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The Archeological Excavations at Willow Beach, Arizona 1950

By ALBERT H. SCHROEDER

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The University of Utah Anthropological Papers are a medium for reporting to interested scholars and to the people of Utah research in anthropology and allied sciences bearing upon the peoples and cultures of the Great Basin and the West. They include, first, specialized and technical record reports on Great Basin archeology, ethnology, linguistics, and physical anthropology, and second, more general articles on anthropological discoveries, problems, and interpretations bearing upon the western region, from the High Plains to the Pacific Coast, insofar as they are relevant to human and cultural relations in the Great Basin and surrounding areas.

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AUTHOR'S NOTE

This report was completed in 1952. Aside from a few notes and references to more recent publications, no attempt has been made to correlate the material with more recent publications relating to the cultures involved. This applies particularly to the discussions on the Fremont and Desert cultures.

PREFACE

In 1936 the first investigation of Willow Beach was undertaken (Fig. 3). An area 40 by 38 ft. was excavated to a depth of 9 1/2 ft. by the C.C.C. with M. R. Harrington as collaborator for the National Park Service. The party was in the field from March 18 to April 8, and again from September 8 to November 13, 1936. Nine hundred and twenty-seven specimens were cataloged from these excavations and six human burials and one dog burial were recovered. In a brief report on this work, Harrington (1937, 86-9) indicated that the lower levels were preceramic in content, the projectile points being similar in workmanship to those of the Basketmaker II culture. Above this material was a barren layer averaging 2 ft. in thickness. Resting on this barren layer were 4 ft. of deposits containing pottery and points which he compared to the early Pueblo culture. Near to and on the surface, Paiute points were found, representing the last occupation of the site.

During the 1947-48 excavation program of the National Park Service, two additional tests were made under the direction of Gordon C. Baldwin, archeologist at Lake Mead National Recreation Area. One excavation was set down along the northwest face of the 1936 excavations. It was about 25 ft. wide and extended 15 ft. to the northwest to a depth of 8 1/2 ft. A second test about 20 ft. wide was run into the terrace from the river side for a distance of about 15 ft. In his MS. report on this work Baldwin (1948, 67, 70) stated that though there was evidence of stratification, frequently the lines of demarcation between layers were indistinct, due mainly to the soft sand and ash contents of the deposits.

The project herein discussed took to the field February 8, and completed operations April 14, 1950. Two tests were conducted in the course of the work. The first was set down and extended to the northwest of the 1947-48 excavations. Cultural material was recovered to a depth of 1.5 m. Below this, tests revealed sterile earth to a depth of 3.5 m. below datum, beyond which no further testing was conducted. The second test was laid out on the southeast edge of the 1936 excavations and it was here that the great majority of material and information was gathered. Excavations reached a depth of 4 m. in the deepest spot, and, throughout the trench, stratigraphy was clearly evident (Figs. 39-40).

It is with sincere appreciation that I acknowledge the aid and technical assistance rendered me by those indicated below. Without their

generous help, this report would have been seriously lacking in detailed information. To Erik K. Reed, then Regional Archeologist, Region Three, National Park Service, for his constructive criticism; to Harold S. Colton, former Director of the Museum of Northern Arizona, who generously offered some of his time and the use of the ceramic laboratory and comparative materials for study; to Russell K. Grater, former Park Naturalist, Lake Mead National Recreation Area, for his many hours spent in photographing the artifacts; to George F. Baggley, former Superintendent, Lake Mead National Recreation Area, and his staff for their assistance in the administrative tasks connected with the project; to the late William S. Russell, photographer, Bureau of Reclamation, Boulder Canyon Project, for the pictures he took for record use; to Edward T. Schenk, geologist, formerly with the Bureau of Mines, Boulder City, for his tests and mineralogical determinations; to Anna O. Shepard, Ceramic Laboratory, Carnegie Institution, Boulder, Colorado, for her comments on the ceramic experiments; to Edwin D. McKee, formerly of the Museum of Northern Arizona, who edited the stratigraphic section; to Robert R. Miller, Associate Curator of Fishes, Museum of Zoology, Ann Arbor, Michigan, for his comments pertaining to fish vertebrae recovered from the site; to Malcolm Farmer, former Director of the San Diego Museum of Man for his determination of the origin of the steatite and asphaltum specimens; to Henry W. Setzer, Associate Curator, Division of Mammals, Smithsonian Institution, for his identifications of faunal material; to Alden H. Miller and his associates of the Museum of Vertebrate Zoology, University of California, and Claude W. Hibbard, of the Museum of Paleontology, University of Michigan, for additional identifications of faunal material; to Howard R. Hill, of the Los Angeles County Museum, for his shell identifications; to Volney H. Jones, University of Michigan, for his report on the vegetal material; to the Forest Products Laboratory, Madison, Wisconsin, for their identification of the charcoal specimens; to Ralph A. Sawyer, Rackham School of Graduate Studies, and James B. Griffin, of the Museum of Anthropology, Ann Arbor, Michigan, for their efforts in arranging for the dating of the charcoal; and to George R. Beckstead and Wesley W. Sheppard for their assistance in the actual excavations.

Additional ceramic tests were undertaken at the Mohave Ceramic Shop in Boulder City, and I wish to express my appreciation to William Baird, the owner, for his cooperation and interest in the project. The results of all ceramic experiments are on file at the Museum of Northern Arizona.

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Amargosa point from 1936 excavations

HISTORICAL BACKGROUND

Willow Beach, a prehistoric camp site excavated by the National Park Service, is located on a river terrace 15 mi. south of Hoover Dam on the Colorado River (Figs. 1, 36). This site was occupied sporadically over many years by several groups of people. It was not the permanent village of a sedentary group.

The materials and tools left by the various people who camped at Willow Beach were periodically covered by sediments and silts laid down by the Colorado River during seasons of flood. As a result, the different levels of human occupation were separated by sterile flood deposits, a situation which simplified the task of excavation and interpretation.

This site probably existed because any travel between the high plateau area of the Arizona Strip and the Mohave Desert of southern California was channeled by geographical features through a restricted area, and at this point a good campsite happened to be available. This travel lane developed into a trade route which in ceramic times joined with the Mohave-Pacific trail across southern California.

A western variant of the Basketmaker II people, who appear to have had many cultural affinities with the Fremont culture of eastern Utah, were the first to occupy this site. Evidence of their culture has been recorded in quantity on the Shivwits Plateau and to a lesser degree in the lower Grand Canyon and in the Muddy and lower Virgin river valleys. In their search for food and game these western Basketmakers apparently crossed the Colorado River at the mouth of the Virgin River into the territory of present day Arizona as did historic tribes and early Anglo-American explorers in the 1800's.

The Colorado River between the mouth of the Virgin River and Willow Beach, prior to the construction of Hoover Dam, flowed through deep gorges. Foot travel through them would have been almost impossible. To avoid this area a traveler would have had to cross the Colorado at the mouth of the Virgin River and proceed up Detrital Wash a short distance before he could turn west to again reach the Colorado River below the mouth of the gorge (Black Canyon). The first spot visible after leaving Detrital Wash and going over the low hills is the bend of the Colorado River just below Willow Beach. This detour from the mouth of the Virgin would amount to about a day's travel with no water along the route, and the site of Willow Beach must have been welcome. During their sporadic visitation to this site, the western Basketmakers made contact with the

Amargosa people living to the west, who also may have occasionally camped at Willow Beach since a few of their points and roasting pits have been uncovered there. As time went on the Basketmakers visited the site less frequently and the Muddy and lower Virgin river valleys to the east became their western border, while groups from west of the Colorado River made more and more use of Willow Beach. Before pottery appeared at this campsite, the southern California people were the sole visitors to the site.

The earliest pottery types introduced to Willow Beach were pre-A.D. 750 intrusive types that came from the western Basketmaker III people, who occupied the Muddy River and lower Virgin valleys as well as the Shivwits Plateau. Contemporaneous types also came from northwestern Arizona from the Cerbat branch, a group that lived to the south and east of Willow Beach. Apparently both of these groups visited the site during this phase.

After A.D. 900, however, a people herein called the Amacava used the site more than did any other group. They manufactured pottery and ranged the area from the Mohave Desert to Willow Beach from A.D. 900 to A.D. 1150, and perhaps before as a non-ceramic group. The occurrence of lower Virgin River Pueblo II pottery types, arrow points and flexed burials at Willow Beach indicates that the Pueblo-like people of southern Nevada actually visited the site on a number of occasions. Trade pieces from the Cerbat branch also are in evidence.

During this period the Amacava on the Mohave Desert, in contact with the California coast, imported objects made of steatite, Olivella shells for beads, and asphaltic siltstone, an adhesive. Trade relations of these people flourished, Willow Beach being their northern terminus on the Colorado River. Undoubtedly, many a lower Virgin River valley and Cerbat merchant haggled with an Amacava trader over merchandise at this site. After purchasing their goods, these neighboring merchants probably traded much of their material farther inland into Utah and Arizona.

Sometime after A.D. 1100, however, this trade was disrupted by the influx of a new group from the north. This intrusion, believed to be the first appearance of Shoshonians, caused an unbalance which forced the Pueblo people of southern Nevada to move east, probably toward the Grand Canyon, out of reach of the Amacava. About the same time the Amacava moved off the Mohave Desert onto the Colorado River below present Davis Dam, either because of the intrusion of the new people or, perhaps, to replace their lost market with new buyers--the Prescott

branch of the Patayan who lived up the Bill Williams River east to Prescott, Arizona, and the Hohokam of southern Arizona.

Thus, Willow Beach, an active trading site in ceramic times, faded out of existence when the ancestors of the modern Paiutes came in from the north. These Shoshonians, apparently, were no market for the goods offered by the Amacava. However, the Amacava, the probable ancestors of the modern Mohaves, continued as the traders of the western desert after A.D. 1150 and imported California coast material into the Parker-Needles area on the Colorado River into historic times.

The following historical briefs are included to round out the history of the region.

