeast corner on the remnants between these gullies a concentration of core tools was located and recorded. Other finds from the area were scattered.

VIII

Surface area VIII lies north of V, VI, and VII to Vegas Wash. It includes several gravel-capped ridges. The surface is broken caliche rubble, and is badly eroded by lateral feeders to Vegas Wash. Other finds were widely scattered, as in the cases of areas V-VII. No limestone was noted.

IX

At the extreme west end of the area and to the north of Vegas Wash, the surface is situated on the flat. Its northern boundary is a long gravel-capped ridge (Pl. 2, *b*). The surface, broken caliche rubble, and dissected by lateral feeders into Vegas Wash, yielded one of the major concentrations of artifacts as well as several small concentrations of limestone, one of which yielded five artifacts (Pl. 2, *b*).

X

Surface area X is a basin north of area IX and is bounded on the west and south by a gravel-capped ridge. Scattered artifacts were collected on the gravels at the west end, and along the skirt of the southern ridge.

XI

Surface area XI lies east of IX, bounded on the north by a gravel-capped ridge, and on the south by Vegas Wash. The surface is broken caliche rubble, somewhat dissected by lateral feeders to Vegas Wash. Most of the artifacts were collected from the south and southwest edges of the area above Vegas Wash. Scattered limestone fragments were also found.

XII

Surface area XII lies east of XI and is likewise south of the gravel-capped ridge and north of Vegas Wash. Its surface is caliche rubble. Little dissection has occurred. Two artifact concentrations occurred. Concentration 1 was located about 200 feet south of the gravel ridge. It yielded numerous flakes and a number of artifacts from scattered gravels and patches of limestone. Concentration 2 is a scattering of artifacts on the east boundary of the site. No limestone was associated with concentration 2. Most of the other artifacts were scattered in the area south of the concentrations to Vegas Wash.

XIII

Surface XIII lies to the east of XII and is a small area of flat land between two shallow gullies. It was littered with chipping detritus and limestone. The area is considered a single concentration.

XIV

Surface area XIV lies south of XIII and west of the long west bulldozer trench. Its surface is broken caliche rubble and its southern half contains several gravel-capped ridges and is cut by lateral gullies feeding Vegas Wash. Three small artifact concentrations were noted.

Concentration 1 was a small group of artifacts collected from an area on the flat about 20 feet square. It was associated with scattered limestone. Concentration 2 was on the flat on the east edge of the area. It was likewise associated with limestone. Concentration 3 was collected from the broken caliche surface just above Vegas Wash and west of the gravel remnants. No limestone was noted.

Most of the artifacts in area XIV were scattered, however, much as they had been in XI and XII. Scatterings of limestone occurred throughout the area.

XV

Surface area XV lies east of the long west bulldozer trench and north of Vegas Wash. The area is cut by east-trending gullies 10-15 feet in depth, and very little of the flat remains. All artifacts collected were from three concentrations.

Concentration 1 was situated between the gravel remnant and Vegas Wash. The concentration con-

tained scattered gravel and was on a broken caliche surface within 15 feet of the main gravel remnant. Concentration 2, on a long, narrow, badly eroded remnant of the flat yielded few artifacts and flakes, and no limestone. Concentration 3 was collected before the long west trench was cut. It was a concentration of artifacts and flakes associated with a scattering of limestone on a caliche rubble surface.

XVI and XVII

Surface areas XVI and XVII lie to the west of IX off the map on the north side of Vegas Wash. These areas were deeply eroded by channels draining the foot of the alluvial fan. The remnants of the broken caliche flat yielded a few scattered artifacts and occasional scatterings of limestone.

XVIII

Surface area XVIII is an island in Vegas Wash just south of site 3 and surface area IX. Its surface area is cut by erosion gullies, and covered with broken caliche rubble. Its surface yielded a few scattered core tools and flakes, and some scattered limestone.

XIX

Surface area XIX lies south of Vegas Wash and just east of the area shown in Figure 1. It includes all the finds made to the east of areas I and II. Most important in this area is concentration 1 which is the remnant of a site. It is about 1000 feet south of Vegas Wash along the south edge of an old lateral feeder wash. This wash is not eroding but has a very slight gradient and rounded banks. It empties into Vegas Wash about three-fourths of a mile to the east, and there it is undergoing severe headward erosion. The erosion has not progressed very far back up the channel. This wash lies on the north of the site area. The site's southern and eastern edges are gravel-capped ridges. The artifacts were found on the flanks of the gravel ridges and on the flat. Situated along the edge of the old wash were three rock concentrations, 15-30 feet in diameter, and roughly circular in outline. They contained a variety of rocks similar to those in the gravels. The rocks were subangular to rounded, larger than those in the adjacent gravels, and more weathered. Three similar concentrations, located on the banks of the wash to the west of concentration 1, were not associated with artifacts. Of the three concentrations in concentration 1, only one yielded an artifact.

Surface area XIX concentration D was a small concentration of limestone containing a few flakes. It was not associated with ridges, Vegas Wash, or the old lateral wash. Other finds from area XIX were few and widely scattered.

XXII

Surface area XXII is the designation for the surface of the main grid area. Scattered surface finds were made during the course of the work. The entire grid area is very eroded; hence the exposures of Pleistocene fauna, and very little of the original surface remains. The area had been intensively collected by the Southwest Museum; while bulldozing had disturbed much of the surface. The result was that artifacts discovered were studied in place for possible relevance to bone exposures, but systematic survey of the grid area before it was disturbed was not accomplished.

SURFACE AREA 2

Surface area 2 lies on the south edge of Vegas Wash across from area XIV. It is a shallow basin bounded on the south and east by low knolls capped with light gravels. To the west is a deep lateral feeder to Vegas Wash.

The area was first located and surveyed by Ruth D. Simpson. Additional finds were collected and recorded later. The basin yielded a large assortment of artifacts and contained scattered limestone fragments and one concentration of limestone (Pl. 1, *c*).

An additional disbursed group of artifacts was collected from the north band of a shallow east-trending wash that lies south of the main concentration. This wash is similar to the one associated with area XIX concentration 1. It is not presently eroding, but has a slight gradient and rounded banks. It is three-four feet deep and 30-50 feet wide. Artifacts from the banks of this wash are grouped as "2 scat."

SURFACE AREA 4

Surface area 4 lies just northwest of 2 across the deep lateral feeder that forms the north boundary of 2. A few artifacts, flakes, and some scattered limestone fragments were collected.

SURFACE AREA 8

Surface area 8 is on the south edge of Vegas Wash, west of the area shown in Figure 1. It is an area of well-sorted gravels distributed on the flat. Some of the gravel bars contain cobbles up to eight inches in diameter while others consist only of small pebbles. Flakes were collected from an area of small pebbles grading into the broken caliche surface. One artifact was found in this area in a gravel bar.

SUMMARY

This description of the surface areas points out that consistent associations of artifacts, detritus, and rock concentrations were mainly situated on the north side Vegas Wash in areas IX, XI, XII, XIII, XIV, XV concentration 3. The part of the collection from these areas can be postulated as the product of occupation with a greater degree of certainty than any other part of the collection, or the collection as a whole.

MATERIALS

Although the area is rich in the various materials used in stone tool manufacture, quarry sites were not located. The material was handled as follows: the detritus was rough sorted into limestone, cherts, quartz, and obsidian; the material was then resorted, noting cortex or matrix, and amount of weathering. The limestone was divided into two categories, and one important variety of chert was identified. Some statements about the sources for the various materials may be made.

LIMESTONE

A great variety of limestone is exposed in the fault scarps of nearby ranges, and it occurs as cobbles and boulders on the alluvial fans and in the gravels on the valley bottom. The aboriginals distinguished two kinds of limestones and put them to different uses. The first is fine-grained with a good sub-conchoidal fracture. This variety was selected for the manufacture of projectile points, knives, scrapers, and other small chipped stone artifacts as well as for some of the larger ones. Years of exposure on the valley floor have given it a desert varnish, deepening its color to rust brown and dark brown from its fresh grey state, and giving the surface a dull lustre. This limestone will be referred to as desert-varnished limestone.

The second variety of limestone is coarser grained and has a subconchoidal fracture. It was used only for the heavy stone artifacts, and is the primary source of material for this group. Years of exposure have pitted the surfaces. As a result of this weathering, some artifacts retain no evidence of flake scars while few retain evidence of their use. The colors of this eroded limestone are lighter than the desert-varnished variety. They range from a light grey to a light yellow brown.

Anomalous concentrations of rock, primarily limestone, were noted in many of the surface areas associated with artifacts and chipping detritus. It is likely that their placement occurred during occupation of the areas. The limestone cobbles forming these concentrations showed more weathering than did limestones in the fossil streambeds; they were darker grey, with rectangularily etched and friable surfaces. In one case the cobbles were broken into several fragments as a result of weathering. The hastening of the weathering process may have resulted from the rocks having been subjected to the heat of campfires.

OBSIDIAN

The obsidian is a dense black, sometimes with a dark grey veining. Exposure has reduced its glassy surface to a dull lustre, and smoothed the flake scars somewhat. Obsidian was especially selected for a few of the point and knife varieties.

QUARTZ

Quartz is not consistent in quality but ranges from quite clearly colored to heavily veined with impurities. The color range includes white, grey, yellow, orange, and rosy hues, with a sugary texture. Four artifacts and four flakes show remnants of a cobble cortex, indicating that in some instances the source was rounded quartz cobbles from the gravels. Quartz was used for a wide variety of small chipped stone artifacts.

CHERT

One variety of chert is distinct in the collection, and will be referred to as vein chert. When the flakes, cores, and artifacts of chert that showed matrix were studied it was evident that most of them were very similar and were probably derived from a single source, a vein of chert in limestone. This vein chert is impure, and includes patches of limestone and cherty limestone. Where it is pure it is a mottled semi-translucent grey. Owing

TABLE 1

Distribution of Materials - Tule Springs Surface Areas

	Eroded Limestone				Desert Varnished Limestone				Obsidian				Vein Chert				Undifferentiated Chert				Quartz			
	Flakes		Artifacts		Flakes		Artifacts		Flakes		Artifacts		Flakes		Artifacts		Flakes		Artifacts		Flakes		Artifacts	
	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.	No.	wgt. gms.
I															5	144.7			8	128.7				
II							1	30.6			2	11.7	1	10.3			1	10.9	1	10.8			1	111.3
III			1	516.1	1	5.3	1	369.5			1	4.3	1	10.6	2	48.2	7	76.9	12	254.8				
IV	1	131.7															1	42.5	5	135.7	1	9.5		
V					1	44.5	1	210.8							1	17.7	3	13.3	3	42.7			1	93.8
VI	1	66.7	2	855.6			1	5.3	1	5.0	2	8.1	2	13.5	1	26.7	15	196.5	1	13.9	1	22.9		
VII	2	80.7	1	659.9			3	821.7					1	9.9			6	53.8	3	72.6	1	39.2		
VIII	1	74.3			1	75.5	1	61.2					1	13.5	1	48.1	1	2.7	8	293.8				
IX			6	2503.2	3	83.3	3	328.0	1	5.1			7	93.9	9	276.2	17	131.1	12	252.8	1	23.8	3	37.2
X	1	56.3	1	428.2	1	15.1			1	19.9	3	74.9	1	9.6			5	37.4					1	20.1
XI					3	8.2	3	18.8	1	0.6	1	4.4	9	56.1	3	168.4	26	126.0	12	264.3	3	26.3	1	9.5
XII	3	138.1	1	408.8	6	22.3					1	6.2	4	21.2			24	182.0	4	57.9	2	1.9	1	107.8
XII-1	1	45.5			1	4.5	2	64.4	1	0.7			1	6.3	1	9.5	13	44.5	3	25.5	1	5.8		
XII-2					1	1.9							1	12.1	1	36.8			2	22.1				
XIII	4	222.5			2	46.2			3	8.5	1	4.2	4	35.8	1	8.0	17	115.8	2	33.2	2	8.1	2	140.8
XIV	7	327.8	1	328.0	7	72.9	2	18.5	4	2.5	1	3.0	5	22.2	2	93.3	45	189.6	8	180.7	4	30.5	2	68.6
XIV-1	10	204.0			2	18.2	1	7.7			1	2.1	3	54.9					1	6.8			1	7.2
XIV-2	3	112.6					2	743.7									4	22.6			4	41.1		
XIV-3																	1	11.9						
XV-1							1	6.2			1	4.9					1	3.8					1	22.5
XV-2					1	11.3							3	19.0			5	8.1	1	14.2				
XV-3					1	0.9	1	4.2	6	9.6	1	2.0	3	17.9			24	58.7	3	43.1	4	12.7	1	6.0
XVI													1	19.8			3	15.5			1	9.9		
XVII																	2	19.1						
XVIII			1	374.0			2	732.9					1	12.3	1	30.0	1	10.4						
XIX			2	1040.1	2	19.4	1	16.0					1	4.8	1	38.4	4	24.6	3	17.9			1	9.6
XIX-1	2	38.5			6	35.8	1	15.0					5	129.1	1	33.0			2	16.5			1	13.4
XIX-D							1	51.9															1	26.8
XXII									2	20.5									4	121.8				
2a & b	2	150.5			10	112.3			9	10.4	3	12.7	18	84.8			73	269.4	7	63.8	13	82.8		
2scat							4	28.6			3	12.2			3	72.7	5	20.7	6	52.9				
4							3	15.2									1	3.8	2	28.2	1	4.5	1	10.4
8																	4	36.0	1	6.7				
10																	1	1.9	1	4.8				
	38	1649.2	116	7113.9	48	577.6	35	3550.5	29	82.8	21	150.7	73	657.6	33	1051.7	310	1729.5	115	2166.2	39	319.0	19	685.0

to its varied content it weathers differentially, and typically a flake will include still semi-translucent grey chert, some white-to-grey opaque patinated spots, and some white cherty limestone inclusions. This variety of chert was favored in the manufacture of scrapers.

The rest of the cherts include a wide variety of color, translucency, and patination. Two artifacts and 11 flakes show remnants of cobble cortex indicating that the gravels were again a source of materials. Others of the cherts show impurities similar to the veined cherts and may also have had their origin in veins in limestone.

SANDSTONES

Two varieties of sandstone were utilized for grinding implements. All the ground and polished slab fragments are of a fine-grained orange-brown fissile sandstone that occurs in natural flat slabs. Exposure through the years has resulted in the separation of the laminae in some of the fragments and darkening of the exposed surfaces. The one mano collected is a cobble of sandstone conglomerate with well rounded grains of sand up to 0.39 cm. in diameter.

ARTIFACT DESCRIPTION

INTRODUCTION

The section of artifact description that follows is based on formal attributes of the artifacts, in spite of the fact that current terminology for the groups has functional implications. Comments on evidence of method of manufacture and nature of use are included wherever possible. The section is descriptive rather than typological in intent.

Following this line of description, the dimensions of a group are represented by the real dimensions of three members of the group. All artifacts in the group were ranked by weight. The heaviest, the median by weight, and the lightest then appear on the chart below the group description. The computation of maximums, minimums, and averages for each dimension in each class is avoided. These maximums, minimums, and averages are a meaningless statistic in such small groups and are of little use in comparative work. It is hoped that the data presented here will give an impresison of the relative proportions of artifacts in the group and at the same time indicate the size range.

The description is broken at two levels. *Classes* are *A* through *O*, and are the primary subdivisions within the collections. As each is introduced, the class is described briefly as to content. The classes are divided into *groups*, each of which is described. Implicit in the description are two "super-classes," the small chipped artifacts made primarily of cherts and obsidian, and the heavy stone artifacts, made primarily of limestones.

A- projectile points. This class includes all those artifacts that are characterized by a pointed tip at one end, and a specialized butt that would facilitate hafting. Projectile points in this collection approach bilateral symmetry, are bifacially worked, and as a class have had the most attention paid to the details of finishing, although workmanship varies from group to group and between individual specimens. A few scrapers, knives, gravers, and drills are fully as finely finished as many of the projectile points.