1604. Oñate was the first to travel near northwestern Arizona on his expedition to the Gulf of California, when entering the Colorado River Basin at the mouth of the Bill Williams River. Just north of here he encountered the Amacava (Mohave) Indians. He remarked that they gave his party maize, beans and calabashes and that they made use of mesquite beans. From here he went south to the Gulf of California (Hammond, 1926, 63).

1776. Padre Garces came to the Colorado River in the vicinity of Needles, California. He encountered the Jamajab (Mohave) Indians at Punta de los Jamajabs (Ft. Mohave) and noted that these Indians extended south mainly on the east side of the river to Sierra de San Ildefonso (Mohave Range), about 14 leagues (35 mi.) north of the Bill Williams River. He estimated the population at about 3000 and remarked that their language was similar to that of the Alchedun (Halchidhoma), their southern neighbors. Both of these groups today are included among the Yuman speakers. We are indebted to Garces for the first description of the culture of the Mohaves. He stated at the time of his visit that the women wore short scanty petticoats of bark while the men went about nude, both occasionally using woven rabbit and beaver blankets, the furs of which were obtained from tribes to the west and northwest. These people wore their hair long and placed a sticky mud on it. This practice, common along the Colorado River of western Arizona, was primarily for the purpose of removing vermin that might be in the hair. Garces also stated that these people painted themselves with black or red paint and many were seen with other colors.

When learning of his desire to make a trip out to the coast these Indians offered to guide him as they said they had a knowledge of the route

and the people along it. This was undoubtedly true as Garces saw pieces of shell that had been traded from the coast, and later, on his journey to the coast, he actually encountered groups of Mohave traders. He was informed that some of these articles were traded in turn to the Havasupais, farther east, in exchange for leggings, mantas and cowhides. He noted that the Yabipais Tejuas (western Yavapais) came to Mohave rancherias, that the Mohaves were friends with the Yumas and enemies of the Yabipais Cuercomaches (probably a Paiute band known in the 1870's as Kwiengomats), Jaguallapais (Walapais) and Jalchedunes (Halchidhomas). As a result of his observations along the Colorado, Garces stated that south of the Mohaves the Indians did not hunt because they had many provisions (agriculture), and that north of the Mohaves the people subsisted on game and forest fruits because they lacked provisions. Oddly enough, he mentioned fields of wheat among the Mohaves at this date. This European plant was probably introduced to the Mohaves through trade with more southern Indians to whom the Spanish had given wheat.

Though Garces referred to these Indians as Jamajabs, he stated that the Halchidhomas and Cocomaricopas (Maricopas) called them Cuesninas or Cuisnurs, also spelled Culisnurs and Culisnisna. This, however, was an error on Garces' part as these names were commonly applied to the Havasupais.

He also noted that the Payuchas (Paiutes), on and near the Colorado River, were north of the Chemeheuis and Yavapais at that time, and that the Walapais were east of the Colorado River. Of the latter he remarked that they mainly hunted game and made use of the mescal plant. No crops were seen in their region. They dressed in antelope skins and Hopi shirts. Belts of Castile, awls and other things they obtained in trade from Hopis. He observed them using water ollas that seemed to be made of wood smeared with gum. He also noted that when Walapai groups first met they had a custom of making what appeared to be a welcoming address. The western Yavapais seemed to have been their main enemy (Coues, 1900).

1810. A group of Indians, assumed to have been the Mohaves, made raids on the coastal Spanish to steal horses (Sullivan, 1934).

1819. Lt. Gabriel Moraga, son of the first comandante of San Francisco, made a punitive expedition against some Mohave Indians (who had been trading at San Buenaventura, California) probably near the Nevada section of the Colorado River according to some authorities (Chapman, 1921).

1826. Sylvester Pattie and some men went down the Gila River and up the Colorado River to the Mohaves. From there they proceeded north to the Virgin River and beyond (Hill, 1923; Flint, 1930).

1826. A few months later, in August, Jedediah Smith entered southern Nevada near present Panaca on an old Indian trail, and he continued down the Muddy River to its junction with the Virgin River. On the Muddy he met the Pa Ulches (Paiutes). A short trek down the Virgin brought him to the Colorado River which he crossed to the south side. He followed the river for four days and came to a valley that opened out 5 to 15 mi. in width. Here he met the Ammuchabas (Mohaves). Among them he noted Indian deserters from the Spanish missions of California who had brought horses with them. The Mohaves told him that some Americans and Spaniards had recently passed through, having come up from Sonora by way of the Gila and Colorado rivers. These undoubtedly were Pattie and his party. While here, the Mohaves gave Smith corn and beans (Dale, 1918; Sullivan, 1934).

1829. Antonio Armijo led an expedition from Santa Fe, up the Rio Chama through Largo Canyon to the San Juan River. They went west passing north of the Hopi country to the Crossing of the Fathers where they crossed to the north side of the Colorado River. They proceeded across southern Utah to the Virgin River which they followed, more or less, into the Paiute country in the vicinity of the Muddy River. From here they went west to a stopping place they called Laguna del Milagro, probably Las Vegas, and then proceeded across the desert to Los Angeles. This route later was called the "Old Spanish Trail" (Bulletin of the Geographic Society, Paris, 1835).

1829. Ewing Young followed this same trail down the Virgin River into the Muddy River region where he turned southwest to the road followed by Smith. In the following year he and Wolfskill traveled the same route to the Mohave villages on their way to Los Angeles (Cleland, 1922, 82-6).

1844. Fremont and Kit Carson traveled over the Old Spanish Trail from west to east and camped at Las Vegas de Quintana. They proceeded on to the Muddy and Virgin rivers where the Indians (Paiutes) killed one of their men (Fremont, 1845, 165; 1887, 316).

1847. The Mormons went over this route from Utah to Los Angeles on a seed and grain gathering expedition. In the following year Boyle and Shaw guided the first wheeled group and some soldiers of the disbanded Mormon Battalion from Los Angeles to Salt Lake over this trail. It soon

became known as the "Mormon Trail" (McClintock, 1921, 53-5; Kelly, 1930, 87).

1849. The Paiutes in the Muddy and Virgin river area were observed raising corn, squash and pumpkins, using a crude irrigating system. It is thought irrigation was introduced by the Mexicans who had traveled this route since 1829 (Van Dyke, 1894).

1853. In August Jose Gallego with Mr. Beale noted Indian huts of a crude nature (probably Paiute) on the Muddy River. They also observed a large wicker basket with a young child hidden in it. (Heap, 1854, 99-100).

1855. The first settlement of the area was made by the Mormons at Las Vegas, which previously had been a camping site. However, they left there in 1858 when the Indians became oppressive (Mack, 1936, 163; Fremont, 1845, 165; McClintock, 1921, 105-8, 118).

1857. Lt. Ives made his trip up the Colorado by boat. He met Mohaves on first entering the Mohave Valley from the south. The men wore strips of cotton about their loins and the children were nude. The women wore bark petticoats with projections on the hip at either side on which young children sat and clung to their mothers. The infants were carried in a wooden arrangement like an old fashioned watch case, which could conveniently be carried or hung on a tree. These Indians had corn and beans to trade, seven or eight varieties of the latter. They had a few pumpkins and raised watermelons, but did not store crops, with the result that if the Colorado did not flood in one year they had a famine. Ives remarked that game wasn't seen in the valley and that fish were scarce. The main chief had his face painted black with a red stripe down the middle. When Ives first met them they held a general smoke. He learned that though some of these people may have been rich in their own economy, their fortunes might easily change, as they had a custom, when a relative died, of burning their own property as a token of their honor to him. The Mohaves crossed the river using a raft which was often guided by swimmers. They were apparently well acquainted with areas some distance away as they knew of the salt stream (Virgin River) beyond the great bend of the Colorado River. These people were friendly with the Chemehuevis and Yumas and were enemies of the Cocopas, Paiutes, Pimas, and Maricopas. Ives learned of five great chiefs among them. He also learned that the villages extended between Pyramid Canyon and Needles.

In the next valley above, Cottonwood Valley, only a few scattered Mohave families were seen. Ives saw no fields and these Indians did not have any corn or beans to bring for trade. When Ives left this valley the

Mohaves cautioned him about the Paiutes, who were first seen after he entered the mouth of Black Canyon. Farther north, 4 mi. above Roaring Rapids, he camped on the west bank at his Camp 58, a little above Willow Beach. From here he went on to the head of navigation and returned south to his Camp 59 where he proceeded across northern Arizona to the Walapai country.

Ives encountered Hualpais' (Walapais) fires and tracks on the eastern side of the Cerbat Mountains and encountered a group of them at Peacock's Spring. It was here that he observed deer and antelope. In Diamond Creek Canyon he noticed crudely constructed huts in sheltered niches or beneath projecting rocks (Ives, 1861).

The numerous later expeditions will not be discussed, as the descriptions from Garces (1776) to Ives (1857) give a picture, sufficient for present purposes, of the cultures and groups of the area, as observed through the eyes of the early explorers.

METHODS

A horizontal grid was used in which each section measured 1 by 2 m. Each northwest-southeast grid line was given a number and those crossing at right angles were designated by letters. The point where two of these lines crossed on the north corner of a block was used to identify the block: for example, B-6, C-6, D-6, etc. (Fig. 3). The material was removed by artificial levels, each 25 cm. in depth, and the levels were numbered from 1 at datum down to 16 in the deepest test. As these tests were the fourth and fifth excavated in this site, the smaller trench was designated as trench IV and the larger as trench V.

In addition to the above designation, when stratigraphy became apparent in the larger trench, each layer was designated by a letter so that material from the same layer, regardless of varying depth, could be definitely assigned to these natural divisions.

All material was screened, except for one thick deposit of sterile earth which was periodically spot checked, and another deposit at the base of excavations in trench V which contained so many large rocks that hand and trowel work only was possible.