The dimensions measured are length, tip to butt; width, greatest dimensions from blade edge to blade edge; thickness, greatest dimension from one face to the other.

A-1 The points from the collection that fall within the range of the Pinto Points illustrated from the Pinto Basin site (Campbell and Campbell,1935: Pl. 13, p. 47). As common traits these points share crudeness of workmanship resulting in asymmetry, concave bases; weak shoulders with a suggestion of a side notch, a slightly expanding stem; and lanceolate to triangular blades. The edges show some finer retouching. Group A-1, Plate 3, *a-d*.

Materials: 4 obsidian, 2 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	3.47	2.23	0.78	5.7	XIII-3
Median	3.39	1.67	0.83	4.4	XI-20 (Pl. 3, *b*)
Lightest	2.55	1.65	0.63	2.0	XV-7 (Pl. 3, *a*)

A-2 A short small point with a triangular blade. These points have weak shoulders and deeply concave bases. The workmanship is crude, but these is some secondary retouch. Group A-2, Plate 3, *e, g*.

Materials: 2 obsidian, 2 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	2.29*	1.75	0.49	2.1	XIV-3 (Pl. 3, *e*)
Median	2.34	1.89	0.47	1.8	XII-9 (Pl. 3, *g*)
Lightest	2.65	1.59	0.48	1.6	2a-23 (Pl. 3, *f*)

Comparative notes: similar to shoulderless Pinto points, (Harrington 1957: 50-51, fig. 39) from Little Lake, California. Also similar to some of the Early Death Valley II points from site 18-58 in Death Valley (Hunt 1960: fig. 24, especially *h*.)

A-3 Projectile points characterized by an elongate lanceolate blade, suggested side notches with a very weak shoulder, and a concave base. The workmanship is crude and the points show no secondary retouch on the edges. Group A-3, Plate 3, *i-k*.

Materials: 4 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	5.35	4.21	0.92	11.0	XI-5 (Pl. 3, *j*)
Median	5.98	1.98	0.84	8.3	XIX-20 (Pl. 3, *i*)
Lightest	3.62*	2.23	0.64	6.0	VIII-8

Comparative notes: similar to the Pinto points with sloping shoulders from Little Lake, California (Harrington 1957: 51-52, fig 39). Also similar to some of the Early Death Valley II projectile points from site 53-58 in Death Valley (Hunt 1960: fig. 24, especially *b*).

A-4 Points of much better wortkmanship than those previously described, sharing a distinct side-corner notch and shoulder, an expanding stem, and a concave base. The edges of the blade are usually serrated. Group A-4, Plate 3, *l-o*.

Materials: 3 undifferentiated chert, 2 quartz.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	6.22	2.35	0.53	9.0	IX-55 (Pl. 3, *l*)
Median	3.81	2.19	0.76	5.2	VIII-11 (Pl. 3, *o*)
Lightest	3.76	2.06	0.59	4.6	XIX-21

Comparative notes: similar to Pinto points with square shoulders from Little Lake, California (Harrington 1957: 50-51, fig. 39). Also similar to some of the Early Death Valley II projectile points (Hunt 1960: fig. 24, especially *a*).

With W-10 from Danger Cave, Jennings illustrates a similar point. W-10 is distributed from DIII to DV (Jennings 1957: 110). VIII-11 is similar to a point from the midden at Ventana Cave illustrated in fig. 62 (Haury 1950).

A-5 Two points comparable in workmanship to I-1 are likewise asymmetrical. They have distinct shoulders and side notches. The blades are subtriangular, the bases concave.

Materials: 2 obsidian Group A-5, Plate 4, *a-b*

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	3.34*	2.80	0.66	6.2*	XII-4 (Pl. 4, *a*)
Lightest	3.70	2.37	0.74	4.9	XV-2 (Pl. 4, *b*)

Comparative notes: similar to some of the Early Death Valley II points (Hunt 1960: fig. 24, especially *c* and *i*).

A-6 three points alike enough to have come from the same craftsman. They have definite broad serration on the lower half of the blade, decreasing in size toward the tip. They have definite shoulder and broad semicircular corner-side notches forming an expanding stem. The base is slightly concave. Each serration was formed by striking off a long shallow flake that traveled up to the center of the point forming a ridge on one face. Some flakes were struck from the reverse side to deepen the serrations. Group A-6, Plate 4, *c-d*.

Materials: 1 desert-varnished limestone, 1 obsidian,
1 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	4.52*	2.55	0.83	8.4	2-33 (Pl. 4, *d*)
Median	4.92*	2.31	0.70	6.6	2-32 (Pl. 4, *c*)
Lightest	*	2.19	0.65	4.1*	2-31

A-7 Three points and a questionable base. The blades are short and broad with convex edges. Shoulders are straight and weak but evident. The stem expands ever so slightly to meet a slightly concave base. One specimen (2a-18) has a face finished with long flakes up to a a slightly off-center medial ridge. The others are lenticular in cross-section. 2a-18 has basal and lateral grinding on the stem. Group A-7, Plate 4, *e-g*.

Materials: 1 obsidian, 1 undifferentiated chert, 1 quartz,
1 unknown (probably a porphyry).

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	4.07	2.47	0.58	6.9	2-34 (Pl. 4, *e*)
Median	2.54	2.06	0.64	5.0	2a-18 (Pl. 4, *g*)
Lightest	*	2.20	0.67	4.3*	4-33

Comparative notes: 2a-18 is very similar to a point illustrated by Schroeder (1961: fig. 24a). It is a surface find from a "pure stone" site (no pottery) on the Shivwits Plateau. He describes it only as "the base of what appears to be a Plainview-like point."

A-8 Projectile points sharing the following traits: a stubby subtriangular blade, distinct square shoulders and a lenticular cross-section, and lacking a concave base or a basal notch. Stems are straight to expanding and bases straight to convex. They vary widely in proportion and workmanship. They have a little fine retouching usually across the base. XIV-8 has been ground across the base and up the sides of the stem. Group A-8, Plate 4, *h-i, m-u*.

Material: 3 undifferentiated chert, 1 obsidian, 1 desert-varnished chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	3.15	2.42	0.74	5.3	XIV-8 (Pl. 4, *n*)
Median	3.24	2.21	0.56	4.0	XI-22 (Pl. 4, *h*)
Lightest	2.87	2.46	0.60	3.3	2-53 (Pl. 4, *i*)

Comparative notes: XI-22 is comparable to one of Harrington's widestem points, a type confined to the upper three levels at Little Lake (Harrington 1957: 54-55, fig. 41).

XIV-8 is similar to points which have been called Silver Lake but it has little resemblance to points from the type locality. It is very similar to a Death Valley I point illustrated by Hunt (1960: fig. 5e). Type specimens illustrated in Plate 2, *h, i, m, n*.

A-9 Miscellaneous points.

2-55 This point is neither notched nor stemmed, but has a stubby lanceolate blade that flares out to form ears at the base, the widest part of the point. The base is both broadly and deeply concave and the cross-section lenticular. Both blade edges show dulling by small flakes ending in hinge fractures as though the artifact may have seen use as a knife. Group A-9, Plate 4, *j-l, o-s*.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
3.38	2.17*	0.56	4.4*	2-55 (Pl. 4, *s*)

XIX-14 This point is a lanceolate blade with a concave base. Several long flakes on each face indicate bifacial basal thinning. The tip appears to have been broken and retouched to a sharp edge forming a blunt squarish tip. The cross-section is lenticular, and the greatest width is at about half the length. It was not associated with any other artifacts in area XIX.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
3.91	2.01	0.59	5.0	XIX-14 (Pl. 4, *r*)

XIV-7 A small point that might have been included in A-8 except for its concave base. The concave base results not from purposeful shaping, but from a flake scar already on the flake before it was made into a point. The blade is triangular, the shoulders poorly developed, and the stem straight to slight expanding. The cross-section is lenticular.

Material: desert-varnished limestone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
3.12	1.96	0.59	3.6	XIV-7 (Pl. 4, *k*)

10-37 A base of a large point with deep hemispherical side notches and a straight base. It is thinly lenticular in cross-section. The blade is broken but appears to have had somewhat convex edges. The edges of the blade and the base have been retouched by pressure.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
*	2.74	0.45	4.8	10-37 (Pl. 4, *o*)

Comparative notes: 10-37 is clearly the same as Schroeder's type I from Willow Beach. This type is diagnostic of stone horizon I, which is affilated with Basketmaker II and is dated 2200±250 BP (Schroeder 1961:13, 57, 61-62, fig. 13*o*),

2a-19a A crudely-made point with broad side notches and weak shoulders. The base is concave but primarily because of a single surface that was on the flake shaped into the point. The point has no fine retouching and is irregularily lenticular in cross-section.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
3.65	2.02	0.66	5.2	2a-19a (Pl. 4, *q*)

2a-19b This point is so heavily patinated as to be partly eroded away. It appears to have had a subtriangular blade, square shoulders, and corner notches with a slightly expanding stem and straight base. It is roughly lenticular in cross-section.

Material: heavily patinated undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
4.04	2.40	0.82	6.2	2a-19*b* (Pl. 4, *l*)

XI-19 The basal portion of a point similar to an Agate Basin point. Made with a well-controlled percussion technique, the straight sides of the base are converging symmetrically when they terminate in a slightly concave base. The base is formed by what appears to be a striking platform at a 45° angle to the frontal plane. From this platform two small flakes have been struck to lend the concavity to the base. The base is heavily desert-varnished. If there is edge grinding present, it is very slight.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
*	2.23	0.72	7.7*	XI-19 (Pl. 4, *p*)

IX-3 and XIV-5 Two badly weathered leaf-shaped bifacial forms. Each artifact had a single point but they differ in proportion. They have a suggestion of a slight shoulder and are concave based. Both are lenticular in cross-section.

Material: 2 limestone desert-varnished.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
4.95	2.36	0.86	8.9	IX-3
4.11	2.46	0.88	7.7	XIV-5 (Pl. 4, *j*)

Comparative notes: may have been similar to some of the leaf-shaped points from Pinto Basin, especially *e* in Plate 9 (Campbell and Campbell 1935).

XIX-4 and XIX-19 Are two medial fragments of points. They fall within the size range of the small A-4 points.

Material: 2 undifferentiated chert.

B- Disk-choppers (name from Rogers 1939: 49).

B-1- bifacial tools roughly oval to circular in outline. They were shaped by rough percussion flaking. All show some batering on edges. Two have been worked over their entire surfaces, and about the entire periphery. The third includes some cortex, so that the working edge is only about ¾ of the periphery.

Material: 2 undifferentiated chert, 1 vein chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	5.07	4.75	1.92	48.1	VIII-18 (Pl. 6, *h*)
Median	4.47	4.28	1.88	38.2	IX-52 (Pl. 6, *g*)
Lightest	4.35	3.46	2.16	27.0	IX-16

Comparative notes: apparently like the smaller representatives of Rogers' disk-choppers, which he says range down to 30 mm. in diameter (1939: 49). A similar artifact is illustrated by Hunt (1960: fig. 15d from a Death Valley I site, 2-57). She found only larger ones on Early Death Valley II sites. W-74 from Danger Cave is a similar form. All five are recovered at Danger Cave were from DIII. Discoids from the midden at Ventana Cave (Haury 1950: Fig. 44) are also similar.

C-Knives This class includes the bifacially worked forms that lack the specialized characteristics that might class them as projectile points or drills. Although many may have been hafted, they lack the specialized details of butt manufacture that characterize projectile points. A few have pointed tips, but most have poorly developed points ore none at all. Some approach bilateral symmetry, while others are definitely asymmetrical. Length, width, and thickness correspond generally to the attributes measured in the projectile points.

C-1 Small, crudely leaf-shaped knives, with the points hardly developed. They are usually asymmetrical All that are not too badly eroded (8) show small hinge fractures as though from use along an edge and around the tip. Cross-sections are crudely lenticular to plano-convex. Group C-1, Plate 5, *a-d*.

Material: 5 obsidian, 2 desert-varnished limestone, 2 undifferentiated chert, 1 vein chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	4.96	3.27	1.19	16.0	XIX-18 (Pl. 5, *d*)
Median	4.61	2.10	0.85	7.6	II-1 (Pl. 5, *a*)
Lightest	3.74	2.65	0.68	6.7	8-34

Comparative notes: similar to two Early Death Valley II knives illustrated by Hunt (1960: fig. 26*b* and *e*).

C-2 Lanceolate knives represented only by fragments, long in proportion to their width. Two fragments show small hinge fractures as though resulting from use on their edges. Whether the knives were bipointed can not be determined, and no fragment shows a well-developed point. Cross-sections range from lenticular through plano-convex to diamond shaped. All are bifacially worked. Group C-2, Plate 5, *e-i*.

Material: 6 desert-varnished limestone, 4 quartz, 1 undifferentiated chert.

Greatest width	3.52*	3.52	0.92	15.8*	IX-11	both from
	4.98*	3.15	0.84	15.6*	IX-38	same knife (Pl. 5, *i*)
Median	4.21*	2.26	0.96	8.4*	IX-56	
Least width	4.09*	1.95	0.81	7.2*	XIV-1	

Comparative notes: similar to Early Death Valley II knives illustrated by Hunt (1960: fig. 26*a* and possibly *c*, *d*, and *f*).

C-3 A complete large symmetrical knife is the best specimen. It is made on a flake with the unretouched bulb of percussion at the base. The knife was roughed out with broad shallow percussion flakes and the edge given a retouch with small evenly spaced flake scars. Cross-section is thinly lenticular. Four bases of knives

appear to be from the same type. Three fragments are semicircular to subrectangular on the worked edges, and each is broken across the length. One has the bulb of percussion intact. The fourth is ovate in outline. It has the striking platform and bulb of percussion remaining, off-center from what appears to be the center of the knife. More nearly on the center of the base is a flake 1.19 cm. long removed just to one side of the striking platform and thinning the bulb of percussion. On the reverse, a flake 1.48 cm. long has been struck from the striking platform, also thinning the thickest part of the knife base. Group C-3, Plate 6, *a-e*.

Material: 3 undifferentiated chert, 3 quartz, 1 desert-varnished limestone.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Complete	8.77	4.35	0.76	38.2	VIII-15 (Pl. 6, *a*)
Greatest width	*	4.70	1.05	20.1*	X-5 (Pl. 6, *d*)
Least width	*	3.52	0.53	6.0*	XV-9 (Pl. 6, *c*)

C-4 Three small objects subtriangular in outline. All have one face that is basically a single flake scar giving a definitely plano-convex cross-section. The workmanship on all is crude. XIV-11 may be an incomplete projectile point, for a basal notch is worked into it. VI-12 shows use along both its edges and the somewhat pointed tip. VI-7 does not show use. Group C-4, Plate 5, *j-l*.

Material: 3 obsidian.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	2.98	2.10	0.73	4.2	VI-12 (Pl. 5, *j*)
Median	2.71	2.02	0.85	3.9	VI-6 (Pl. 5, *l*)
Lightest	2.62	2.08	0.61	3.0	XIV-11 (Pl. 5, *k*)

C-5 Miscellaneous knives.

XI-31 A knife fragment with flaring convex edges and a slightly concave base. One face has a large flake (length, 2.20 cm., width, 1.53 cm.) struck from the base. The cross-section is concavo-convex. Group C-5, Plate 5, *n-p*.

Material: undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
	*	3.09	0.74	10.4*	XI-31 (Pl. 5, *p*)

VI-7 A small, laurel-leaf-shaped knife with a keel or medial ridge down one face giving a plano-convex cross-section. The knife is shaped by percussion flaking. It shows much use from the tip down one edge about 1.3 cm.

Material: undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
	5.73	2.65	1.01	13.9	VI-7 (Pl. 5, *o*)

XIV-36 A shouldered knife that was perhaps hafted. It has a triangular blade with slightly convex edges, slight shoulders, and a straight stem and base. One edge of the stem shows many little hinge-fracture flake scars. The knife is lenticular in cross-section.

Material: undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
	4.98	3.94	0.63	10.4	XIV-36 (Pl. 5, *n*)

Comparative notes: similar to a knife from Stuart Rockshelter. The knife was contained in a fire hearth that rested directly on bedrock and was dated 2094 BC 300 (Shutler and others 1960: 13, Plate 8 *k*).

V-1 A fragment of an asymmetrical knife that had two parallel slightly convex sides. The tip is formed by a straight edge at about 45° to the sides. The base is missing. The knife has been used most heavily on the corner with the obtuse angle. The convex edge opposite has also been used.

Material: undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
	4.68*	2.62	0.64	9.5*	V-1 (Pl. 5, *m*)

Nineteen other knife fragments are too small or shapeless to classify.

Material: 1 desert-varnished chert, 7 obsidian, 2 vein chert, 8 undifferentiated chert, 1 quartz.

D- Cores

Except for 1 item noted below, the items called cores here are not cores in the sense of a carefully flaked and prepared piece of raw material destined to produce a particular kind of flake. These are remnants of raw material discarded in the process of artifact manufacture, from which flakes have been struck. No such clear pattern as platform cores or polyhedral cores appear. It seems rather that the shape and size of the material available and the desired result influenced the flaking and the sundry forms.

D-1 The by-products of artifacts manufactured from cherts occurring as veins in the limestone of the surrounding country. All show some of the limestone matrix. The more desirable material was broken away and used, leaving these remnants with limestone and cherty limestone matrix adhering. Three small hinge fractures on an edge as though they might have been secondarily used as scrapers.

Material: 6 vein limestone, 3 undifferentiated limestone.

Size range:	Max. dia. cm.	Min. dia. cm.	Wgt. g.	No.
Heaviest	7.43	3.86	129.1	XI-17 (Pl. 6, *f*)
Median	4.87	3.60	50.0	XIV-10
Lightest	4.80	4.22	36.9	IX-26

D-2 The matrix on 2 cores shows that the material occurred in cobbles rather than veins. Neither show a consistent pattern of flaking.

Material: 1 quartz, 1 undifferentiated chert.

Size range:	Max. dia. cm.	Min. dia. cm.	Wgt. g.	No.
Heaviest	6.64	3.57	111.3	II-6
Lightest	6.27	2.53	73.7	2-54

D-3 Chert cores showing neither matrix nor cortex. All surfaces are flake scars. One core in this group, I-14, is a double platform core. It has a flake scar at right angles to its height from which flakes have been struck. Opposite this platform there is another flake scar, that if extended would intersect the first plaform about 45°. The flake scars indicate that some long narrow flakes that could be classed as blades were struck from the core. Two have been used secondarily as scrapers.

Material: 10 undifferentiated chert, 2 vein chert. Group D-3, Plate 6, *i-j*.

Size range:	Max. dia. cm.	Min. dia. cm.	Wgt. g.	No.
Heaviest	6.43	4.23	113.5	XI-16 (Pl. 6, *i*)
Median	4.74	3.25	38.8	III-4a
Lightest	2.79	1.81	12.7	IX-11
I-14	4.52	2.51	45.9	

D-4 One small, broken core looks to have been a polyhedral core. A single flake scare served as a striking platform from which flakes were struck all about the periphery. The core was a piece of a cobble, for the cortex forms the bottom. The four complete flake scars present measure:

	L cm.	W cm.
1.	2.40	0.80
2.	2.07	0.69
3.	1.49	0.79
4.	2.49	1.36

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
2.77	2.89	1.39*	10.6	XI-18; (Pl. 6, *k*)

E- Scrapers

The scrapers all have a planar surface that serves as a base. The length and width are measured in the

plane of the base, and the thickness is the maximum height perpendicular to the basal plane. Cross-section refers to the section created by a plane perpendicular to the basal plane including the width. Profile is the section created by a plane perpendicular to the basal plane including the length. Group E-1, Plate 7, *a-c*.

E-1 A variety of keeled end scraper. Made on a flake, the bulb of percussion appears at either end of the length. One end is retouched into a steep working edge which crests at the height of the artifact very near the end. From the height, the upper edge of the profile is a keel, formed by two or more flake scars that are parallel to the basal flake and were prepared on the flake before it was removed from the core. The keel slopes down toward the opposite end of the length. The scrapers are retouched along two long edges and the steep end. The main working edge was not directly on the end but offset at about a 45° angle from the length. Each scraper shows use of one of the edges parallel to the length also.

Material: 3 undifferentiated chert, 1 vein chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	5.27	3.40	2.07	43.3	XIV-16 (Pl. 7, *b*)
Median	5.31	3.05	1.64	31.9	4-32 (Pl. 7, *c*)
Lightest	4.31	2.64	1.49	15.9	XVI-1 (Pl. 7, *a*)

Comparative notes: similar to "snubnose" scrapers from Death Valley I (Hunt 1960: fig. 12, especially *a, b,* and *e*).

E-2 A variety of side scraper. Made on a flake, the bulb of percussion when present is at one end of the length. Each has a long edge, parallel to the length, retouched to form a steep, straight working edge. The ends are usually unretouched and do not appear to have been used. Their profile is not distinctive, showing only that they are much longer than high. Several of the scrapers have cortex forming part of their upper surface. Group E-2, Plate 7, *d-e*.

Material: 2 vein chert, 6 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	8.37	4.00	1.48	56.6	VII-3
Median	5.69	2.78	1.51	23.8	III-3
Lightest	3.17	2.02	1.21	7.5	XI-30

Comparative notes: similar to concave side scrapers from the midden at Ventana Cave (Haury 1950: 220).

E-3 Made on a flake, the bulb of percussion is present on only one of these scrapers. The flakes determine to a large extent the form of these scrapers. Their upper surface is 1 or 2 flake scars parallel to the basal scar. Two or three edges are retouched into well-developed steep working edges. The edges are parallel to slightly converging and straight to slightly concave. These have been used the most, and are typically joined by a retouched end that shows little use. Group E-3, Plate 7, *f-h*.

Material: 5 undifferentiated chert, 1 desert-varnished limestone.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	5.73	3.77	1.13	23.0	VIII-13 (Pl. 7, *h*)
Median	5.09	2.22	0.98	14.8	III-5
Lightest	2.66	2.11	0.62	4.1	I-11

Comparative notes: some similarity to concave scrapers from Death Valley I (Hunt 1960: fig. 14, especially *a, b,* and *e*). Similar to thin flake scrapers from the midden at Ventana Cave (Haury 1950: fig. 34). Generally similar to end scrapers from the midden at Ventana Cave (Haury 1950: fig. 36).

E-4 Scrapers steeply retouched around ½ - ¾ of their periphery to form convex working edges. They have no length or width, but tend to be sub-ovoid in outline. In cross-section they possess a slight keel, but the upper surface is formed by several flake scars remaining from the original flake, or part of the cortex. Group E-4, Plate 8, *a-d*.

Materials: 4 vein chert, 10 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	6.55	4.41	2.07	73.9	VIII-2
Median	4.31	3.70	1.45	24.5	IX-54
Lightest	4.06	2.90	1.40	15.5	IX-46

Comparative notes: similar to some of the "snubnose" scrapers from Death Valley I (Hunt 1960: fig. 12, *c* and *d*).

E-5 Made on a flake, these artifacts have received no general shaping, but have one end worked into a convex end scraper with the edge continuing along one side for a short distance. Like scraper group one they have received most of their use on the "corner" at about a 45° angle to the length rather than on the end squarely. Group E-5, Plate 7, *i-j*.

Material: 1 vein chert, 2 undifferentiated chert, 2 quartz.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	5.70	3.91	3.31	34.2	I-13 (Pl. 7, *j*)
Median	3.45	2.22	1.57	14.0	XII-4
Lightest	4.62	3.31	1.24	9.5	XI-14 (Pl. 7, *i*)

Comparative notes: similar to Hunt's elongate end scrapers (1960: fig. 13).

E-6 Although made on a flake, the base of these scrapers is not a single flake scar but several struck from the flake before it was shaped into the scraper. The outline is determined by flakes struck from the base. The scrapers have a sinuous convex steep edge showing use, but there is no fine retouching. At right angles to the line of the working edge the scraper tapers back to an undeveloped tail, so that the main working edge spans the width or length. The upper surface is a flake scar parallel to the base, or is a cortex remnant. Group E-6, Plate 8, *e-f*.

Materials: 2 undifferentiated chert, 1 quartz.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	4.0	3.90	1.47	21.9	IX-18 (Pl. 8, *f*)
Median	*	3.69	1.73	17.8*	XIV-13 (Pl. 8, *e*)
Lightest	3.20	2.99	1.48	13.2	XIV-28

E-7 Flake scrapers. Flakes which have had an edge or edges retouched and used. The form of the tool is derived from the flake, and the class includes a wide variety of sizes and shapes. Many of the scrapers have remnants of cortex or matrix remaining. Group E-7, Plate 8, *g-k*.

Materials: 8 desert-varnished limetsone, 1 obsidian, 12 vein chert, 18 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	6.20	5.78	1.78	57.2	III-14 (Pl. 8, *i*)
Median	4.27	4.22	0.91	15.0	XIX-2
Lightest	3.08	1.33	0.37	1.4	2-45

E-8 This group of scrapers are made on cores and someof them may have been cores prior to their use as scrapers. They have a single basal surface which shows no evidence of bulb of percussion. From all about the periphery flakes have been struck, usually terminating in hinge fractures so that the working edges have a stepped appearance. These scrapers are tall, plano-convex to triangular in cross-section and plano-convex in profile. The working edges are convex and not smoothly finished.

Materials: 3 quartz, 3 undifferentiated chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	6.79	3.50	4.53	135.7	XIII-2
Median	4.18	4.00	3.98	93.8	V-2
Lightest	4.13	2.70	2.51	48.1	XI-10

Comparative notes: similar in size and shape to Rogers' scraper planes ascribed to his San Dieguito-Playa phase (Rogers 1939: 29).

E-9 Made on cores, these scrapers like E-8 have flake scar for a base. One shows that its basal scar was negative; the others are indeterminate. They have been shaped into a semicircular outline by flakes removed using the base as a striking platform. They are half a circle in profile and a quarter circle in cross-section. Their working edges have been smoothed by retouch and use. Two made from quartz cobbles have part of their upper surface formed by cortex.

If the above are correctly interpreted as fragments, then scraper E-5 represents a complete one. It is circular in outline and hemispherical in cross-section and profile. Its entire upper surface is smoothly worked.

Materials: 2 desert-varnished limestone, 1 undifferentiated chert, 2 quartz.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	7.60	6.72	4.08	210.8	V-5
Median	6.13	3.30*	2.64	51.8*	XIV-25
Lightest	4.01	2.24*	2.21	22.1*	XI-27

Comparative notes: (E-8 and E-9) similar to some of the planes from the midden at Ventana Cave (Haury 1950: 280) but tending to be slightly smaller in size range.

E-10 Miscellaneous scrapers

IX-15 This scraper is distinctive in the collection for its fine workmanship and extensive evidence of use. It is made on a thick flake. The basal surface is very flat and does not show the bulb of percussion. The scraper is an elongate ovoid in outlie. The upper surface is another flake scar, approximately parallel to the basal plane. Long flakes were struck from the base up to the upper flake scar, resulting in a well-made, steep-edged scraper, carefully shaped all about its periphery. The long edges show heaviest use in the form of many small hinge-fractured flakes, but the entire periphery shows some use, and secondary concentrations of use appear on the ends.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
4.51	3.00	1.49	25.7	XII-7 (Pl. 9, *b*)

XIII-7 This is another ovoid scraper but very different from I-15. Its basal surface is a concave flake scar which does not include a bulb of percussion. Its upper surface is formed by 4-5 shallow, broad flake scars, giving it a "turtle-back" appearance. It has received some retouching from the basal surface, again, broad shallow flakes. It has many small hinge-fracture flakes all about its periphery.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
4.84	4.38	1.22	25.7	IX-15 (Pl. 9, *a*)

Comparative notes: similar to Death Valley I round scrapers (Hunt 1960: fig. 10).

XXII-7 A small, elongate, leaf-shaped scraper, it is plano-convex in cross-section and has a high keel running the length. The basal surface was a single flake scar but from all about the periphery short broad shallow flakes have been knocked off which serve to make the basal surface irregular. No retouch occurs, but there is evidence of heavy use on two areas; one on the middle of one side and the second on the opposite side near the tip. There is some evidence of use at each end also.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
4.46	1.89	1.07	9.8	XXII-7 (Pl. 9, *c*)

Comparative notes: similar to Rogers' plano-convex knife (1939: 51, Plate 12, *a* and *b*).

F- Gravers. This class includes the small chipped stone artifacts that are characterized by the development of a small, sharp point or points on the periphery. They are made on a flake, primarily by unifacial retouching. The dimensions measured correspond to those of the scrapers, class E.

F-1 Flakes, otherwise unretouched, on which one or more graver points have been flaked by unifacial retouch of a section of an edge. Two have 2 points, the other 4, a single point. Group F-1, Plate 9, *d-e*.

Material: 5 undifferentiated chert, 1 vein chert.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	3.83	2.87	0.98	8.6	IX-1
Median	2.58	2.52	0.72	4.4	2-42 (Pl. 9, *d*)
Lightest	2.20	1.33	0.43	1.2	IX-57

F-2 Scraper-gravers with one or more graver points in addition to edges unifacially retouched and in at least some cases used. On XIV-2 the point occurs right in the middle of a straight to convex edge. The other 4 all have graver points on points of juncture of two edges. IV-3 has two points, the rest one.

Material: 1 vein chert, 4 undifferentiated chert. Group F-2, Plate 9, *f-h*.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	5.04	2.27	1.09	12.1	IV-3 (Pl. 9, *f*)
Median	3.96	2.09	1.12	8.5	XV-13
Lightest	4.28	2.10	0.66	6.4	2a-16 (Pl. 9, *g*)
XIV-2	2.67	2.60	0.92	6.8	

F-3 Two sturdy gravers made on thick flakes and primarily shaped by unifacial flaking. The gravers are ovoid in outline and have been crudely shaped all around. Each has a sturdy keeled point triangular in cross-section protruding from a long edge. The point is primarily shaped by a large flake scar to each side of it, with some subsequent fine retouch. The result is a sharp, strong point.

Material: 1 desert-varnished limestone, 1 undifferentiated chert.

Sizes:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heavier	3.96	3.24	1.20	16.9	III-11 (Pl. 9, *j*)
Lighter	3.76	3.51	1.18	14.9	XIV-6 (Pl. 9, *i*)

G- Drills. This class includes the small chipped stone forms that are characterized by the development of an elongated tip or point that served as a drill bit. The tip, and usually some of the body of the artifact, are bifacially worked, and bilateral symmetry is approached. Attributes measured correspond roughly to those of projectile points and knives.

G-1 The basal portion is a flake on which one end is a bifacially worked bit. The shoulders are unifacially retouched. The complete drill shows hinge fractures as from use along the bit.

Material: 2 undifferentiated limestone.

Sizes:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heavier	*	2.64	0.89	8.3	XXII-2 (Pl. 9, *l*)
Lighter	4.35	1.90	0.64	4.9	I-16 (Pl. 9, *k*)

Comparative notes: similar to some of the drills from the midden at Ventana Cave (Haury 1950: fig. 67, especially *a, j*).

G-2 An expanded base drill that has been carefully bifacially shaped all about its periphery. The long bit has a distinct diamond-shaped cross-section through its entire length. It has a T-shaped base.

Material: undifferentiated chert.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
5.2	2.49	0.67	4.5	XXII-10 (Pl. 9, *m*)

Comparative notes: similar to some of the drills from the midden at Ventana Cave (Haury 1950: fig. 67, *g, h,* and *i*).