ENVIRONMENT

The site is situated on the east bank of the Colorado River, on a sandy terrace in lower Black Canyon, 15 mi. south of Hoover Dam. The canyon, along this stretch of the river, is lined with rugged mountains and occasionally is broken by side washes that empty into the river (Fig. 1). Along the banks on one or sometimes both sides there are a few narrow sand terraces built up by past floods and wind deposition. These are covered with scattered growths of mesquite, creosote, willow and occasional cactus, and the banks are lined with fairly thick concentrations of arrow brush. The amount of mesquite present today would present a poor harvest for any native group depending upon it for subsistence. The mountains away from the river are even less attractive as far as plant cover is concerned. Scattered creosote is all that is readily noticeable.

Game in the area today consists of small numbers of Nelson bighorn sheep, a few desert deer, some beaver along the river, jack and cottontail rabbits, ground squirrels and desert rats. Duck and geese are fairly common in season and quail are numerous. In addition there are several varieties of lizards, snakes and the desert tortoise.

The practice of agriculture in the immediate vicinity is remote but possible. The few open spots in the canyon are barely large enough to accommodate more than an Indian campsite. The sandy terraces here are from 5 to 30 ft. above the river, most of which are not low enough for crops to obtain subsurface water seepage from the river. Since the site is located in a desert environment at an elevation of about 600 ft., it is not surprising to encounter temperatures well over 100° in the summer. Under such conditions nonirrigated crops would burn up. The 5 in. of annual rainfall that occurs in winter and late summer would be of little value.

TRENCH IV

The deposits in this trench gave no indication of soil stratigraphy except where the culture-bearing zone rested on sterile material at the base of the trench (Fig. 38). Loose sand and charcoal concentrations throughout blended with one another so gradually that it was often difficult to distinguish where one began and the other left off. There was no indication that the flood waters of the river ever reached the cultural level to churn up the deposits, as none of the fine silt that occurred in the lower levels of the second test was present. The sterile hardpan on which the cultural material rested was composed of this silt. The heterogeneous mixture of the cultural deposit was probably caused by wind action and constant trampling over the site by the Indians during occupation periods. In addition, the presence of quantities of thermal fractured rocks from the cooking and roasting pits which occur through these deposits indicates that the occupational surfaces must have been raked over quite often whenever the pits were cleaned out for reuse. As a result, all conclusions pertaining to trench IV are based on comparisons of the material in each level and each artificial block with one another. As will be seen further on, these associations correlate with those of trench V wherein associations are based on definable layers. Since only one line was excavated, the blocks are referred to by letters and the levels by numbers; for example, instead of C-6, level 3, the designation is C-3.

CULTURAL REMAINS OF TRENCH IV

General

The cultural stratigraphy of this trench revealed two definite horizons. The lower levels, resting on sterile soil, contained stone implements only, though the upper portion of this preceramic zone contained a few intrusive sherds in blocks C-3 and F-3 and several in blocks E, F, and G of level 2. The majority of level 1 exhibited probable indigenous pottery (Table 1).

Table 1
Occurrence of pottery

Block	B	C	D	E	F	G
Level						
1	X	X	X	X	X	X
2	O	O	O	I	I	I
3	O	I	O	O	I	O
4	O	O	O	O	S	S
5	S	O	O	S	S	S

X - Indigenous (?) pottery present

I - Intrusive pottery present only

O - No pottery, but other material

S - Sterile, no cultural material

Quantities of burned bone occurred throughout the trench, indicating that the people of both horizons depended heavily upon hunting.

Table 2
Occurrence of burned bone

Block	B	C	D	E	F	G
Level						
1		X		X	X	
2				X		X
3						
4	X		X	X		
5		X	X	X		

Split bone was restricted to the non-indigenous ceramic and pre-ceramic levels (Tables 2 and 3). Specimens that were identifiable to genus revealed that mountain sheep occurred in all levels and desert tortoise in levels 4 to 2.

Table 3
Occurrence of split bone

Block	B	C	D	E	F	G
Level						
1						
2				X	X	X
3		X		X	X	
4		X	X	X		
5		X	X	X		

Bone Material

Only two specimens of worked bone, fragmentary tips of a needle and an awl, were recovered in the lower stone horizons D-4 and D-5, respectively.

Shell Material

The occurrence of shell in the ceramic levels only indicates that these later people had relations with others to the west, as the two identifiable specimens (in G-1 and G-2) are Olivella biplicata, a Pacific coast shell. Four fragments of unworked shell were recovered in B-1, E-1 and D-1 (two), in addition to the two Olivella beads which had been formed by grinding down the shell ends.

Stone Material

The stone work recovered was a lean assortment, but is indicative of a poor nomadic group rather than of one of great antiquity. One broken, unshaped, shallow, oval basin metate of malpais was found in the intrusive ceramic zone in F-2 (Fig. 2, a). Two broken quartzite manos also were recovered. One, from C-3, is a small fragment, of what appears to be an oval river boulder, with a single convex grinding surface; it was associated with preceramic material (Fig. 2, b). The other, from F-2, is somewhat oval, with ground edges and two slightly convex grinding faces (Fig. 2, c).

The majority of the stone artifacts recovered were hunting tools. Eleven flake scrapers, usually with unifacial flaking on one edge only, were recovered. All but three of them (E-1, F-1 and G-1) occurred in preceramic associations. Of the seven knives, all but one fragmentary, four are thick bifacial percussion-made blades and three are thin blades. Two of the former (C-2 and B-3) were preceramic and two (D-1 and G-2) were in ceramic and intrusive ceramic association. Of the thin blades, one from preceramic block B-3 is flaked all over with one edge retouched, while that of D-2 is flaked on the edges only. The thin blade of ceramic association in F-2 also is flaked all over. These are shown by types in Tables 5 and 6; these types are based on the analysis of trench V material.

Points

The points and blades recovered, almost all fragmentary, consist of five types.

Type I. A large blade with an expanding, short, wide stem with horizontal to slightly projecting shoulders formed by more or less diagonal notches, and a straight, concave or convex base, exhibiting allover flaking of good workmanship, usually made from mottled chert or jasper (D-5, C-3, F-2 - total 3).

Type II. A large blade of obsidian, excellently chipped all over and exhibiting fine bifacial retouching on the edges. Basal treatment not known (D-4 - total 1).

Type III. A large blade of quartz or mottled chert similar to type I in all respects except that the stem is straight and lacks notching (C-2, C-1 - total 2).

Type IV. A long, fine-grained rhyolitic blade, with a tapered base fashioned by percussion, possibly a knife (G-2 - total 1).

Type V. A small, relatively thick point of quartz with small expanding stem and horizontal shoulders, of poor workmanship, exhibiting flaking mainly on the edges with one side of the blade usually relatively flat or concave and the other side somewhat humped, presenting a bowed longitudinal cross-section (D-3, D-2, C-1 - total 3).

Type V, a. Similar to type V but a thinner and smaller point, well flaked allover, of good workmanship. It also has one flat side and one humped side (C-1 - total 1).

Of the 16 points, five were fragmentary and could not be classified. Types I, II, and III are probably dart points, type V an arrowpoint, and type IV of unknown use. Little concerning chronology can be gleaned from the relative positions of these types in the deposits. However, type I appeared first in the lowest levels and type II was perhaps contemporaneous with it or slightly later. Since type V is the only definite arrowpoint, it probably was the latest.

The single type II point in D-4 is the only one of obsidian, the only one to exhibit excellent chipping and the only one having retouched edges. Because of these differences in manufacture and material, plus the fact that only one other fragment of obsidian was found (in C-3), this point is considered an intrusive.

Miscellaneous Stone

Included in the class of miscellaneous stone are two surface finds, a piece of raw turquoise and a fragment of worked steatite of Santa Catalina

origin. The steatite fragment, with smoothly polished convex exterior and concave interior surfaces and a smoothed rim on one end, apparently is a portion of a tubular pipe.

A somewhat questionable dual purpose end scraper and graver (more probably a rough drill, since it is percussion formed), humped on one side and flat on the other, with a pointed extension which is unifacially worked on both edges, was recovered in B-3. A drill of flaked quartz, broken at the tip, was found in B-2.

A battered river pebble, probably a pecking stone, was encountered in preceramic block D-4, and a piece of asphaltic siltstone, probably from McKittrick, California, bearing abrading marks near one edge, was found in G-1 with pottery.

Four unworked oval stone discs, one of which is broken, were recovered from preceramic blocks. One is a shiny river pebble (C-3), two are dull waterworn river pebbles (C-4 and E-5), and the other exhibits a rough surface (C-5). Though there is no reason to consider these artifacts, they were saved because no other river pebbles were noted throughout the excavations of trench IV.

Cooking Pits

This designation is based on the finds in trench V and is used for the features discussed here, because the pits were small and contained many rocks on which cooking pots could have been steadied. Four of these pits were uncovered; locations and dimensions are listed below.

<u>No.</u>	<u>Level</u>	<u>Block</u>	<u>Diameter</u>	<u>Depth of pit</u>
1	1	F	35 cm.+	8 cm.+
2	1-2	D	52 cm.	15 cm.
3	2	C	50 cm.	13 cm.
4 (Fig. 4)	2	D	65 cm.	20 cm.

Because pit 1 projected into the trench, its full dimensions could not be determined. All of the pits are similar to the one illustrated in Fig. 4 (also see Fig. 38). They contained ash, mesquite and willow charcoal and quantities of thermal fractured rocks. No bones or artifacts were associated. The external portions of the pits were somewhat irregular in outline and bore no evidence of a clay or rock lining. Pits 1 and 2 were in

ceramic blocks and pits 3 and 4 in preceramic blocks. However, the tops of these latter pits were within 3 to 4 cm. of the ceramic material above them. Undoubtedly they were set down into the preceramic level by the people of the ceramic horizon, as the evidence of trench V indicates.

Clay

One worked sherd of Aquarius Orange, ground down into a rough triangular shape, was recovered in E-2. Both faces and all edges bear striations from abrasion.