G-3 A distinctive specimen that looks as though it were made on a convex-based knife. The base makes up ½ of the total length. The drill has been bifacially worked all over. The base has a lenticular cross-section and the bit a roughly diamond-shaped cross-section.

Material: quartz.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
7.95	3.02	1.24	22.5	XV-1 (Pl. 9, *n*)

H- Ground stone. Unlike other classes, these artifacts derive their form from the grinding they receive as they are used. They are the only class of artifacts typically manufactured from sandstone.

H-1 Ground and polished slabs. Fragments of slab metates were collected from several areas. They are all thin natural slabs of fine-grained sandstone that have a polished surface. None show concavity; nor are the faces of any pecked. The fragment of the finest grained material, IX-37, still shows striae that indicate parallel

strokes. None of the fragments are complete enough to indicate the total dimensions of the original slab. One, XI-2 has been used on both faces.

Material: fine-grained sandstone.

Size: the maximum dimensions of the fragments are about 13 by 14 cm. They range in thickness from 0.5-2.6 cm. but only two, with thickness of 2.1 and 2.6 cm. respectively, have their complete thickness.

Comparative notes: similar to the 21 small flat metates and fragments from Pinto Basin (Campbell and Campbell 1935: 33). Similar slabs of schist or other material are described by Rogers. He felt that there was some evidence that these were contemporaneous with Pinto-Gypsum. As to possible use, Rogers says, "No manos or stones smooth enough to have produced this polished effect have been found with them. Although their functional purpose is an open question, the writer suggests that they may be planing platforms upon which fibrous leaves or skins were scraped" (Rogers 1939: 52-53).

H-2 Only one mano was found. It is a cobble of sandstone conglomerate. It has one main grinding face that is slightly convex in cross-section and flat along the long axis. There is an adjacent narrow parallel facet on one edge. The end has been battered heavily to the extent that it has a squared-off appearance.

Material: sandstone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
8.56*	7.73*	5.90	620.5	VIII-7 (Pl. 10, *a, b*)

I- Quartz crystals. Two quartz crystals were collected from within the area. One is quite weathered, with a frosted surface. The smaller retains most of its clarity. Neither appear to have been worked.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
3.42	2.07	1.80	16.4	VIII-17
1.79	0.97	0.97	2.4	VI-3

J- Heavy scrapers. Formally like class E, but larger in size, and typically manufactured from a limestone cobble. The attributes measured correspond to the scrapers.

J-1 Scraper planes made from cobbles. They use a natural surface for the basal plane. ¼ - ¾ of the periphery is steeply retouched with flakes ending in a hinge fracture. Varying amounts of the upper surfaces are worked, but in no case all of it. When not too badly eroded, the edges show small hinge fractures from use. Group J-1, Plate 10, *c-d*; 11, *a-d*.

Material: 1 eroded limestone, 4 desert-varnished limestone.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	9.91	7.89	6.99	737.7	XIV-22 (Pl. 10, *c, d*)
Median	7.73	7.89	6.78	549.0	VII-13 (Pl. 11, *a, b*)
Lightest	7.74	6.29	5.30	289.6	XIX-8 (Pl. 11, *c, d*)

Comparative notes: planes of similar size range but using a flake scar for a base are reported from the midden at Ventana Cave (Haury 1950: 208-210). The pebble plane (fig. 28h) may be very similar.

J-2 Cobble scrapers. Scrapers made on cobbles utilizing a natural flat surface for a base, and an adjoining face for a back. The angle between the two natural faces is a little greater than 90°. This back forms ⅓ to ½ of the periphery. The rest of the periphery and the upper surface are carefully shaped by broad, shallow flake scars, creating a convex working edge. The edges vary in steepness, but none are as steep as those on scraper planes. Group J-2, Plate 12, *a-c*; 13, *a, b*.

Material: 7 eroded limestone.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	11.7	10.3	5.46	918.6	IX-8 (Pl. 12, *a, b*)
Median	9.5	8.8	2.5	408.8	XII-17
Lightest	8.9	8.0	4.3	328.0	XIV-19 (Pl. 12, *c*)

J-3 Scraper. One small badly eroded scraper. Basal plane was probably a flake scar, and it has been

worked all about its periphery. It has a large flake scar for an upper surface and may have been similar to IX-15 (E-10).

Material: eroded limestone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
7.27	5.52	1.65	96.2	IX-29 (Pl. 13, *c, d*)

K- Hammerstones

K-1 Cobble hammerstones. Flat rounded cobbles that show battering on their edges, but no other alteration.

Material: 2 quartzite.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
10.2	9.9	4.53	640.7	VIII-4
8.41	7.06	3.26	278.0	VIII-19 (Pl. 14, *a, b*)

L- Choppers

L-1 Cobble choppers. A broad, flat cobble on which ⅓ - ⅔ of the periphery has been unifacially retouched to give a convex working edge. The remainder of the cobble is unretouched.

Material: 5 eroded limestone.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	10.5	8.7	5.72	659.9	VII-1
Median	11.1	8.2	4.4	516.1	III-2 (Pl. 14, *c, d*)
Lightest	9.5	8.5	3.3	304.5	XIX-3 (Pl. 15, *a, b*)

L-2 Flake choppers. Large flakes struck from a cobble and unifacially retouched using the flake scar for a striking platform. The working edge constitutes ⅓ to ½ of the periphery.

Material: 2 desert-varnished limestone, 1 eroded limestone.

Size range:	L cm.	W cm.	Th cm.	Wgt. g.	No.
Heaviest	9.4	8.6	2.7	310.7	IX-59
Median	8.8	7.5	3.8	252.3	VII-12 (Pl. 15, *c, d*)
Lightest	6.8	6.6	2.8	148.3	IX-7 (Pl. 16, *a, b*)

Comparative notes: five of the 8 choppers from Pinto Basin are made on large percussion flakes (Campbell and Campbell 1935: 35-36).

M- Bifaces. This class includes all bifacially worked artifacts in the larger size range.

M-1 Crude bifaces, diamond-shaped in cross-section with one or two long edges flaked with large, shallow flakes to give a sinous working edge. They were made on a natural cobble.

Material: 3 eroded limestone, 1 desert-varnished limestone.

Size range:	Max. Dia. cm.	Min. Dia. cm.	Wgt. g.	No.
Heaviest	9.2	5.3	428.2	X-7 (Pl. 16, *c, d*)
Median	10.2	5.5	389.1	VI-9 (Pl. 17, *a, b*)
Lightest	9.9	5.5	369.5	III-15 (Pl. 17, *c, d*)

M-2 A large limestone flake bifacially retouched to an almond shape. One face is entirely retouched, but the opposite only along the edges.

Material: eroded limestone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
12.7	8.4	2.8	342.2	IX-20 (Pl. 18, *a, b*)

Comparative notes: very similar in size, shape, and workmanship to a "blank" from the midden at Ventana Cave (Haury 1950: fig. 43).

N- A large limestone flake that has been retouched unifacially on the end and face opposite the bulb of percussion. It is shaped to a point, and has been used at the point and on both adjacent edges.

Material: eroded limestone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
10.9	8.1	2.5	223.7	VII-8 (Pl. 18, *c, d*)

TABLE 2 Tule Springs Surface Areas Artifact Distribution

TYPES	I X	II X	III X	IV X	V X	VI X	VII X	VIII X	IX X	X X	XI X	XII X	XII CON 1 X	XII CON 2 X	XIII X	XIV SCAT X	XIV CON 1 X	XIV CON 2 X	XIV CON 3 X	XV CON 1 X	XV CON 2 X	XV CON 3 X	XVI X	XVII X	XVIII X	XIX X	XIX CON 1 X	XIX CON D X	2 a & b X	2 scat X	4 X	8 X	XXII X	TOTALS
A-1	–	1	–	–	–	–	–	–	–	–	1	1	–	–	2	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	6
A-2	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	4
A-3	–	–	–	–	–	–	1	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	4
A-4	–	–	–	–	–	–	–	1	2	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	5
A-5	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	2
A-6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	3
A-7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	1	–	–	4
A-8	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	5
A-9	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	3	–	–	–	–	–	–	–	–	–	2	–	1	2	1	–	–	–	10
	–	1	–	–	–	–	1	2	3	–	4	3	1	–	3	4	1	–	–	1	–	2	–	–	–	4	–	1	10	2	1	–	–	43*
B	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
	–	–	–	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3*
C-1	–	1	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	2	–	–	1	3	10
C-2	–	–	–	–	–	1	–	–	4	–	2	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	11
C-3	1	–	–	–	–	–	–	1	–	2	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	7
C-4	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
C-5	1	–	1	1	1	1	–	1	1	1	1	–	1	–	–	1	–	2	–	–	–	1	–	–	–	–	1	–	6	1	–	–	1	23
	2	1	2	1	1	4	–	2	5	3	3	–	2	–	–	3	1	3	–	–	–	2	–	–	–	2	1	–	9	1	1	1	4	54*

| | | |

TABLE 2 (Continued)

TYPES	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XII CON 1	XII CON 2	XIII	XIV SCAT	XIV CON 1	XIV CON 2	XIV CON 3	XV CON 1	XV CON 2	XV CON 3	XVI	XVII	XVIII	XIX	XIX CON 1	XIX CON D	2 a & b	2 scat	4	8	XXII	TOTALS
H-1	–	–	–	–	–	–	1	2	1	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	8
H-2	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
	–	–	–	–	–	–	1	3	1	–	1	2	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	9*
I	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2*
J-1	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	5
J-2	–	–	–	–	–	–	–	–	–	–	3	1	–	–	–	1	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	7
J-3	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
	–	–	–	–	–	1	1	–	–	–	4	1	–	–	–	1	–	1	–	–	–	–	–	–	2	1	1	–	–	–	–	–	–	13*
K-1	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2*
L-1	–	–	1	1	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	5
L-2	–	–	–	–	–	–	1	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
	–	–	1	1	–	–	3	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	8*
M-1	–	–	2	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
M-2	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
	–	–	2	–	–	1	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5*
N	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1*
O-1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
O-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	2
	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	3*

*Total - 278

O- Pointed cobbles. This class includes limestone cobbles on which a small part of the periphery has been unifacially retouched to create the working edge. The shape of the cobble primarily determines the shape of the artifact.

O-1 Elongate natural cobbles subrectangular in cross-section that have one end unifacially worked into a rounded point.

Material: eroded limestone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
13.2	6.32	5.16	492.5	IX-44 (Pl. 19, *a, b*)

O-2 Natural elongate cobble with one end bifacially worked into a rounded or convex edge. Shows some use.

Material: 2 desert-varnished limestone.

Size: L cm.	W cm.	Th cm.	Wgt. g.	No.
12.6	7.7	5.08	526.2	XXII-13 (Pl. *c, d*)
15.0	11.7	4.6	1433.1	2-56

DISTRIBUTION

Table 2 shows the distribution of the classes of artifacts in all areas. It illustrates that area 2a and b contrast with the remainder of the locality. The primary clue is point types A-6 and A-7 which occur only in that area and make up six of the ten points. The second clue is the seven flake scrapers (E-7). At the Tule Springs locality as a whole, the E-7 group constitutes about 43% of the scrapers and about 14% of the entire assemblage. At 2a and b, flake scrapers are the only scraper type present and constitute about 22.5% of the assemblage. Conspicuously absent are heavy limestone tools and grinding implements. Area XIX con. 1 is distinct also, owing to its unusual location and association with rock features that may be of human origin.

The consistent association of artifacts, flakes, and limestone in areas IX, XI, XII, XIII, XIV, and XV con. 3, the relative concentration of artifacts and the consistant distribution of types make the area north of Vegas Wash and west of the long bulldozer trench the best representative of the main occupation of the locality. Table 3 summarizes the assemblage from this area, and contrasts it with the assemblage from the locality as a whole. One hundred eleven artifacts were derived from these contiguous areas, about 40% of the total collection.

These 111 artifacts are difficult to interpret. They show a recurrence of types; for instance, projectile point groups A-1 and A-8, scraper types E-2 and E-6, as one would expect in an area occupied by a people for a time. However, the comparative notes do not clearly indicate relationship with any one particular phase of desert prehistory; perhaps because the sequence is not well worked out and documented, but perhaps also because the collection includes the recognizable relicts of earlier periods: these include the Agate Basin point XI-19 (group A-9); one of the type F-3 gravers (XIV-6), a type usually associated with Clovis assemblages; and perhaps the two badly weathered leaf-shaped forms, XI-3 and XIV-5 (group A-9). In a region where well described stratigraphic assemblages are lacking these is no way to determine how many more artifacts of a less distinctive nature may also be relicts.

Even though the amount of mixing through time cannot be quantitatively stated, the consistent association between artifacts, flakes, and limestone scattered over the flat surface seems to require interpretation as an assemblage representing an occupation, with some reservations regarding its purity. The scattering of the areas of concentration and the scattering of artifacts indicate intermittent occupation of the site by small parties over a period of time. Today Tule Springs is barren and dry, exposed to baking heat in the summer and the cold winds of winter. One wishes the geological record had thoroughly substantiated the presence of a small, permanent stream in Vegas Wash 3,000-4,000 years ago, rather than hinting at the possibility.

TABLE 3

Summary of the Assemblage - Tule Springs Surface Locality

Class	No. in Recombined Areas	No. in Locality
Projectile Points		
A-1	5	6
A-2	2	4
A-3	1	4
A-4	3	5
A-5	1	2
A-6	0	3
A-7	0	4
A-8	4	5
A-9	5	10
	21	43
Disk Choppers		
B	2	3
Knives		
C-1	1	10
C-2	8	11
C-3	4	7
C-4	1	3
C-5	8	23
	22	54
Cores		
D-1	3	9
D-2	1	2
D-3	8	13
D-4	1	1
	13	25
Scrapers		
E-1	1	4
E-2	6	8
Scrapers (continued)		
E-3	0	6
E-4	7	14
E-5	2	4
E-6	3	3
E-7	13	39
E-8	3	6
E-9	3	5
E-10	2	3
	40	94
Gravers		
F-1	3	6
F-2	2	5
F-3	0	2
	5	13
Drills		
G-1	0	2
G-2	0	1
G-3	0	1
	0	4
Ground Stone		
H-1	4	8
H-2	0	1
	4	9
Heavy Scrapers		
J-1	1	5
J-2	5	7
J-3	1	1
	7	13

DATING THE SURFACE COLLECTION

GEOLOGY

The area geology will be described in detail by Vance Hayes in the forthcoming report on Tule Springs. He has summarized the geological events pertintent to the surface collection (personal communication 1964) as:

> "11,500-6,000 BP: Intermittent filling of the valley floor with alluvial silt and gravel (unit E_2). Possible occupation (undefined) at the base of E_2 at site 1 (Flake site) (11,200±200 BP, UCLA-508, TS-C14-2). Apparently this occupation is not represented in the surface collections. There is no evidence of occupation between 10,000 and 6,000 BP in any exposures of unit E_2. It is, therefore, unlikely that much of the surface collections are of this age. Evidence of what occupation there may have been has likely been flushed out with unit E_2, however, the Agate Basin point (XI-19) stem from west off datum may be a relict of this period.
>
> "6,000-5,000 BP: Rapid erosion and removal of most of the unit E_2 by dissection, slope washing, and deflation. Much of the present surface was laid bare at this time, and occupation of the surface could date from this time.
>
> "5,000-2,000 BP: General surface stability with intermittent periods of weak slope washing, soil development, and eolian activity. Vegas Wash may have been a small permanent stream during part of this time. Most of the surface occupation represented by the surface collections probably occurred during this time."

Occupation in the Tule Springs locality from the period 11,500-6,000 BP would have been stratified within the alluvial silts and gravels. In the period of intense erosion that removed the silts and gravels 5,000-6,000 years ago, the sites would have been severely disturbed and most of the artifacts flushed out.

Occupations remaining in place on the old surface must date from after the time that the present surface was exposed (6,000-5,000 BP). Six thousand years is the maximum date for the occupation represented by the collection from areas IX, XI, XII, XIII, XIV, and XV con. 3. Individual artifacts in the collection may be relicts of earlier occupations.

Since 6,000 BP the local drainage has shifted from the braided stream channels to Vegas Wash, now entrenched about 20 feet into the valley floor. In the areas to the north of Vegas Wash the scattering of artifacts was continuous on the old surface, across lateral feeder gullies now 5-15 feet deep. The occupation may date from a period of relative stability prior to the recent erosion cycle that has cut these gullies. This period of stability may correlate with the time during which Vegas Wash was a small permanent stream. A closer dating than 5,000-2,000 BP is not justified from the geology.

COMPARISONS

WITH OTHER DATED SITES

The possible time span for the dating of the occupation at Tule Springs can be narrowed by comparing the assemblage with well-dated assemblages in the region.

The Corn Creek Dunes site (CL-243) is a surface assemblage securely tied by radiocarbon dates on seven hearths to the period of about 4,030±100 BP to 5,200± BP. The site lies northwest from Tule Springs up Las Vegas Valley and about 100 feet higher in elevation (Williams and Orlins 1963). Comparison with Corn Creek eliminates the time span of 4,000-5,000 years for the Tule Springs assemblage, for the two are very unlikely contemporaries. They differ in artifact styles, choice of materials for artifacts, and economic emphasis reflected by artifacts.

Statistical comparison of the two assemblages would be misleading, for there are at least three factors that make the samples different. The Corn Creek Dunes area has been surface-collected for years by local amateurs, with the likely result that chipped chert artifacts, especially projectile points and knives, are underrepresented in the reported sample. The Tule Springs locality seems to have escaped the surface collectors' attention, but after centuries of weathering many of the limestone artifacts are only ghostly images of their former selves. Large limestone tools are underrepresented in the Tule Springs sample. The catalog reveals that fifty of the large limestone "tools" that were recorded and collected were so badly weathered that they could not be described with assurance, and were thus excluded from the report.

A third source of skewing results from the techniques of collection. At Corn Creek the site was delimited and gridded. The visible artifacts were collected and then the surface was raked and screened through ¼" mesh (Williams and Orlins 1963:10). Raking and screening resulted in recovery of many small flakes that would have been missed at Tule Springs. These techniques would most seriously distort comparison with the amounts of stone refuse recovered at Tule Springs.

After considering such skewing, the two collections are still strikingly different. Heavy block metates and bifacial hammerstones, both numerically important at Corn Creek, are absent at Tule Springs. When artifacts of the same class are present at both sites, stylistic differences are evident. Scrapers from Corn Creek are typically large flakes with a retouched or used edge. The extensively worked, keeled, snubnosed scrapers at Tule Springs do not occur at Corn Creek. Although the projectile point sample from Corn Creek is poor, the fragments found do not resemble typical point types found at Tule Springs.

Different materials were selected for similar artifacts at the two sites. The colorful varieties of cherts from Tule Springs are absent at Corn Creek, where "the cherts are predominantly greenish or grayish green. White, purple, and banded varieties are also present." (Williams and Orlins 1963:26). Quartzite, used for manufacture of the heavy artifacts at Corn Creek, was readily available at Tule Springs as handy sized cobbles in the gravel ridges, but was not used for large chipped tools.

The absence of large block milling stones at Tule Springs by itself could be explained as resulting from different site use by the same people. Some of the differences in material selection might be explained by different local resources at the two sites. Possible sources of raw material were not sampled at Corn Creek and Tule Springs and compared with the artifacts collected. Differing sources of raw material can only remain a hypothesis. The neglect of quartzite at Tule Springs is not explained away.

Stylistic differences between projectile points and scrapers cannot be explained either by seasonal use of the sites by the same people, or by contemporary use by two peoples. These artifacts, while basically functional, include stylistic attributes and reflect cultural pattern as as well as use in their form. They reflect different culture patterns and are the product of different peoples. These differences are attributed to a difference in time. Because Tule Springs occupation cannot be considered contemporary with the Corn Creek Dunes site, the Tule Springs occupation does not date from the span of 4,000-5,000 BP.

Turning to the near end of the time scale, we can suggest a minimum age for the assemblage. Wallace's work in the southern California deserts (summarized Wallace 1962), Schroeder's work at Willow Beach (Schroeder 1961) and Shutler's Lost City report (Shutler 1961) provide a well-documented archaeological sequence back from the historic period. Pottery appears at Willow Beach before A.D. 750, introduced from western Basketmaker, III and is represented in assemblages in the Lower Colorado area until contact times. Schroeder's earliest phase, Price Butte, is dated 2,200±250 BP (1961:82). This pre-pottery phase represents contact between western Basketmaker II peoples and the Amargosa people of the southern California-Nevada deserts. With the exception of one projectile point (10-37, A-9), no part of Schroeder's sequence is represented at Tule Springs, and Tule Springs thus predates the Price Butte phase (2,200±250 BP).

COMPARATIVE MATERIAL

DEATH VALLEY

Death Valley presents a situation somewhat similar to the Tule Springs locality. Death Valley is 90 miles due west of Tule Springs and is the nearest local sequence available for comparison in the appropriate time range.

Hunt (1960) describes four environmental areas from bottom to top of the valley; (1) the salt pan, used only to harvest salt. The pan probably held a relict lake from Pleistocene times until sometime between 6,000-3,000 B.C. The pan was dry during the altithermal. A lake 30 feet deep formed about A.D. 1 for a short time, but soon dried leaving the present salt pan.

A second area, a belt of mesquite-covered sand dunes adjoins the salt pan and has been winter residence for the Indians for the past 2,000 years. It is similar to the scarp area at Tule Springs in vegetation, and water could be reached in shallow holes. The altitude of the mesquite belt is -220 to -240 below sea level.

Gravel fans 5-6 miles long extend from the sand dunes back to the foot of the mountains. Tops are

TABLE 4

Tule Springs Compared with Pinto Basin and Death Valley
(Major Artifact Categories Only)

	PINTO BASIN	DEATH VALLEY		TULE SPRINGS	
			Early Death Valley II*	Entire locality	Areas IX, XI, XII, XIII, XIV, XV con. 3
Projectile Points	173 (42%)	12 (10%)	9 (14%)	43 (16%)	21 (19%)
Knives	27 (7%)	18 (15%)	20 (31%)	54 (19%)	22 (20%)
Scrapers	135 (33%)	77 (60%)	6 (17%)	94 (36%)	40 (36%)
Heavy Chipped Forms	30 (7%)	16 (12%)	30 (46%)	32 (11%)	13 (12%)
Ground Stone	47 (11%)	absent		8 (3%)	4 (3.6%)
Totals	412	130	65	278	111

*Computed from Hunt 1960 by subtraction of artifacts from site, a specialized site that yielded a relatively large number (21) of artifacts, and distorted the proportions.

1,200-1,500 feet above sea level. Campsites were located on the fans only where there were springs. Vegetation is sparse shrubs.

The fourth area is the long canyons and bordering hills that form the lower part of the mountains. It is covered with sparse shrubs. The canyons see extensive use as routes of travel into the mountains and contain small campsites.

Pertinent to the collection from the Tule Springs locality are the assemblages designated Death Valley I and early Death Valley II. Death Valley I sites are located on desert pavement gravels on benches near springs, and the artifacts themselves are darkly stained with desert varnish. This assemblage is "almost identical" to the assemblage from Soda Lake (Hunt 1960:20-21). Early Death Valley II sites are found on silty surfaces almost totally lacking stones. The assemblage, or at least the points, are similar to the Pinto points from Pinto Basin and Paradise River (Hunt 1960:62-63).

Table 4 compares Death Valley I and Early Death Valley II with the Tule Springs collection.

Judging on the basis of projectile points alone, there is no doubt that the Tule Springs assemblage is closely related to Early Death Valley II. Yet Table 4 reflects clearly differing emphasis on general tool types between Tule Springs and Early Death Valley II.

The disparity between heavy stone tools results more from the analysis than from the assemblages. The original catalog at Tule Springs shows 82 heavy stone tools collected. After the collection was reduced to the unquestionable artifacts, only 32 were described, the rest being far too weathered to describe. Hunt found no evidence for food grinding in Early Death Valley II materials (Hunt 1960:63).

When contrasted with Early Death Valley II sites the Tule Springs locality appears to have received more intensive use than any of the Early Death Valley II sites. The extent of the continuous artifact distribution, combined with a tendency for the artifacts to be more concentrated in small areas, suggests frequent use of the Tule Springs locality by small groups during a relatively limited time span. Whatever the attraction was at the Tule Springs locality, and it was probably economic, Death Valley appears not to have been similarly used in Early Death Valley II times.

In terms of site use, the Tule Springs locality is most similar to Death Valley I. The extent of the sites and artifact quantities suggest that at different periods in the past both localities were being exploited by groups with a similar basic economy.

PINTO-GYPSUM (ROGERS)

Malcolm Rogers, reporting on the work of the San Diego Museum in the desert areas of southern California-Nevada, called one of his complexes Pinto-Gypsum. Sites included in this designation numbered 28. Eleven of these yielded both Pinto points (as described by the Campbells from Pinto Basin) and Gypsum points (as described by Harrington from Gypsum Cave). Five sites yielded only Gypsum points, and presumably the other 12 yielded Pinto points only. As Rogers neither describes the sites, nor gives a distribution of artifacts by site, it is not possible to compare the assemblages and try to separate a "Pinto" complex from a "Gypsum" complex, even though the figures above indicate that there should have been two complexes.

In terms of the assemblages itself, like Hunt, Rogers notes a paucity of scrapers. In strong contrast with both Tule Springs and Early Death Valley II sites, "Knives are notable for their absence at most sites" (Rogers 1939:51). Rogers felt that metates, when present with the Pinto-Gypsum complex were of later origin. A second variety of ground slab, evidently much like the ground and polished slabs from Tule Springs, were considered possibly part of the assemblage. Without more information it is difficult to compare more intensively with Rogers' work.

PINTO BASIN

The original Pinto Basin assemblage was collected by the Campbells from the bands of the now dry Pinto River in Pinto Basin, Riverside County. Although geological situation is not firmly pinpointed in time, its general outlines are similar to that at Tule Springs. Lacustrine clays and sandstones interstratified with several flows of basalt are referred to as the Pinto formation. Horse and camel remains were recovered from it, dating it as Pleistocene in age. In the section exposed in the banks of Pinto Wash the lower half is predominantly a grey clay with minor lenses of sandstone. The upper half is composed mainly of brown sandstone with minor clay (Camp-

bell and Campbell 1935:13-15). Scharf (in Campbell and Campbell 1935:15) describes the sediments as "fairly well indurated."

The banks yielding the artifacts are 6-8 feet above a flat floor varying from a mile in width at the upper end to ¼ mile at the lower end. This channel is interpreted by Scharf (Campbell and Campbell 1935:17) as "formerly occupied by a shallow body of water, lake-like at its wide upper end, and narrowing to shallow stream of verly low gradient at its lower end." This channel of present day Pinto Wash is entrenched up to 8 feet into the floor of the old Pinto River, and is only a few yards in width. The Campbells (1935:26) describe the soil on which the artifacts rest as green lake clay.

At Pinto Basin, like at Tule Springs, artifacts occur on the surface of a unit yielding Pleistocene animal remains along a drainage that appears to have been formed while carrying much water. Both areas are now devoid of water sources in the area where artifacts indicate habitation.

The Campbells saw no differential distribution of artifact types. "These same artifacts were found on both shores from one end of the occupation to the other, without variation in their forms. It is the most uniform culture we have ever found" (Campbell and Campbell 1935:28). They also noted that the "softer stones . . . are in the last stages of decomposition" (Campbell and Campbell 1935:29).

A tabulation of the artifact counts at Pinto Basin (Table 4) shows a higher percentage of projectile points than at either Early Death Valley II or Tule Springs, and there appear to have been fewer heavy stone tools collected at Pinto Basin. The number of ground stone implements is large. Twenty-one of the 24 "metates" were similar to the ground slabs from Tule Springs, but the large number of manos indicated that they are part of the Pinto assemblage at Pinto Basin.

The similarity of setting and resemblance of many artifact types indicate that the complex defined at Tule Springs is closely related to that at Pinto Basin. The differences could be due to regional differences in economy and materials. They might be the result of different seasonal specializations. But they could result from any of these factors, combined with a temporal difference. Accepting the bracketing dates of 2,200-4,000 years ago would not necessarily delimit the entire time span of the Pinto Basin occupation. Until detailed work is done in Pinto Basin, it remains possible that the occupation there is somewhat earlier than that recorded in the assemblage from Tule Springs.

SUMMARY

Two hundred seventy-eight artifacts comprise the surface collection made at the Tule Springs locality while the project was underway. The artifacts were systematically located and recorded. On a comparative basis, the collection is most similar to the collections made by the Campbells at Pinto Basin and Malcolm Rogers in the Colorado desert. Some individual items are remnants of earlier and later habitation in Las Vegas Valley. The dating of the occupation at Tule Springs may be bracketed by a combination of geology and culture history to the span of 2,000 to 4,000 years ago as most likely, with a secondary possibility of 5,000-6,000 years ago. The lack of both midden and perishables make any cultural interpretation of the assemblage difficult.

CONCLUSIONS

The attempt to interpret the Tule Springs surface collection on the basis of internal and comparative evidence has merely served to emphasize the problem of Pinto—what it is, what is its temporal and spatial distribution? The problems cannot even be attacked until the fact that a point type is not a culture becomes a part of the basic conceptual approach to local archaeology. Assuming that the Pinto points do represent a type, or a series of related types with a consistent temporal and spatial distribution, they show up in a surprising variety of cultural contexts, from Little Lake to Pinto Basin and the Concho, San Jose, and Santa Ana sites in New Mexico, and even farther east. Jennings et al (1956:98-100 and fig. 3) point out the widespread distribution of projectile point forms in the southwest, plains, and Missouri valley. It seems very likely that projectile point styles diffused widely and rapidly in aboriginal America. They may be much better markers of a particular time span (horizon) than of a particular cultural continuum (tradition). We should expect in areas like the desert southwest where microenvironmental differences result in a variety of closely adapted cultural patterns, to find stemmed, indented based points in the inventory of a variety of cultural continuums. A Pinto culture, identified primarily by the presence of the projectile points, is not in keeping with a critically constructive approach to culture history.

If a Pinto culture is to be discussed, it must be on the basis of the Pinto Basin as the type specimen. This assemblage is well-reported for its time and looks to be relatively unmixed. It must be approached locally and remain localized. And it must be found in other sites that represent a seasonal occupance.

Once Pinto, whether it be a point type, or a culture, shrinks to its proper proportions, we can begin to study culture history in the area. Between the Lake Mojave complex, dating from about 9,500-10,000 years ago (Warren and deCosta 1964) and Amargosa, beginning perhaps before 2,200 years ago (Schroeder 1961:82), we have 8,000 years of culture history in which Pinto and "Gypsum" rattle. It is hardly necessary that all finds be fitted into these categories. New phases should be suggested; independent sequences set up as did Alice Hunt for Death Valley.

The first candidate for a new phase is the Corn Creek Dunes site. Williams and Orlins concluded "on the basis of the radio carbon dates, the artifact inventory, and comparisons with other contemporary sites that the Corn Creek Dunes site represents an eastward extension of the southern Nevada Pinto Culture into the southern Nevada Cultural sequence (1963:35). I have concluded that Corn Creek and the Tule Springs surface occupation are not contemporary and are evidence of two distinct culture patterns in Las Vegas Valley which existed at different times. Specific resemblances between artifact types, the complexes, and the site locations point toward close relationship for the Pinto Basin sites and the Tule Springs surface occupation. Corn Creek presents a much more exciting assemblage if it is viewed as representative of a new phase.