Table 4 lists the pottery types recovered in trench IV, as well as the provenience of all types. It will be noted that in level 3 only two sherds occur, both of which are intrusive to the area; in level 2, aside from one sherd of Pyramid Gray, all again are intrusive; and in the top level Pyramid Gray is dominant, constituting 63% of the total pottery.

A collection from the surface of trench IV contains six Cerbat Brown, one North Creek Black-on-gray, one Sandy Brown, one large clapboard style corrugated sherd (otherwise similar to Parker Buff), and one small sherd of Tusayan Gray Ware, plus the usual Pyramid Gray.

Details and statistics are discussed under Ceramics following the discussion of trench V material.

Summary

The lower levels (2-5) are preceramic in content. Intrusive pottery appeared in the upper preceramic levels (2-3). Probable indigenous pottery occurred in the upper level (1) only.

The material yield was light and information, other than that given above, is lacking. A listing of the traits of each level is contained in Table 5, and in Table 6 they are listed by ceramic and preceramic associations.

Table 4

Occurrence of pottery types in Trench IV

		<u>Block</u>	<u>B-6</u>	<u>C-6</u>	<u>D-6</u>	<u>E-6</u>	<u>F-6</u>	<u>G-6</u>	
	<u>POTTERY</u>	<u>Ware Total</u>							<u>Totals</u>
Level 1	<u>Lower Colorado Buff Ware</u>	(92)							
	Pyramid Gray		31	29	8	5	8	5	86
	Variant			1	1	1	3		6
	<u>Moapa Gray Ware</u>	(1)							
	Boulder Gray			1					1
	<u>Tizon Brown Ware</u>	(37)							
	Aquarius Brown			6					6
	Cerbat Brown		8	5	6	6	2	4	31
	<u>San Francisco Mt. Gray Ware</u>	(5)							
	Kirkland B/O						1		1
	Deadmans B/G				1				1
	Kirkland Fugitive Red				1				1
	Deadmans Fugitive Red						1	1	2
	(Sub Total)		(39)	(42)	(17)	(12)	(15)	(10)	(135)
Level 2	<u>Lower Colorado Buff Ware</u>	(1)							
	Pyramid Gray					1			1
	<u>San Francisco Mt. Gray Ware</u>	(14)							
	Kirkland Orange					1	1	1	3
	Kirkland Fugitive Red					6	2	1	9
	Deadmans Fugitive Red						1	1	2
	<u>Tizon Brown Ware</u>	(9)							
	Cerbat Brown					2	5	2	9
	(Sub Total)					(10)	(9)	(5)	(24)
Level 3	<u>Prescott Gray Ware</u>	(1)							
	Aquarius Black/Gray			1					1
	<u>San Francisco Mt. Gray Ware</u>	(1)							
	Deadmans Fugitive Red						1		1
	(Sub Total)			(1)			(1)		(2)
							<u>Grand Total</u>		<u>161</u>

Table 5
Trench IV traits by levels

<u>Trait</u>	<u>Level</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Bone, burned		X	X		X	X
Bone, split			X	X	X	X
Bone, worked					X	X
Knives, type II				X		
type III		X	X	X		
type V			X			
Scraper, flake		X	X	X		
Drill			X	X		
Points, type I			X	X		X
type II					X	
type III		?	X			
type IV			X			
type V		X	X	X		
Pecking stone					X	
Manos, shaped, rounded corners			X			
oval ?				X		
Metate, oval basin			X			
Turquoise				surface only		
Oval stone disc				X	X	X
Pit, cooking		X	X			
Pottery, intrusive		X	X	X		
indigenous		X	X			
worked			X			
Steatite				surface only		
Asphaltum		X				
Shell		X	X			

Table 6
Trench IV trait associations

<u>Trait</u>	<u>Ceramic</u>	<u>Preceramic</u>
Bone, burned	X	X
Bone, split		X
Bone, worked		X
Knives, type II		X
type III	X	X
type V		X
Scraper, flake	X	X
Drill		X
Points, type I	?	X
type II		X
type III	?	X
type IV	?	X
type V	X	?
Pecking stone		X
Manos, shaped, rounded corners	X	
oval?		X
Metate, oval basin	X	
Turquoise	X	
Oval stone disc		X
Pit, cooking	X	
Pottery, intrusive	X	X
indigenous	X	
worked		X
Steatite	X	
Asphaltum	X	
Shell	X	

STRATIGRAPHY OF TRENCH V

Figures 39 and 40 at the back of the report present in detail the various horizons and features encountered on the four walls of trench V (See also Figs. 5 and 6). The strata along the long axis of the trench are fairly flat-lying, except where affected by cultural disturbances. However, on the short axis of the trench the strata from layer H down through O all dip toward the river. Above layer H they are all more or less flat-lying as on the long axis.

It will be noted that the culture-bearing sand and charcoal zones are interbedded with silt deposits of varying thicknesses. These apparently represent the end stage of various floods of the Colorado River. All of these silt strata dip toward the river and are of greater thickness on the river side of the trench. These silt deposits, exceptionally hard, acted as seals for the various cultural horizons that they covered. Due to this fortunate circumstance, there was no chance for material from one horizon to become intermixed with that of another.

The history of the site is one of successive Indian occupations interspersed by periods of flooding. Throughout the discussion below, certain deposits are often referred to as being wind-deposited even though cross-bedding is not evident. The presence of man, and particularly his churning and raking the contents of his many roasting pits over the deposits, easily could have destroyed any structure the deposits may have once exhibited. None of these zones defined as windblown exhibits the variation or the gradual change in size of the material deposited that one would expect to find in a waterlaid deposit.

Under layer O

Alternate layers of sand and silt, bearing no evidence of cultural occupation, were found in a test under the concentration of rock fragments in layer O (test pit of Fig. 39). Stratigraphy of this test pit was further checked by examination of the terrace exposure on the river side, where sterile silts and sands were found below this level down to the gravel terrace bordering the river below the site. The surface finds that had washed out of the bank onto this gravel terrace are in no way different from material encountered in the trench.

Immediately under O was a silt layer on which the rocks of O rested. Irregularities due to human activities (roasting pits, etc.) occurred on the top surface of this silt deposit. Silt from a flood that followed was the common filler between the rocks at the base of layer O. However, on the

northeast side of the trench, away from the river and at a slightly higher level, sand was the filling agent. This suggests that this portion of the deposits was above the action of this particular flood.

The large depression in the silt, seen at the base of the line 2 profile, contained a fair quantity of thermal fractured rock (fire rock). In places some of the rock was imbedded in the silt layer as though it were a part of a cooking pit. Near the center of the trench the silt layer was completely broken through into the sand below. Only a few fire rocks were found here.

Thus, in summary, the pre-occupation history below layer O appears to have been a series of depositions on the banks of the river, followed by probable flood erosion, which, during a slow recession of the waters, deposited silt over previously deposited material.

Layer O

A wandering group of Indians came to this site shortly after recession of the water exposed the terrace and in places they disturbed the silt layer below layer O, on which they camped. For an undetermined number of years the wind must have deposited sand on the terrace, during which time the site was visited often by nomadic hunters, as the quantities of thermal fractured rocks, charcoal, chips, and discarded rubbish in layer O attest. This period of occupation apparently was brought to an end by a gradually rising flood which churned and lapped over the terrace carrying off the above postulated loose sand but allowing the heavier cultural materials and fire rock to sink. This appears to be the only explanation for the unconformity, in which an almost level concentration of stone material rests on the old silt layer to form layer O. It also explains the greater concentration of rock in the lower southwest portion of the trench in layer O and the heavier occurrence of sand among the rocks in the slightly higher northeast portion of the trench in layer O.

Layer N

The situation in this layer appears to substantiate the conclusions pertaining to layer O. Occasional fragments of charcoal and fine level lines of charcoal dust, as well as small, fine gravel deposits, were found at varying levels throughout this layer. Cultural finds, rocks and bones were extremely rare and scattered. Apparently the flood continued to rise (after removing the lighter sands and allowing the heavier materials to drop to form layer O), and evidently lapped against higher portions of the terrace

farther back from the river. The lighter material thus removed from the higher area by this lapping action must have been redeposited in the deeper and less turbulent water which dropped quantities of sand and formed the fine gravel deposits and fine charcoal lines (mentioned above) to form layer N over layer O.

This type of geologic action is quite probable, as the river bank just below and southeast of the site must at one time have projected some distance out into the river where today only a low gravel bank remains. Such an obstruction would slow up the lateral action of flood waters on the site proper, probably by the creation of an eddy in the cove. This would allow for redeposition within the cove after the turbulent initial flood removed the original sand cover. This gravel bank is not to be confused with the gravel deposit in the wash a few hundred feet to the southeast, which also would slow down stream action, particularly if the stream was in flood stage at the same time the gravel was being deposited.

Layer M

This layer of silt marks the final recession of the floodwaters of the first flood.

Layer L

The history of this layer must have been somewhat similar to that of layers N and O--wind deposition and either a very short human occupation or a possible long occupation followed by a more intense flood action--as only portions of this layer appeared throughout the area excavated (Figs. 39 and 40). The lack of anything except minute charcoal in the sand of L leads one to believe that the entire original deposit was eroded away by flood action and that the remnants of L encountered in the trench represent material redeposited from higher elevations during a higher stage of the flood that caused this unconformity. The only indication of layer L, where it was not obvious between K and M, was either a very thin stratum of sand or a dark color line at the point of contact between K and M. One small pecking stone was recovered in this deposit.

Layer K

This silt represents the withdrawal stage of the second flood. It was composed of 90% angular and subangular grains of quartz and chalc-dony, 5% garnet, and the remainder of mica, principally muscovite with an occasional pyroxene grain. Size of grains runs from .006 to .17 mm. with an average of .05 mm. This is more or less typical of all the silt deposits.

Layer J

The history of this layer is again similar to that of L, N, and O, with slight variations. It consisted of pure sand except for the upper 3 to 5 cm. wherein all charcoal and cultural finds occurred. This layer apparently was first built up by wind and sometime later was used as a camping site. Flooding again followed but only the top portion of the deposits was carried away, leaving intact 3 to 5 cm. of cultural evidence, plus the sand below it.