INTERPRETATION — THE PINTO PHASE

The term Pinto hase been applied to artifact collections found at the Pinto Basin site and a series of similar sites in the southern California-Nevada desert. It is, in these areas, a recurrent and recognizable, although poorly defined, assemblage. By extension, however, the term has been applied at Little Lake, California, (Harrington: 1957), well into Utah, and at least as far east as Texas (Willey and Phillips 1958:126). As the comparative notes above indicated, once out of the southern California-Nevada desert, points similar to those from Pinto Basin show up in a variety of contexts, often in assemblages that indicate a very different lifeway.

In view of the meager information we have it may be possible to narrow the usage of the term Pinto by defining a Pinto phase, and to suggest some working hypotheses that will guide further work toward productive results. Willey and Phillips define a phase (1958:22) as "an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived, whether of the same or other cultures or civilizations, spatially limited to the order of magnitude of a locality or region and chronologically limited to a relatively brief interval of time." This definition outlines a unit of about the right order of magnitude, however, "traits sufficiently characteristic," suggests immediately a list of artifact types occurring in our phase. From the comparative notes above, it is evident that description and typology for the material investigated has been largely intuitive, and few, if any, distinctive traits can be located.

A phase can also be recognized as the integration of a horizon with a tradition (Willey & Phillips 1958:41). If we substitute Steward's concept of cultural core for horizon, the Pinto material can be described as a phase. Steward (1955:37) describes the cultural core as "the constellation of features which are most closely related to subsistence activities and economic arrangements. Innumerable other features may have great potential varia-

bility because they are less strongly tide to the core. These latter, or secondary features, are determined to a greater extent by purely cultural-historical factors—by random innovations or by diffusion—and they give the appearance of outward distinctiveness to cultures with similar cores."

What can we say of the cultural core of Pinto at Tule Springs and Pinto Basin? A lack of emphasis on food grinding, and a development of small chipped forms comparable to that seen in economies where animals were an important source of food are a starting point. Typical site use left thin scattterings of detritus and artifacts over a wide area. Sites are usually along old streambeds, and rarely yield any quantity of evidence of more recent use. Site usage may be interpreted as frequent re-use of sites rather than use of sites for extended periods. Such re-use of sites at a preagricultural level fits nicely into an interpretation of "restricted wandering" as a postulated community pattern (Beardsley et al 1955: 136-138). Until a seasonal round of wandering can be reconstructed, and more evidence relating to technology and food resources is found, it would be foolish to further restrict the interpretation.

A lifeway based on large and small game, collecting of vegetable foods, and perhaps exploitation of stream resources apparently permitted the Pinto groups to exist in the area without resorting to food grinding, a technique well established both to the east and west. Resemblance of scraper types to older assemblages (Lake Mohave, Death Valley I) and resemblances in site usage to these groups, is interpreted as the archaeological expression of a cultural core with time depth, in other words, a tradition.

The h' 'zon that intersects this tradition and marks the Pinto phase is the advent of the stemmed, indented base points commonly called Pinto points. In 1953 Lister suggested that this widespread point type was a possible horizon marker of the Middle Period (post big game hunting and pre-ceramic) in a large area of western North America. He summarized the distribution and dating of these points. They did not show the tight dating reliability that a reliable horizon marker should, nor did their pattern indicate their point of origin and direction of spread. Subsequent work has provided more dating on the points, falling within the range Lister outlined.

The above interpretation envisions a cultural core that, through time, tends to remain intact, manifested as a tradition. It envisions culture change as partly adaptive, and partly historical. Changes in the core would, for the most part, be expected to result in adaption; changes in the rest of the culture may or may not be adaptive. The acceptance of the stemmed, indented base projectile points into a tradition where projectile point styles had been locally limited in distribution is an example of the latter.

This cultural core is inclined to remain in equilibrium until a changing environment or contact with a new technology provides a stimulus to change. The key to this stability in the Pinto phase is the lack of emphasis on a major item of technology, food-grinding implements. Without knowing the specific functions of these artifacts, the fact remains that at a point in time where specializations based on this artifact were well established to the west, on the southern California coast (Warren, True and Eudey 1961:25), and to the east in the Cochise site of Arizona (Sayles and Antevs 1941), they are not integrated into a basic position in the Pinto phase assemblage. Corn Creek (Williams and Orlins 1963) shows that such a specialization was known in the immediate area, probably just prior to the Pinto phase. Whole-hearted adoption of this item of technology, however, would indicate a change in the culture core, thus the conclusion is that the environment permitted a generalized hunting-gathering economy to persist locally. The culture is envisioned in a situation of choicemaking. The items of technology, the grinding tools, were available to them and were used to a small extent, but not integrated into a position where the economy was dependent on them.

The Pinto phase can be seen as probably the final time period in a tradition in western prehistory that can be traced back about 10,000 years to the Lake Mohave and Death Valley I surface finds. Documentation for the entirety of the period does not exist; so it remains a hypothesis, to be tested in the southern California-Nevada deserts. In a strictly local sequence, this tradition is not continuous in Las Vegas Valley, because Corn Creek is interpreted as a specialization based on food-grinding and is not part of the tradition. The hypothesis views Corn Creek as intrusive, and would look to local environmental changes that made the Lake Mohave-Pinto tradition locally non-adaptive.

The interpretations of the Tule Springs surface locality take the form of a series hypothesis for testing, rather than accomplished fact.

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EXPLANATION OF PLATES

Plate 1. *a,* Survey area I from gravel ridge over the caliche rubble surface toward Vegas Wash and the Sheep Mountains; *b,* survey area III looking WNW at artifact-bearing gravel ridge. Wash erosion through underlying sediments in foreground; *c,* campstones. Datum area 2, Site A, (at bone exposure) 264' 20° NW of Datum 2A. Surface area 2. Concentration of limestone cobbles; *d,* survey area IV looking WSW from area IV to Charleston Mountains. Foreground, core tools marked by cairns in the gravel patch.

Plate 2. *a,* Area IX. Limestone cobbles on broken caliche surface. Sheep Mountains in background; *b,* close-up of caliche rubble area IX with IX-20 (Type M-2) *in situ.* Artifact is 12.7 cm. long.

Plate 3. Projectile points. *a-d,* Group A-1, Pinto types; *e-g,* Group A-2; *i-k,* Group A-3; *l-o,* Group A-4. Length of *j* is 5.35 cm.

Plate 4. Projectile points. *a-b,* Group A-5; *c-d,* Group A-6; *e-g,* Group A-7; *h, i ,m, n,* Group A-8; *j, l, o-s,* miscellaneous points, Group A-9. Length of *r* is 3.9 cm.

Plate 5. Knives and miscellaneous artifacts. *a-d,* leaf-shaped knives, Group C-1; *e-i,* lanceolate knives, Group C-2; *j-l* miscellaneous artifacts, Group C-4, (see text for explanation); *m,* V-1, knife fragment; *n-p,* miscellaneous knives, Group C-5. Length of *o* is 5.7 cm.

Plate 6. Knives, choppers, cores. *a-e,* knives, Group C-3; *f,* limestone core, Group D-1; *g-h,* disk-choppers, Group B-1; *i-j,* chert cores, Group D-3; *k,* XI-18, small, broken core. Length of *g* is 4.47 cm.

Plate 7. Scrapers. *a-c,* keeled end scrapers, Group E-1; *d-e,* side scrapers, Group E-2; *f-h,* flake scrapers, Group E-3; *i-j,* convex end scrapers, Group E-5. All actual size.

Plate 8. Scrapers. *a-d,* convex scrapers with steeply retouched working edges, Group E-4; *e-f,* convex scrapers, Group E-6; *g-k,* flake scrapers, with steep edges, but no fine retouching, Group E-7. All actual size.

Plate 9. Scrapers, gravers, drills. *a,* ovoid scraper, Group E-10; *b,* chert scraper, Group E-10; *c,* leaf-shaped scraper, Group E-10; *d-e,* flakes with graver points, Group F-1; *f-h,* scraper-gravers, Group F-2; *i-j,* gravers made on thick flakes, Group F-3; *k-l,* drills with bifacially worked bits, Group G-1; *m,* drill with expanded base, Group G-2; *n,* bifacial drill, Group G-3. Length of *m* is 5.2 cm.

Plate 10. *a,* mano, top view; *b,* same mano as *a,* side view, Group H-2; *c,* scraper plane, end view showing working edge; *d,* same scraper plane as *c,* bottom view, Group J-1. Length of *c* is 9.91 cm.

Plate 11. *a,* scraper plane, top view showing working edge; *b,* same scraper plane as *a,* side view; *c,* scraper plane, side view; *d,* same scraper plane as *c,* bottom view. All Group J-1. Length of *c* is 7.74 cm.

Plate 12. *a,* cobble scraper, top view; *b,* same cobble scraper as *a,* front view; c, cobble scraper, top view. All Group J-2. All actual size.

Plate 13. *a,* cobble scraper, top view; *b,* same scraper as *a,* front view; Group J-2; *c,* scraper, top view; *d,* same scraper as *c,* side view; Group J-3. All actual size.

Plate 14. *a,* cobble hammerstone, top view; *b,* same hammerstone as *a,* side view, Group K-1; *c,* cobble chopper, side view; *d,* same chopper as *c,* top view, Group L-1. All actual size.

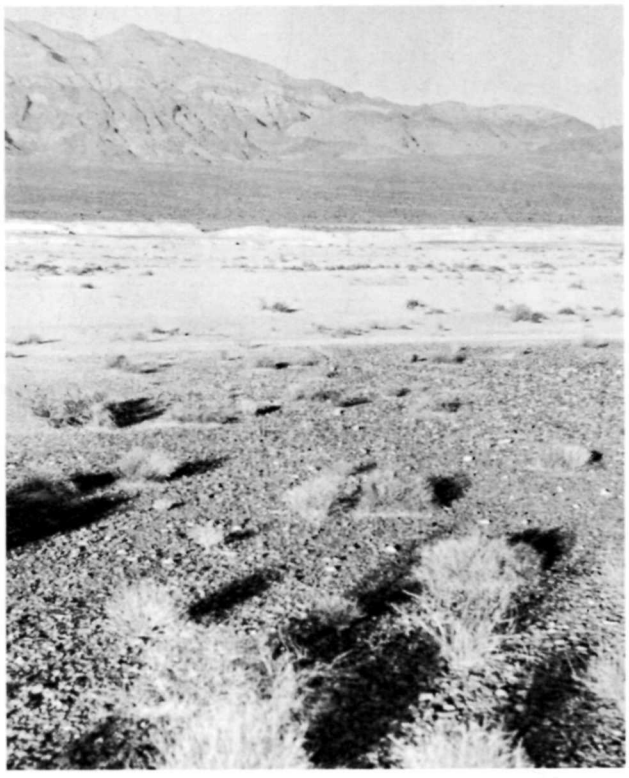
Plate 15. *a,* cobble chopper, top view; *b,* same chopper as *a,* side view, Group L-1; *c,* flake chopper, top view; *d,* same chopper as *c,* bottom view, Group L-2. All actual size.

Plate 16. *a,* flake chopper, top view; *b,* same chopper as *a,* side view, Group L-2; *c,* crude biface, top view; *d,* same biface as *c,* side view, Group M-1. Length of *c* is 9.2 cm.

Plate 17. *a,* crude biface, top view; *b,* same biface as *a,* side view; *c,* crude biface, top view; *d,* same biface as *c,* bottom view, all Group M-1. All actual size.

Plate 18. *a,* large limestone flake, bifacially retouched, top view; *b,* same flake as *a,* side view, Group M-2; *c,* large limestone flake, unifacially retouched on end and face opposite the bulb of percussion, top view; *d,* same flake as *c,* side view, Group N. All actual size.

Plate 19. *a,* pointed cobble, top view; *b,* same cobble as *a,* side view, Group O-1; *b,* pointed cobble, top view; *d,* same cobble as *c,* bottom view, Group O-2. All actual size.



A



B

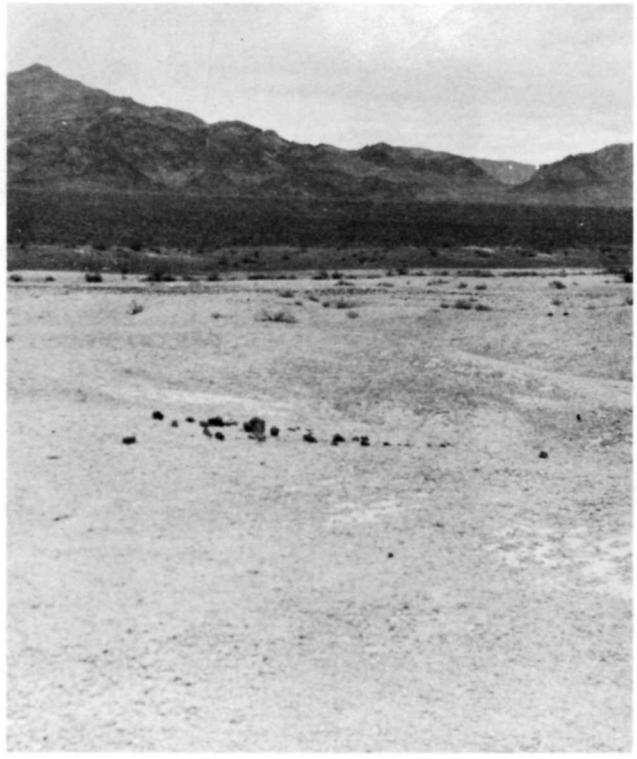


C



D

Plate 1



A



B

Plate 2



A



B



C



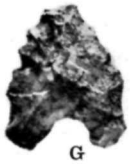
D



E



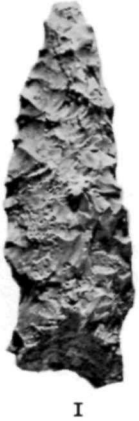
F



G



H



I



J



K



L



M



O



N

Plate 3

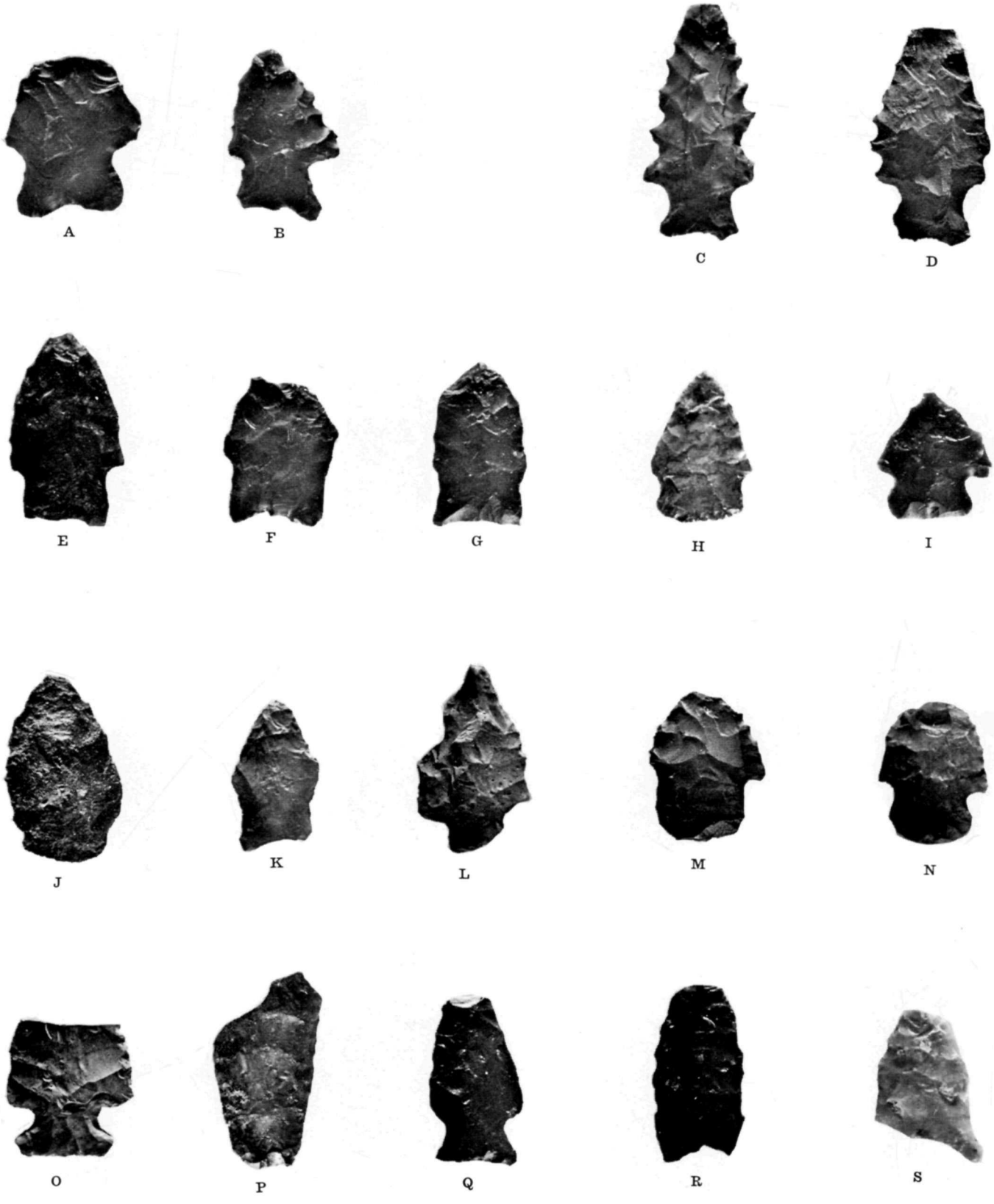


Plate 4



A



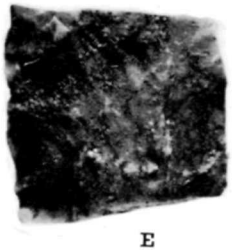
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C



D



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I



J



K



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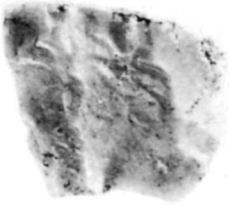
M



N



O



P

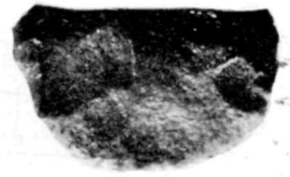
Plate 5



A



B



C



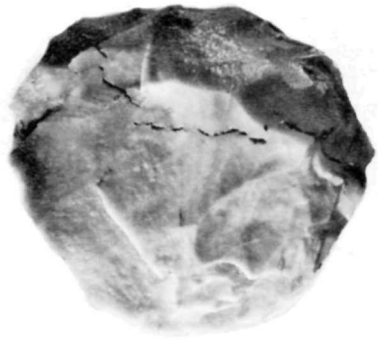
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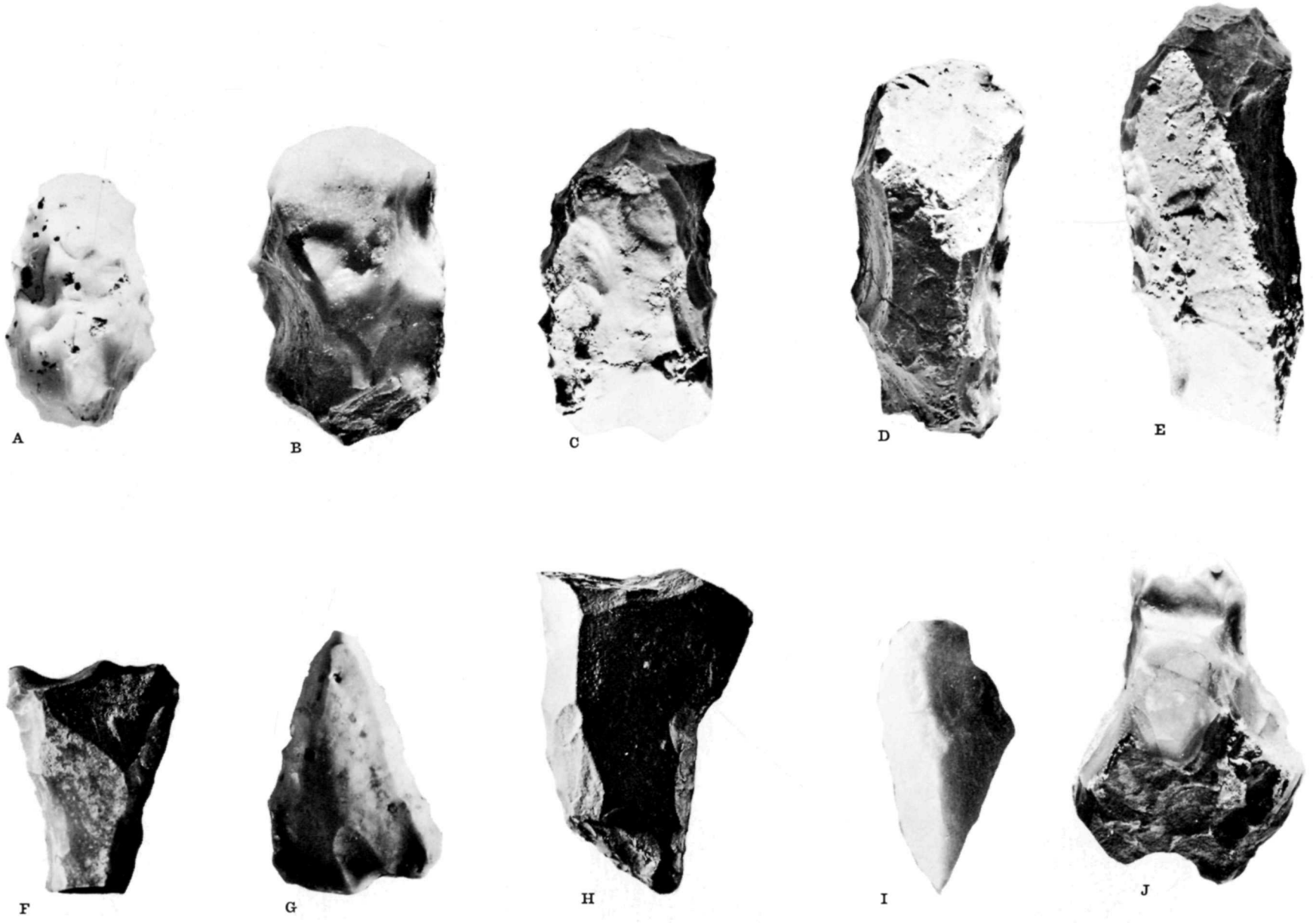


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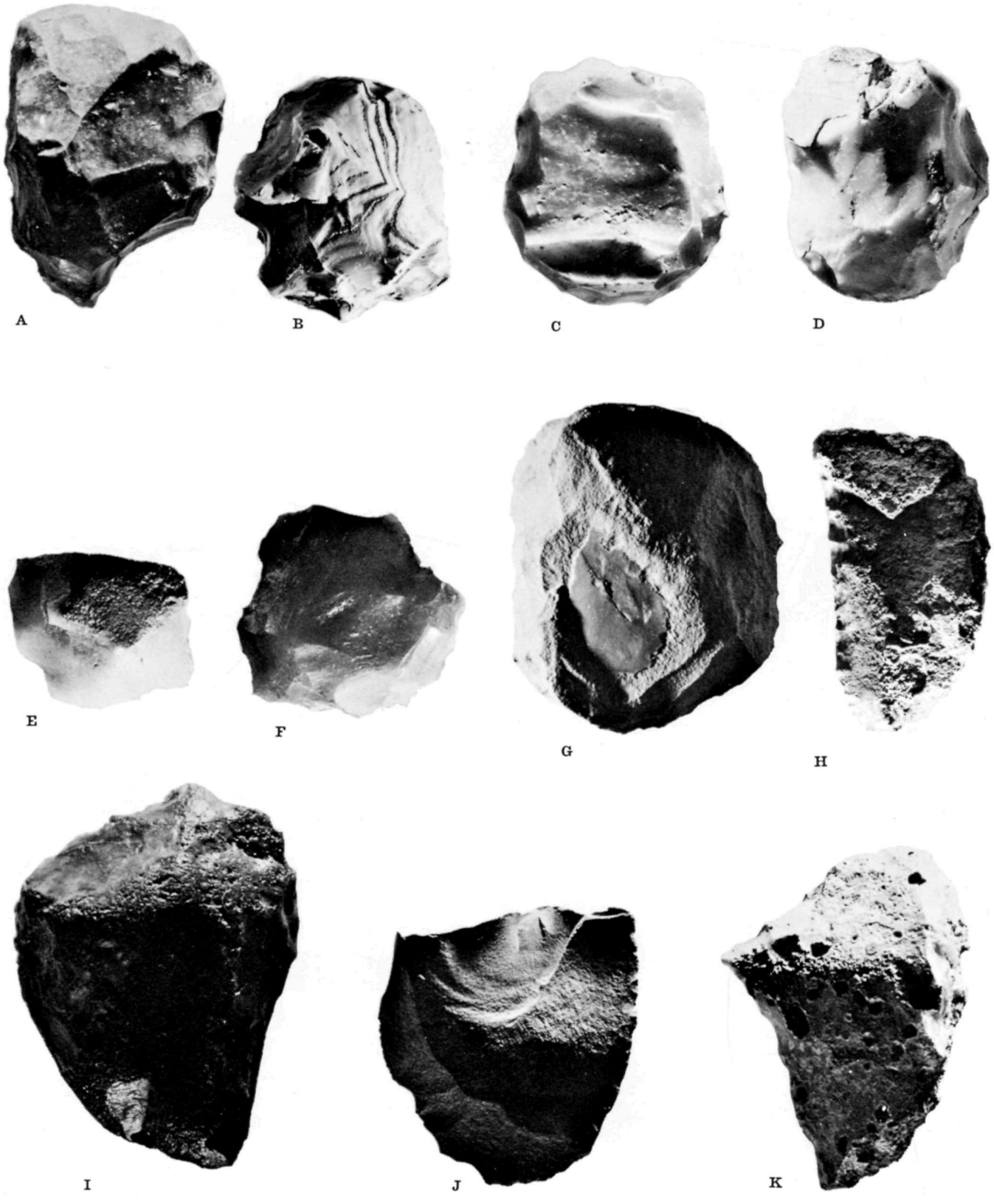


Plate 8



A



B

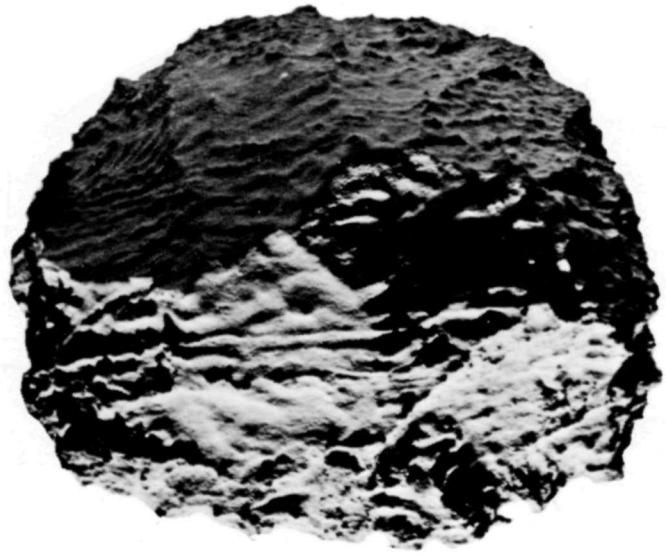


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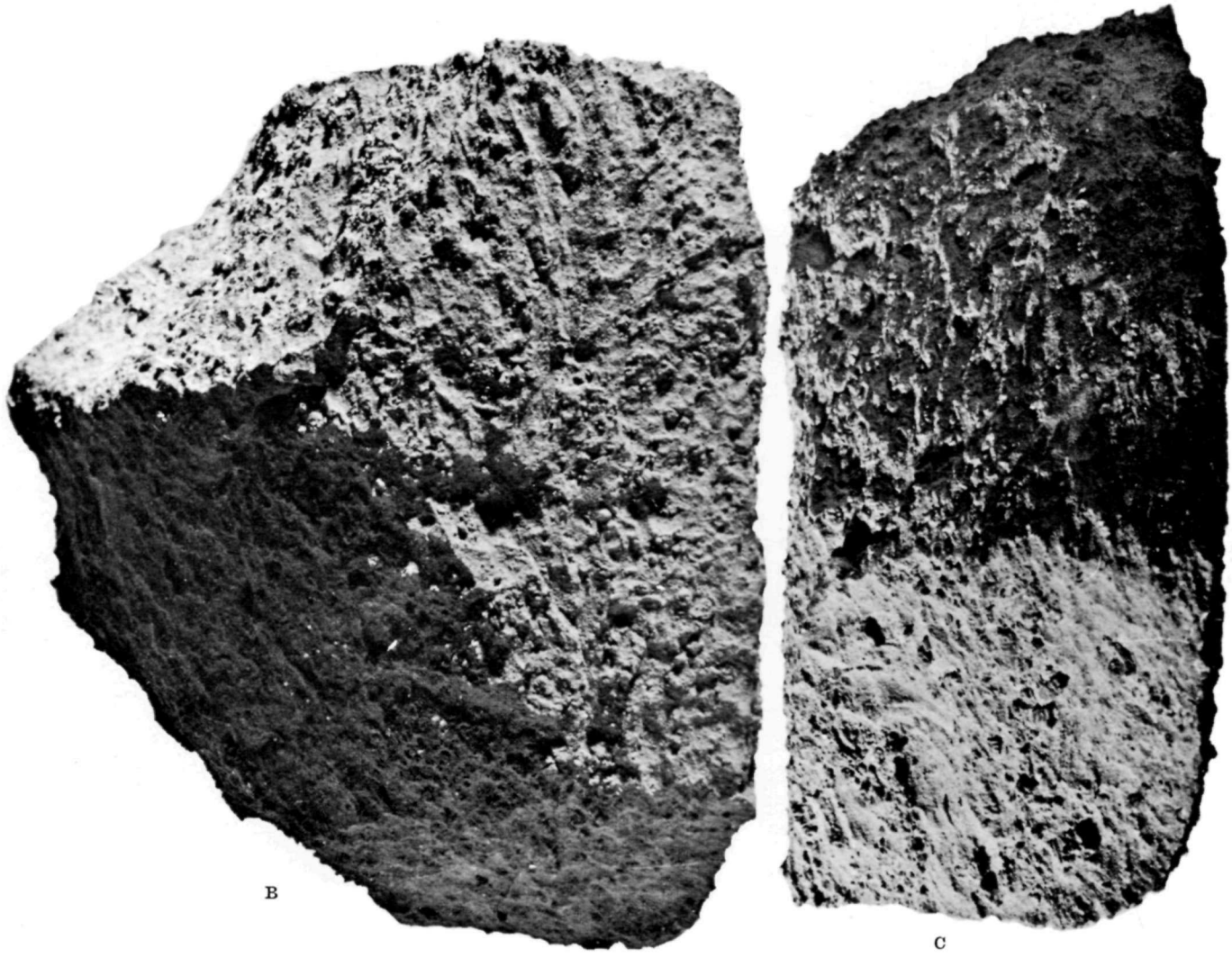