A large depression seen in the profile of line 2 (Fig. 39) quite obviously was a roasting pit dug by the Indians. The lowest portion of the depression cut through layers K and M and exhibited concentrations of ash and charcoal at its base. To the right was a continuation of this same material which had been raked out onto the occupational surface area on top of layer J. This is not an unconformity, but a cultural disturbance. The presence of the rakings to one side of the pit, where they were pulled out onto the old occupation surface, indicates that very little of layer J was eroded away by the next flood.

Layer I

This silt represents the final stage of the third flood.

Layer H

This silt layer represents the final stage of a fourth flood. Between H and I a dark line, which in places contained a thin stratum of sand, gave evidence that another stratum had been formed and subsequently had been almost entirely removed. In one place, above the pit described in J, where layers H and I meet, some charcoal, chips and an animal bone were at the line of contact. On the left edge of the pit, where it meets layer I (the question mark in Fig. 39), was a charcoal timber surrounded by ash. Directly under it was a scorched area which entered layer I obliterating any trace of a contact line between layers I and J. The timber itself was completely surrounded by the silt of H and I, and must have been associated with the layer between H and I that was completely eroded away. Additional evidence of a former layer was the presence of a fire rock between H and I, 1 m. from line D in block E-3; a thin stratum of sand and charcoal in D-4 between H and I; a few rocks resting on a thin sand stratum between H and I; and a point fragment (Fig. 13, d) under H on line 2, 75 cm. from line C. Otherwise, there are no indications of the intermediate layer. The grain composition of this layer is the same as in layer K and the mass is quite calcareous. Grain sizes range from .001 to .16 mm., averaging .024 mm.

A test also was made of material, which occurred here as well as in all other silt deposits, which effloresced on exposure to the air. Chemical tests showed a strong reaction for calcium, a good reaction for CO_2 and SO_4 , and a weak reaction for Na and Cl. No manganese was detected. Salts were composed of calcite, gypsum and a small amount of halite (common salt).

Layers F and G

What remains of F and G, except for the very top of the layer, is completely untouched by water action. Evidence of occupational levels, in the form of heavy concentrations of charcoal and ash, as well as concentrations of fire rock and ash, were found throughout. Cultural material, though sparse, occurred in all levels of this layer. For purposes of obtaining possible cultural stratigraphy in this layer, the upper half is designated as F and the lower half as G. The very upper portion of F is sterile in many places and these particular spots contained fine, bedded sand, probably reworked by the flooding that followed its deposition.

Layer E

Though of no apparent significance, this thin line of dark silt was given a designation. The top of this stratum blends into the lighter colored Layer D above it, and probably represents a very slow beginning of a somewhat stagnant period at the beginning of the final flood recession during which considerable charcoal from layer F was mixed with the silt.

Layer D

This is the thickest layer of silt in the entire excavation and its "ripple-like" water laminated structure was clearly evident. White particles which occurred throughout were tested and proved to be finely precipitated calcite and gypsum. A brown staining material proved to be carbon. Manganese dioxide was not detected. The presence of gypsum is indicative of slow deposition wherein the salts in solution crystallized out during the process of evaporation. This silt represents the final stages of the fifth and last flood to cover this terrace.

Layer C

This level, which is actually an old ground surface, is distinguished by a thin humus-like soil stain. Imbedded in it and into layer D was a small fireplace and also a small possible posthole (Fig. 7). Also associated with layer C was the bed of a small wash (Figs. 8, 9, 39, 40). The

environmental conditions under which this level was laid down may have been somewhat different from those under which the other layers were deposited, as this soil profile was well developed. The presence of cultural material directly on this surface excludes the possibility of any extensive depositions during occupation. Material finds indicate that the natives camped on both sides of the small wash. At some later time, however, windblown material was again carried in, filling the wash. The bedding of sand and fine charcoal dust conforms with the depression of the wash (Figs. 8, 9, 39 and 40).

Layer B

This layer, actually a continuation of layer C, consists of material laid down after the deposition of windblown sand began. Charcoal and cultural objects occurred throughout the sand.

Layer A

This consists of sterile, finely bedded windblown sand. Its contact with layer B is indefinite; in most spots the two blend together. This is the topmost deposit of the terrace.

Of interest is a comparison of the action of each successive flood. When the terrace was lowest (layers N and O) the floods removed all the sand and redeposited considerable quantities of sand from higher levels over the remaining stone (fire, rock, tools, points, etc.) material of O. With layer L, which had been built up by silt and windblown sand, the same thing occurred except that very little sand was redeposited. In layer J, the flood waters did not succeed in removing the entire original stratum, and no sand was redeposited. In layers F and G, apparently only the uppermost level of the windblown deposit was removed by the flood. The terrace was never again flooded. In short, the higher the terrace grew, the less drastic was the flood damage. The only exception is the practically non-existent layer between H. and I. This layer may have been a very thin deposit which the floods could have carried away with ease, or an exceptional flood may have occurred.

Associated bone material in the deposits of Willow Beach does not indicate any environmental change (Table 7). Only bighorn mountain sheep was recovered below layer G and it occurred up through layer B. In layers F and G were woodrat, chuckwalla, tortoise, jackrabbit and beaver. All but the beaver also occurred up into layer B. Because water action had removed the lighter material in layers O, N, and L, and had eroded away a small portion of the occupation zone of layer J, which originally was not

very deep, faunal remains from these lower levels were few. In the 1936 field notes is a statement that only a few large animal bones were found in the lower ash layer. The faunal variations between the upper and lower layers are due either to cultural selectivity or to deterioration caused by the moisture of the lower layers rather than to environmental change.

The following are the comments of Robert R. Miller, Associate Curator of Fishes, Museum of Zoology, Ann Arbor, Michigan, on the six fish vertebrae recovered from layer B:

"The best I can do is to suggest that these vertebrae belonged to a minnow or sucker of considerable size, evidently about 20 inches long. I am aware of only 3 species that inhabited the primitive Colorado River which attained such lengths. These are the Colorado salmon or squawfish, Ptychocheilus lucius; the bonytail, Gila robusta elegans; and the humpback sucker, Xyrauchen texanus. All of these evidently were used as food by the Indians. I suspect that the vertebrae in question probably belong to the Gila or the humpback sucker, for the Colorado salmon generally runs much larger in size."

The 1936 excavations yielded two other species in addition to those listed in Table 7--grebe (Aechmophorus sp.) from between the 4 ft. 6 in. level and the surface, and grizzly bear (Ursus sp.) from the floor of a burned hut situated 6 in. below the surface. The occurrence of grizzly bear should not occasion surprise as these mammals were observed up into the 1880's in the Cerbat Mountains, southeast of the site of Willow Beach.

Baldwin reported mule deer from the 1947 excavations, a tentative identification.

Table 7
Occurrence of faunal remains

GENUS	<u>Ovis canadensis</u> (mt. sheep)	<u>Gopherus</u> (tortoise)	<u>Castor canadensis</u> (beaver)	<u>Neotoma</u> (wood rat)	<u>Sauromelas</u> (chuckwalla)	<u>Lepus californicus</u> (jackrabbit)	<u>Anas</u> (surface feeding duck)	<u>Zenaidura macroura</u> (mourning dove)
LAYER								
A-B		X		X	X	X		
B	X	X		X	X	X	X	X
C	X	X			X			
D	X							
E								
F	X	X	X	X	X	X		
G	X	X						
H	X (between H and I)							
I								
J	X							
K								
L								
M								
N	X							
O	X							

Identifications by:
 H. W. Setzer of the
 Smithsonian Institution,
 Messrs. Miller, Benson,
 and Russell of the Museum
 of Vertebrate Zoology,
 University of California,
 and Claude W. Hibbard,
 Museum of Paleontology,
 University of Michigan.

CULTURAL REMAINS OF TRENCH V

General

The stratigraphy of the deposits in trench V outlines the sequence of the periods of cultural occupation so well that there is no problem concerning associations. As in trench IV, both stone and ceramic horizons were encountered. Here, however, the stratigraphy separated the stone culture into three definite occupational levels (N-O, J and F-G) and two other probable levels (L and between H and I), and the pottery zone was separated into two levels (B and C).

Quantities of burnt and split bone were recovered from all layers (Tables 8 and 9). Identified specimens include antelope, mountain sheep, beaver, chuckwalla, wood rat, cottontail, jackrabbit, tortoise, duck and mourning dove (Table 7).

Worked bone

Only four specimens of worked bone, all fragments, were recovered. One (A-B) exhibits a smooth, rounded tip with polishing striations along the long axis of the unbroken portion of the bone. The end opposite the smooth tip bears a fine point which was worked down by grinding across the short axis. This tool may have been a flaker.

Another bone fragment (B), quite thin, exhibits two surfaces bearing striations across the short axis as though worked down by grinding. One end is broken and partially scorched while the other is rounded off to form a blunt edge or rim. It appears to be a portion of a spatulate-shaped object.

The tip end of a well polished awl or punch (B) and a broken tubular section of bone bearing haphazard striations (G) also were recovered. The striations on G probably were caused in the course of scraping meat from the bone.

In contrast to trench IV all worked bone in trench V was associated with the ceramic horizon.