D

Plate 11



A



B

C

Plate 12



A



C



B

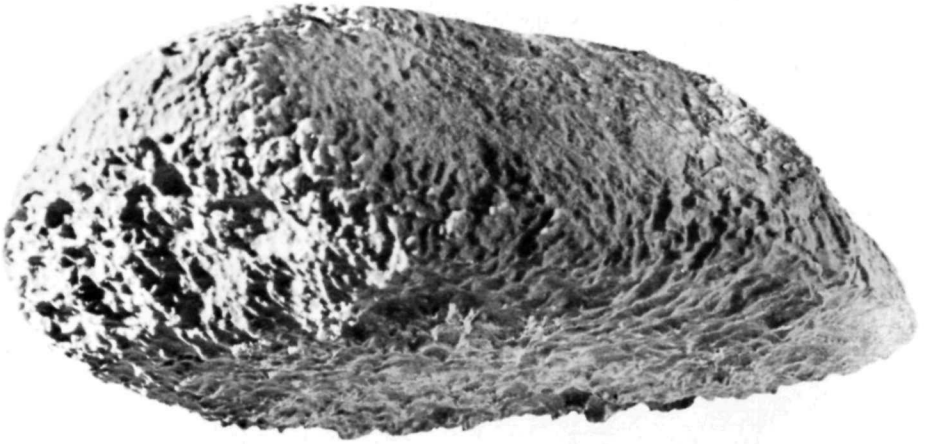


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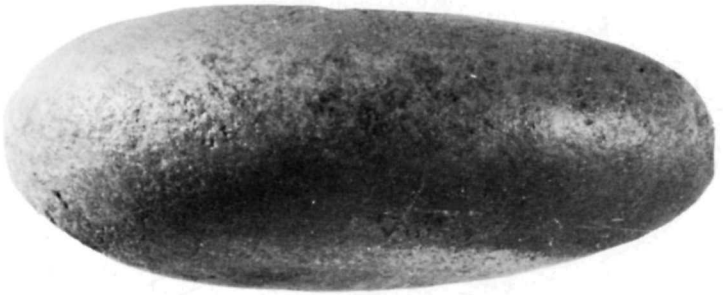
Plate 13



A



C

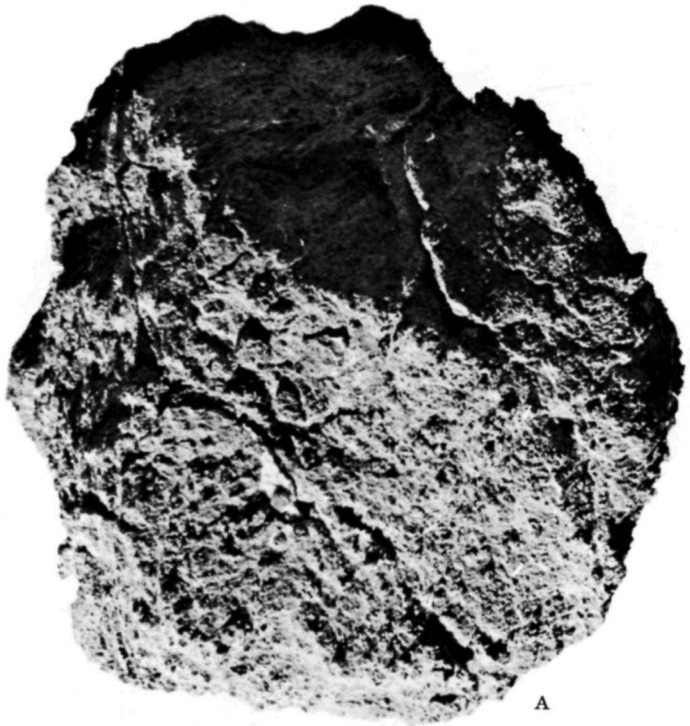


B



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Plate 14



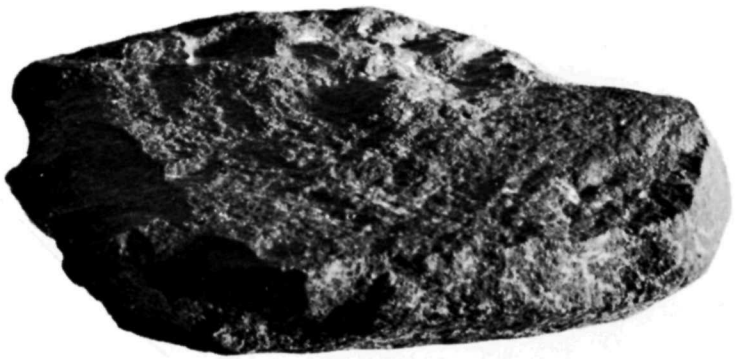
A



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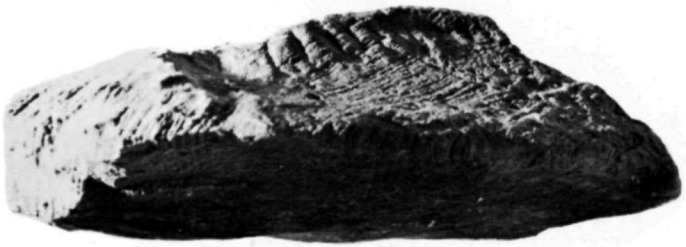


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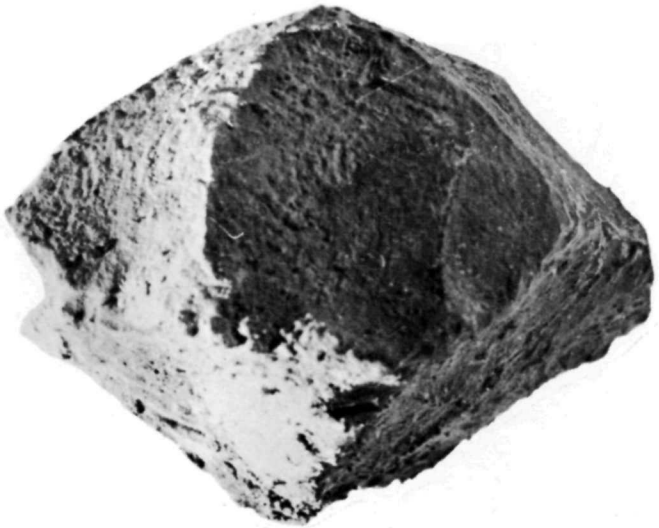
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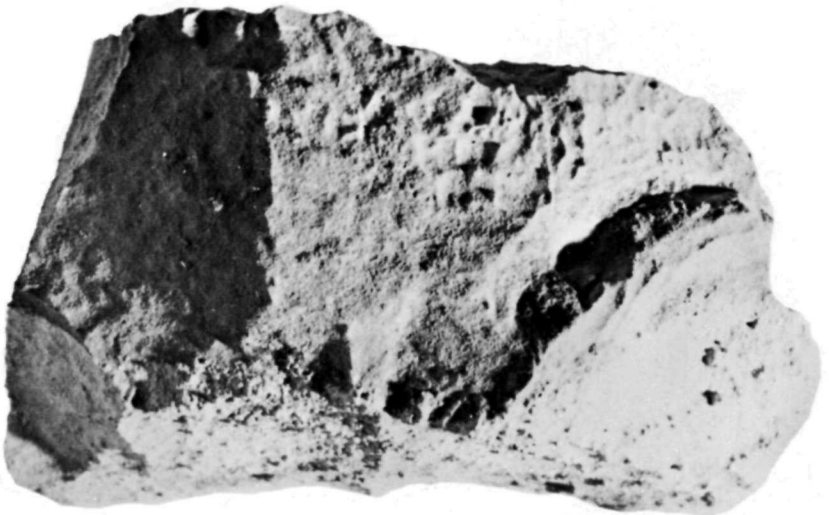
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Plate 16



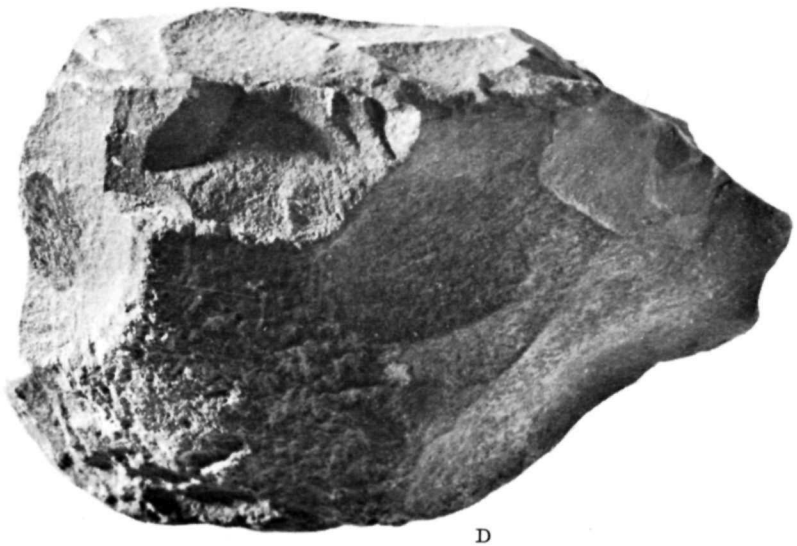
A



B



C



D

Plate 17



Plate 18



Plate 19

NEVADA STATE MUSEUM ANTHROPOLOGICAL PAPERS

No. 1. Notes on Paviotso Material Culture, Number 1. By Margaret M. Wheat (1959), 13 pp., 25 figs. (out of print)

No. 2. Notes on Some Paviotso Personalities and Material Culture. By Robert F. Heizer (1960), 16 pp., 9 pls. (out of print)

No. 3. Stuart Rockshelter: A Stratified Site in Southern Nevada. By Dick Shutler, Jr., Mary Elizabeth Shutler, and James S. Griffith (1960), 36 pp., 10 pls. 10 figs. (out of print)

No. 4. Honey Lake Paiute Ethnography. By Francis A. Riddell (1960), 87 pp., 5 pls., 2 maps. $1.50. postage, 10¢.

No. 5. Lost City, Pueblo Grande de Nevada. By Richard Shutler, Jr. (1961). 87 pp., 110 pls., 2 figs., 29 tables. $3.00. postage, 15¢.

No. 6 Washoe Economy. By John Andrew Price (1962), 74 pp., 5 pls. $1.50. postage, 10¢.

No. 7. Archaeological Survey in Southern Nevada. By Richard Shutler, Jr .and Mary Elizabeth Shutler (1962), 38 pp., 35 pls., 2 maps. $1.50. postage, 10¢.

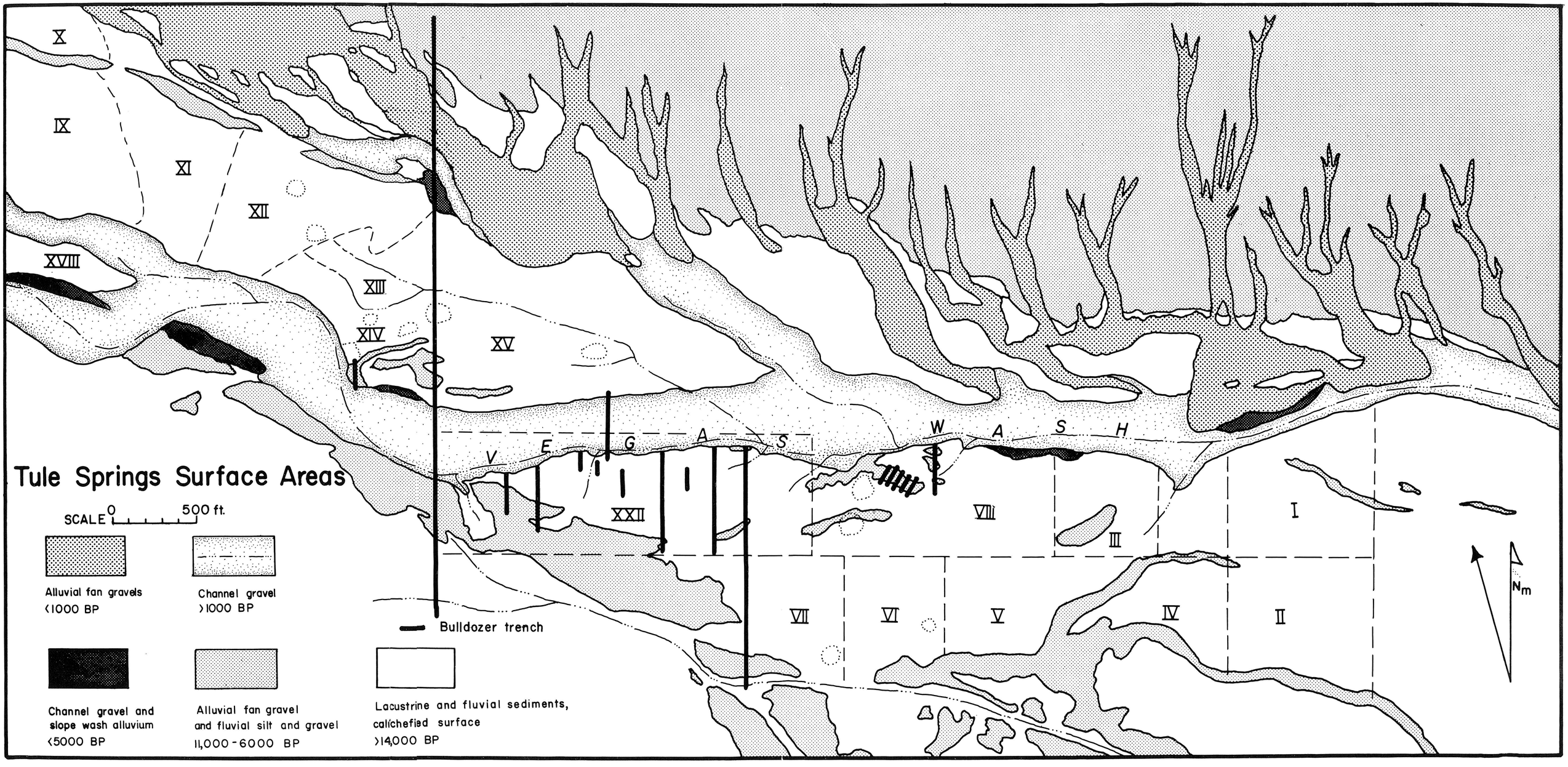
No. 8. Archaeological Survey in Southwestern Idaho and Northern Nevada. By Donald R. Tuohy (1962). 120 pps., 39 pls., 5 maps, 4 figs. $3.50. postage, 15¢.

No. 9. 1962 Great Basin Anthropological Conference Papers, Eleven Papers (1963), 112 pp., 4 pls. $1.50. postage, 10¢.

No. 10. The Corn Creek Dunes Site. By Pete A. Williams and Robert I. Orlins (1963), 65 pp., 13 pls. 1 fig., 4 maps, 15 tables. $1.25. postage, 10¢.

No. 11. Deer Creek Cave. Elko County, Nevada. By Mary Elizabeth Shutler and Richard Shutler, Jr. (1963), 70 pp., 9 pls., 7 figs., 5 tables. $2.50. postage, 15¢.

No. 12. Tule Springs Archaeological Surface Survey. By Margaret L. Susia (1964), 34 pp., 19 pls., 2 figs., 4 tables. $2.50. postage, 10¢.


Tule Springs Surface Areas
SCALE 0 500 ft.
Alluvial fan gravels
<1000 BP
Channel gravel
>1000 BP
Channel gravel and
slope wash alluvium
<5000 BP
Alluvial fan gravel
and fluvial silt and gravel
11,000-6000 BP
Lacustrine and fluvial sediments,
calichefied surface
>14,000 BP
Bulldozer trench
VEGAS
WASH
X
IX
XI
XII
XVIII
XIII
XIV
XV
XXII
VIII
III
I
VII
VI
V
IV
II
Nm

INDEX MAP

TULE SPRINGS

NEVADA

1 2 3 4 5
MILES

Contour interval
500 FEET

N

Dry Lake

LAS VEGAS VALLEY

SHEEP RANGE

LAS VEGAS RANGE

5,000

4,000

3,000

Corn Creek

Gass Pk. 6943

TULE SPRINGS AREA

2,000

Charleston Pk. 11,910

Las Vegas

M.L. Susia