Chipped Stone

Choppers, pick, blanks, and cores. Several percussion worked objects were recovered. Only one chopper occurred in ceramic associations, layer C, and it was associated with intrusive pottery only. This

Table 8

Burned bone - occurrence and soil layer designation

Block	B-3	C-3	D-3	E-3	F-3	B-4	C-4	D-4	E-4	F-4	B-5	C-5	D-5	E-5	F-5
Level															
1					A-B										
2			A-B		B										B
3	C								B		B	B			
4										C	B				
5							C	C							
6															
7		F	F			F				F					
8	G						G								
9		G				G									
10			I												
11															
12															
13															
14															
15	O														

Table 9

Split bone - occurrence and soil layer designation

Block	B-3	C-3	D-3	E-3	F-3	B-4	C-4	D-4	E-4	F-4	B-5	C-5	D-5	E-5	F-5
Level															
1															
2	A-B		A-B				B	B	B		B	B	B	B	
3	B	B	B	B	B	B	B	B	B	B	B	B	B		C
4						B	B		B	C	B	B			
5	C	C				B	C								
6			F												
7		F	F	F	F			F	F	F	F	F	F	F	
8	G					G					F				
9	G	G				G									
10			I			J	J					J			
11				J	J						L				
12															
13	N		N			N	O	O	O		O				
14		O		O											
15	O														

specimen is unifacially fashioned out of a quartzite river rock. A humped specimen from layer F is a thick spall of cherty material, one edge of which was worked unifacially by percussion. Because the underside, which bears a percussion bulb, is quite uneven, it may be incorrect to term this a scraper. The quartzite chopper from layer G is a thin spall with portions of the worked edge exhibiting serrations. A questionable object from layer N bears percussion marks and may be a chert core. In layer O were recovered a chert core; a hump-backed, granitic implement with unifacial percussion flaking around the edges and an uneven, though somewhat flattened, base (perhaps a scraper); another chert core; and a coarse-grained quartzite fragment with one edge sharpened by percussion. Four other fragments of chert and mottled chert cores were recovered from layer O. The tip end of a chert pick, well shaped by percussion, was found in layer G. Two blanks of mottled chert were recovered, one each in layer O and J. Both are oval, bifacially shaped by percussion, with the upper surface humped. The reverse, fairly flat, surfaces are rough, each containing sharp flaws, and it is doubtful that in their present form they were used for fleshing.

Knives. As would be expected among hunting groups, knives (Figs. 10 and 11) are quite common. A variety of shapes and sizes, as well as degrees of workmanship, are represented, and nearly all specimens are fragmentary. There are five types.

- I - A thin, large triangular blade usually made from a mottled chert, pointed tip, good allover pressure flaking, and retouched edges.
- II - A thin, parallel-sided blade of plain or mottled chert or jasper (rare) with a rounded (?) tip, usually exhibiting good allover pressure flaking and retouched edges.
- III - A thick blade, usually of dark chert, with convex to flat sides and base, and a rounded or pointed tip, entirely shaped by percussion with edges rarely retouched by flaking. Some approximate type II in shape. One specimen is notched (Fig. 11, a).
- IV - A relatively thick, short, wide-stemmed pressure flaked blade of chert with sides expanding away from the stem.

- V - A small leaf-shaped blade of quartz, one side slightly concave with little flaking, and the other side somewhat humped and flaked all over. Both edges are retouched.

The provenience of the various types is as follows:

	I	II	III	IV	V	fragments	Total
Layer A-B					1		1
B			6				6
C			2			1	3
F		3	2				5
G	1	1					2
J		2		1			3
N						1	1
O	2	7	17			13	39
	—	—	—	—	—	—	—
Total	3	13	27	1	1	15	60

The knives of type III, which occur in ceramic associations, are similar to those of the lower stone horizons, though they are generally cruder. Often one side of these knives, from layers B and C, is scarcely worked and the cutting edges are rather rough. Moreover, in some cases, the material used is a poor choice, three of them being igneous rocks (Fig. 10, left hand specimen from layer C and two left hand specimens from layer B).

In summary, a study of the various types of knives indicates that the well flaked specimens are restricted to the stone horizons. Type I is found only in layers O and G and type II in all stone horizons. Of the others, type III is common in layer O, absent in J, occurs in horizon F-G, and is found in poorer form in layers B and C. Type IV is restricted to layer J and type V to layer A-B.

Scrapers. Three types were encountered -- flake, spall and rough scrapers. The first are small irregular flakes, usually of dark chert, with one edge, rarely two, exhibiting fine unifacial chipping. These are encountered in all culture horizons but J (probably due to the small yield from J) and

exhibit no variation other than in shape (3 in layer B, 2 in C, 4 in F, 1 in G, 2 in N, and 7 in O).

The spall type is a large irregular spall, usually of dark chert, exhibiting a bulb of percussion and a portion of the striking platform. One and sometimes two edges are chipped from one side only (1 in B, 1 in J, and 3 in O).

Those considered as rough scrapers, though perhaps within the knife classification, are of chert on which rough edges have been formed by unifacial or bifacial percussion. The two in layer G have been roughly worked on both surfaces and appear to have been shaped. The working edges are more suited to scraping than cutting; they may be blanks. The object from layer F is worked on both surfaces, as is one specimen from C. The other humped artifact from C, which is the only one exhibiting unifacial flaking, bears a percussion bulb on the side opposite the hump. This implement is broken, but appears to have had a turtle back shape. These "rough scrapers" were found only in layers C (2) and F-G (3) wherein, curiously enough, spall scrapers were absent. Perhaps spall and rough scrapers served the same purpose.

Drills, graver, and reamer. The shaft of a drill of light chert, with finely chipped surfaces and edges, was found in layer B, and a similar specimen was recovered from the lower half of layer B in the pier test. A graver recovered from the lower half of layer B in the pier test is merely a flake of brown jasper, one side of which is flat. Fine chipping is restricted to both edges on the side opposite the flat surface. A fragment of mottled chert from layer O appears to be the base of a well chipped drill. Two other specimens, though large, are apparently portions of drill shafts of white chert. One (from layer O) exhibits reworking near the upper broken end. The reamer from layer B is a small triangular blade of chert which is flaked all over. The very tip is broken and all edges are bifacially chipped.

Points and blades (Figs. 12 and 13). All of the point types found during the excavation of trench IV also were recovered in trench V, except for types II and IV. Two additional types and four variations were noted from trench V. Types I through V have already been described under the discussion of trench IV. Only the two new types, VI and VII, and the variations will be described here. (In layer O the tip of a dart point was found (see frontispiece). The tip end is finely chipped, the edges below the tip serrated, and both surfaces are worked with allover pressure flaking.)

I, a - Similar to type I except edges are serrated.

I, b - Similar to type I except notches are lacking and the stem is straight-sided with a convex base. This may be an atypical form of type I.

V,b - Similar to type V, a but larger and with downward projecting shoulders.

VI - A long, thin, slender, slightly convex-based blade of gray chert, well flaked all over with slightly retouched edges.

VII - A small, rather slender, thin quartz point with corner tangs, side notches, and a basal notch, well chipped all over.

VII, a - Similar to type VII but the basal notch is enlarged to form a sizable concavity and one side of the blade is relatively flat and unworked while the other side is somewhat humped and poorly worked. It presents a bowed longitudinal cross-section. Most of the chipping is confined to the edges. Workmanship is similar to that of type V.

The provenience of the various types is as follows:

	I	Ia	Ib	III	V	Va	Vb	VI	VII	VIIa	Fragments	Total
Layer A-B									1		4	5
B					2	1	4		2	2	12	23
C					4	2		2			1	9
F				2							1	3
G				1							1	2
H-I											1	1
O	8	2	1								3	14
	—	—	—	—	—	—	—	—	—	—	—	—
Total	8	2	1	3	6	3	4	2	3	2	23	57

Abraded Stone

Pecking stones. Five specimens were found, four of which are small oval-shaped quartzite river pebbles exhibiting battering marks along the edges, mainly on the somewhat pointed ends. The fifth, from layer F,

is a flat river stone with battering marks on each end. This specimen, however, exhibits striations, more or less along the line of the long axis, on one side only. The striations were made individually (as when a sharp-edged implement is drawn over a surface), as some of the marks overlap and no two of them are of equal length or parallel to one another. This specimen was found in two pieces in level 7, one in block E-5 and the other in F-3, over one m. apart. The pecking stone from layer C was associated with intrusive pottery representing a time prior to the manufacture of indigenous pottery. The specimen from L was the only artifact recovered from that layer in the entire excavations. The other two pecking stones came from layer O. None was recovered in association with indigenous pottery.

Hammerstones. All but two specimens are fine-grained quartzite river rocks. The two exceptions are a waterworn chert hammerstone from layer B and a waterworn fine-grained metamorphic hammerstone from layer O (Figs. 14 and 15). All exhibit battering marks, usually on more or less angular edges, though some flat surfaces also were used. The one specimen from layer D undoubtedly belongs to layer C as it occurred in the very upper portion of the layer, near line E where the contact between layers C and D was disturbed by a roasting pit (Fig. 40). The specimens from layers N and O are all fragments of river rock. Those in the levels above are complete river stones except for one fragment type from layer A.

Manos. All manos recovered came from the stone horizons, six from layer O and one from layer F. The latter, of quartzite, is the only one that can definitely be designated a mano. It appears to have been shaped by grinding on all surfaces like the mano in Fig. 2, c. The two slightly convex grinding surfaces indicate that a linear motion was employed in using it in a shallow oval basin or slab type metate. All surfaces exhibit pecking marks. The remaining fragmentary specimens are of unshaped quartzite river rock except for one which is a coarse-grained metamorphic rock. All exhibit one smooth side with three bearing fine striations. The possible grinding surfaces are slightly convex. The reverse surface of one of these manos has battering marks indicating use as a hammerstone. All of these are somewhat doubtful specimens with the exception of the one in layer F.

Metates. (Fig. 16) One fragment of a slab or shallow oval basin metate of metamorphized rock was encountered in layer B in ceramic association. Such a small portion of the grinding surface is evident that its type is questionable. The remaining six were preceramic in association and all but that of layer O, which is a flat unshaped slab metate of meta-

morphic rock, are deep oval basin types of malpais with shaped exteriors.

Deep, oval basin metates, in which linear grinding was accomplished, are restricted to layers J and F-G from which one mano was also recovered (layer F). The slight convex surfaces of this mano negates use in a deep basin type metate. However, the edges, instead of the regular grinding surfaces, may have been employed after the metate had been worn down. One mano with ground edges, from trench IV, appears to have been used in this manner. Albert Mohr (1954, 394-6) reports such a practice in the Southern California area in early sites. He described the cultural associations as being roughly similar to the Oak Grove culture. Thus, in summary, it appears that the deep basin metate, in the upper two definable stone horizons of Willow Beach, may be related to similar types in southern California. The slab type at Willow Beach is restricted to the lowest stone horizon.

Miscellaneous stone

In ceramic associations there were recovered from layer A-B, a thick blade-like fragment of greenish-banded quartzite with flaked edges, use unknown; in layer B a small, almost rectangular, turquoise bead with a biconical hole drilled off center; and in layer C a small, shiny river pebble, a possible charm. From preceramic levels there were recovered from layer F a fragment of a possible small mortar with no evidence of working other than a depression probably formed by grinding, and from layer O a black, odd-shaped river pebble, with one enlarged smoothed end. Two oval, waterworn stone discs were found. One, in layer B, is rough on one side and smooth on the other as though worked down by abrasion. The other, in layer O, exhibits battering marks in a few spots along the edges and also a few miscellaneous fine striations on either surface. This may have had a use similar to the pecking stone of layer F.

Raw Materials

One small piece of prepared hematite was found. It could easily be molded between the fingers when first uncovered and only a slight touch left a red stain on the fingers. Though no pieces of raw clay were recovered from ceramic levels, a considerable number were collected from preceramic layers F-G, H-I contact, and J (Table 10). None had any particular form, and all, like the hematite, could be molded because of the moisture content of the sand in which they were found. One small piece of hardened clay was found among the rocks of layer O. It had an amorphous form, but bore a cup-shaped cleavage which allowed it to split on that plane. It contains sand (tempering?), which is absent in the above specimens, and

Table 10

Raw clay - occurrence and layer designation

Block	B-3	C-3	D-3	E-3	F-3	B-4	C-4	D-4	E-4	F-4	B-5	C-5	D-5	E-5	F-5
Level															
1															
2															
3															
4															
5															
6															
7													F	F	
8															
9						G				J					
10		J	H-I				J		J			J			
11		J													
12															
13															
14												O(?)			
15															

for this reason cannot be considered raw clay.

Pits

Remnants of, or entire, roasting, cooking and fire pits were uncovered throughout the excavations. Those designated as roasting pits were large charcoal, ash and fire rock concentrations -- large depressions such as the two seen in layers J and O on line C (Fig. 39) and in layers B and D on line B (Figs. 18 and 40). Cooking pits were from .86 to 1.08 m. in dia. and usually were rock-and-charcoal filled (Figs. 17 and 19). One is clearly shown in layer B between lines A and B. Firepits were small charcoal-and-ash filled depressions measuring from 22 to 40 cm. in dia. (Fig. 7).

Provenience is listed below. Each pit was designated by a Roman numeral.

	Roasting	Cooking	Fire
Layer B	1	3	1
C	2	1	1
F	1		
G	2		
J	1		1
O	3		

Most of the above did not contain artifacts. The base of a roasting pit (II) in layer B contained a hammerstone (possibly thrown in as a fire rock), the tip end of an arrow point, the center section of another point, and the tip end of an awl. None of these bears evidence of having been in a fire and they may be from fill thrown into the pit after it had been raked out. The base of another roasting pit (XV), associated with layer O, contained a tip of a point, a knife fragment, and a Type I, a point (Fig. 13, left-hand specimen). This pit contained a few minute pieces of charcoal and some rock. Most of the contents of the pit had probably been raked out as the sand in the pit was clean and fine, apparently deposited by the wind or water after the contents had been removed. Firepit VI in layer C contained a scorched foot bone of a mountain sheep. These were the only finds associated with the pits.

The roasting pits in all horizons had been raked out, leaving only the charcoal-lined sides and bases of the depressions. (Pit XIII, layer J,

line C is a good example. See Fig. 39). The cleaning indicates that the pit was used to prepare something which later was removed. In contrast, all cooking pits were intact and full of charcoal, implying that the pit served only as a fuel receptacle. All cooking pits were associated with the ceramic horizons and contained a large quantity of rock (Fig. 17), which probably served as a rest for pottery cooking vessels. Of the three firepits uncovered, all contained charcoal and ash only, except for one small rock encountered in pit XIV. The firepits from layers B (V), C (VI) and J (XIV) measured 27 cm. in dia. and 13 cm. deep, 40 cm. in dia. and 12 cm. deep, and 22 cm. in dia. and 10 cm. deep, respectively. They all had been formed by scooping out the hard silt layer underlying the occupational horizon with which they were associated; they thus have the appearance of clay-lined pits, which they actually are not. These may represent small fires to provide warmth.

Of the two roasting pits of layer C, one (XVII) was set down into layer D from C (on line E, levels 3 and 4, Fig. 40). The natives, in excavating the base portion of the pit, disturbed the silt of the usually sterile layer D. The rakings from this poorly defined pit occurred through blocks E-5 and D-5 and E-4 and D-4 of level 3. The other pit (III) in layer C (on line B, Fig. 40) was below the unbroken dark line designated as layer C, suggesting that there was occupation associated with layer D. This pit, however, was undoubtedly set down when the occupation of layer C began, as the irregular line above it is actually the bed of the wash (previously discussed, and illustrated in Figs. 8 and 18). In Fig. 18 the outline of the base of the pit is seen projecting below the string that crosses the 75 cm. mark on the stake. Above this pit, and projecting slightly below the string that crosses near the top of the stake, is an irregular contact that represents the bed of the old wash. The rakings apparently were pulled out of the pit and deposited toward the northwest (Fig. 40, line 5). The upper left-hand portion of the pit exhibits bedding of fine windblown sand, dipping slightly down toward the left (Fig. 18) and blending with layer D. It is impossible to tell where D ends and C begins. This filling occurred after the pit had been raked out. It appears that sometime after the pit filled with sand, the wash cut away the upper portion of the pit fill.

After the above events occurred, the bed of the wash filled with wind-blown sand, the bedding conforming with the depression of the wash (Fig. 40). The natives then excavated roasting pit II of layer B into the sand-filled wash to within 2 cm. of the old bed itself. Most of this pit outline is seen in Fig. 18. After this pit was raked out a windblown fill was deposited, the bedding this time conforming to the depression of the pit. Sometime later, cooking pit I of layer B was set down in the top of the fill.

Of the remaining pits, cooking pit VII of layer C was 1.08 m. in dia. and 34 cm. deep and cooking pit VIII of layer B was 86 cm. in dia. and 14 cm. deep. An incomplete portion of roasting pit IX of layer F (probably the lower half, which had not been disturbed) was 82 cm. in dia. and 17 cm. deep. The outlines of roasting pits X and XI of layer G could not be determined. Only the base portions of roasting pits XII and XVI in and below layer O were found, the upper portions having been eroded away by the flood waters which caused the concentration of material in layer O.

Charcoal and timbers

Several charcoal timber fragments were encountered. In layer B a fragment 5 cm. in dia. was found at the edge of roasting pit II with which it probably was associated. It leaned toward the center of the pit at about a 60° angle and probably was a piece of fuel. Three other fragments, badly decomposed, were uncovered along the edge of a burned area in level 3 of layer B. These timbers were upright, forming a portion of a large arc, and were 25 and 37 cm. apart, each imbedded 15 to 25 cm. in sand. They average 7 cm. in dia. and may be the upright members of a hut, though no floor or features other than the associated burned area were discerned.

In layer C, what appeared to be a posthole, 13 cm. in dia. and 20 cm. in depth, was uncovered 15 cm. west of firepit VI (Fig. 7, upper right-hand corner). It was filled with fine sand and occasional bits of fine charcoal. No other possible house features were noted in the vicinity.

Layer J yielded three burned timbers. Since all cultural material in the layer was encountered in a zone 3 cm. thick at the very top of the layer, along with these timbers, we at first believed the charred timbers were a portion of a brush shelter. One, already discussed under layer H, proved to be associated with the contact between layers H and I. The other two, in layer J, leaned toward the roasting pit figured in the profile of line 2 (Fig. 39). One lay along the edge of the roasting pit area near line D, 60 cm. from line 2. The other, however, was too far removed from the pit to be considered in direct association with it. It was near line E, 85 cm. from line 2. Perhaps it was a portion of the pit rakings, which did extend beyond this point. Therefore, none of the timber remnants could reasonably be assigned to possible brush houses.

Fragments of charcoal from various layers, of a size and condition favorable for identification, were submitted to the Forest Products Laboratory of the U. S. Department of Agriculture, Madison, Wisconsin. The identifiable specimens are listed below according to provenience.

- Trench V, layer B - Ash (Fraxinus sp.)
Populus group (Populus sp.)
Hackberry (Celtis sp.)
Hardwood (Probably a member of
the Leguminosae family)
Walnut (Juglans sp.)
Conifer
- layer F - Conifer
- layer G - Douglas fir (Pseudotsuga taxifolia)
Conifer (Cupressus or Juniperus sp.)
- layer J - Hardwood (Possibly a member of
the Leguminosae family)
Conifer (Pinus or Picea sp.)
- layer N - Douglas fir (Pseudotsuga taxifolia)
Conifer (Pinus or Picea sp.)

All of the above species are foreign to the Willow Beach vicinity today, with the exception of Populus (cottonwood) and hardwoods of the Leguminosae family (mesquite). It appears that the majority of the fuel supply was driftwood that had been carried downstream from the Grand Canyon area, over 100 mi. away. There is no evidence that the Willow Beach area supported Douglas fir or other conifers within recent times.

Vegetal Material

See appendix I.

CERAMICS

The ceramic situation at Willow Beach is the most complex and confusing cultural aspect of the entire study. An analysis of 1571 sherds -- 1260 from trench V, 161 from trench IV, and 150 from a pier test made alongside trench V -- reveals the presence of eight wares. The presence of so many wares, in comparison to the small amount of pottery, is no doubt consequent upon the site's use as a camping spot for hunters and traders, rather than as a permanent habitation area.

Statistical analysis of trench V pottery is based on three types of separations. Table 11 shows provenience by actual soil layers; Table 12 by a selected soil situation (pier test) wherein layers B and C were separated by a sterile windblown sand deposit; and Table 13 by the arbitrary 25 cm. levels by which the material was removed. Table 14 correlates the information of the preceding three tables.

Regarding the placement of sherds in certain soil layers in Table 11, it should be pointed out that the material from layer C was found directly on the soil line of C. The material from layer B includes only that from the blocks in the center of layer B. The same applies to the material of layer A up to the surface. The designations A-B and B-C indicate that the blocks removed could have contained material from the two layers involved.

Layer A, the surface windblown sand, was practically sterile and the few sherds contained in it, similar in all respects to the layer B types, are present probably through disturbances by modern picnickers. A relatively sterile band, 5 to 10 cm. thick, occurred directly above layer C, separating it from layer B, and was thickest directly over the wash. We feel, therefore, that all material designated as being from layers A, A-B, and B-C probably belong to the layer B cultural horizon, but these separations have been retained for statistical studies.

The lowest ceramic zone, layer C, exhibits intrusive material only, except for one sherd of Pyramid Gray (Tables 11 and 12). This is similar to the situation in levels 2 and 3 of trench IV (Table 4). Above layer C in trench V (similarly above level 2 in trench IV) the percentage proportions are abruptly changed by the appearance of Pyramid Gray. (For pottery types and names see Colton and Hargrave, 1937; Colton, 1939; Steward, 1936; and Colton, 1952.)

The pottery collection from layer C of trench V is not indigenous and it contains the earliest known types from surrounding cultural areas -- Lino Black-on-gray, from northeastern Arizona or southwestern Utah

Table 11

Occurrence of pottery in Trench V by layers

LAYER	POTTERY TYPE															TOTAL
	Paiute Ware	North Creek Gray	Lino Black-on-gray	Lino Gray	Boulder Gray	"Utah" Gray Ware ?	Logandale Gray Ware ?	Aquarius Brown	Aquarius Orange	Aquarius Black-on-gray	Aquarius Gray	Verde Gray	Sandy Brown	Cerbat Brown	Pyramid Gray	
# of sherds (A)														3	9	12
%														25	75	
# of sherds (A-B)	2	1			2		1		1	1	1	1	3	3	194	210
%	1	.5			1		.5		.5	.5	.5	.5	1.5	1.5	92	
# of sherds (B)	6	1	1	3	16	2	16	9	3	5	3	6	16	45	851	983
%	.6	.1	.1	.3	1.6	.2	1.6	.9	.3	.5	.3	.6	1.6	4.5	86.6	
# of sherds (B-C)					3									6	9	18
%					16									34	50	
# of sherds (C)			3		12	6	6					1		6	1	35
%			9		33	16	16					5		16	5	
TOTALS	8	2	4	3	33	8	23	9	4	6	4	8	19	63	1064	1258

Table 12

Occurrence of pottery in Trench V
pier test by layers

<u>LAYER</u>	<u>POTTERY TYPE</u>	Unknown Gray	Moapa Black-on-gray	Boulder Gray	Logandale Gray Ware?	Aquarius Brown	Cerbat Brown	Kirkland Orange	Pyramid Gray	<u>TOTALS</u>
# of sherds (A)				1			1		11	13
%				7.5			7.5		85	
# of sherds (Upper 1/2 of B)			1	1	2	1	3	1	43	52
%			2	2	4	2	6	2	82	
# of sherds (Lower 1/2 of B)				1	7	1	4		64	77
%				1.3	9.2	1.3	5.2		83	
# of sherds (Windblown Sand)									2	2
%									100	
# of sherds (C)		1		2	1		2			6
%		17		33	17		33			
<u>TOTALS</u>		1	1	5	10	2	10	1	120	150

Table 13

Occurrence of pottery in Trench V by levels

LEVEL	POTTERY TYPE															TOTALS
	Paiute Ware	North Creek Gray	Lino Black-on-gray	Lino Gray	Boulder Gray	"Utah" Gray Ware ?	Logandale Gray Ware ?	Aquarius Brown	Aquarius Orange	Aquarius Black-on-gray	Aquarius Gray	Verde Gray	Sandy Brown	Cerbat Brown	Pyramid Gray	
# of sherds (1)					1					1	1	1	5	8	136	153
%					.8					.8	.8	.8	3.5	5.6	87	
# of sherds (2)	8	2			8	1	7		2	3	2	1	8	20	552	614
%	1.3	.3			1.3	.2	1.1		.4	.5	.4	.2	1.3	3.2	89	
# of sherds (3)			3	2	6		7	8	1		1	5	6	8	331	378
%			.9	.6	1.8		2.1	2.3	.3		.3	1.4	1.8	2.1	86.5	
# of sherds (4)				1	5	3	5	1	1	2				12	34	64
%				1.6	8	5	8	1.6	1.6	3.2				19	52	
# of sherds (5)			1		13	4	4					1		15	11	49
%			2		27	8	8					2		31	22	
TOTALS	8	2	4	3	33	8	23	9	4	6	4	8	19	63	1064	1258

Table 14

Correlation of ceramic tests by percentage in Trench V

TEST	POTTERY TYPE																	
	Paiute Ware	North Creek Gray	Lino Black-on-gray	Lino Gray	Moapa Black-on-gray	Boulder Gray	"Utah" Gray Ware ?	Logandale Gray Ware ?	Aquarius Orange	Aquarius Brown	Aquarius Black-on-gray	Aquarius Gray	Verde Gray	Sandy Brown	Cerbat Brown	Kirkland Orange	Pyramid Gray	
Pier test Layer A						7.5									7.5		85	
Trench V Layer A															25		75	
Trench V Level 1						.8					.8	.8	.8	3.6	5.6		87	
Pier Test Upper B					2	2		4							6	2	82	
Trench V Layer A-B	1	.5				1		.5	.5		.5	.5	.5	1.5	1.5		92	
Trench V Level 2	1.3	.3				1.3	.2	1.1	.4		.5	.4	.2	1.3	3.2		89	
Pier Test Lower B						1.3		9.2		1.3					5.2		83	
Trench V Layer B	.6	.1	.1	.3		1.6	.2	1.6	.3	.9	.5	.3	.6	1.6	4.5		86.6	
Trench V Level 3			.9	.6		1.8		2.1	.3	4.3		.3	1.4	1.8	2.1		96.5	
Pier Test Sand																	100	
Trench V Layer B-C						16									34		50	
Trench V Level 4				1.6		8	5	8	1.6	1.6	3.2				19		52	
Pier Test Layer C						33		17							33		0	
Trench V Layer C			9			33	16	16					5		16		5	
Trench V Level 5			2			27	8	8					2		31		22	

(pre-A.D. 750); Verde Gray, from central Arizona (A.D. 700-1200?); Boulder Gray, probably from the Toroweap area (pre-A.D. 750 beginning?); Cerbat Brown, from northeastern Arizona (A.D. 700-1100); a type similar to Logandale Gray, from southern Nevada (pre-750?); and what appears to be an early Utah Gray Ware, resembling Rudy and Stirland's (1950, 39) Plain Gray Type I from southwestern Utah, in which the sherds contain quartz and some black (basaltic?) rock.

The time element and associations of these various types, in most cases, have never been certainly established. Layer C, which can be likened to a house floor on which sherds occur, contained Lino Black-on-gray, which has an already determined pre-A.D. 750 date. With it were associated Boulder Gray which occurs in Basketmaker III-like associations in southern Nevada, an unnamed type of "Utah" Gray Ware which resembles Lino Gray, an unnamed type of Logandale Gray Ware exhibiting exceptionally crude scraped interiors and bumpy surfaces similar to Logandale Gray which has been assigned a tentative Basketmaker III status (Colton, 1945, 69-70; Schroeder, 1953a, 19-20), Cerbat Brown, and Verde Gray. Thus, three of these five types appear to belong to a Basketmaker III cultural status along with Lino Black-on-gray. The other two, Cerbat Brown and Verde Gray, have been assigned a tentative pre-A.D. 750 beginning date by Colton (Colton, 1939; Colton and Hargrave, 1937).

These same types appear in layer B, an obvious continuation, but their percentages are minute due to the introduction of a new type, Pyramid Gray, which was used locally and which forms 86% of the total (Table 11). In addition, seven new intrusives, all of a general Pueblo II status, occur in layer B. Two of these date from about A.D. 900 to 1150, three have tentative dates of A.D. 1000 to 1100, and two others overlap the date range of Cerbat Brown. Another possible type, Kirkland Orange, recovered from layer B of the pier test, is herein tentatively dated A.D. 900 to 1100 on the basis of its Pueblo II associations. Since Pyramid Gray first appears in this layer associated with the seven intrusives of Pueblo II status and is absent in the Basketmaker grouping of layer C, it also is tentatively dated pre-A.D. 900 to 1150. Thus, in trench V two recognizable pottery patterns are noted: one of Basketmaker III pre-A.D. 750 status, and the other of Pueblo II A.D. 900-1150 status. Cerbat Brown, Verde Gray, and Boulder Gray, plus Aquarius Brown (which tentatively dates A.D. 750 to 950), appear to be the only possible links between the two patterns if the site was occupied during Pueblo I times.

The situation in trench IV, however, is different. Here sherds of a Basketmaker III status are lacking in the lowest horizons containing ceramics, levels 2 and 3 (Table 4). It is notable that only sherds with a

beginning date of a Pueblo I or II status occur in the lowest ceramic levels. These are Deadmans Fugitive Red (A.D. 750-1100) and Aquarius Black-on-gray (A.D. 1000-1100) in level 3, and, in level 2, Cerbat Brown (A.D. 700-1100), Deadmans Fugitive Red (A.D. 750-1100), "Kirkland Fugitive Red" (new type?), and "Kirkland Orange" (new type?). As in trench V, this ceramic pattern is replaced and dominated by one in which Pyramid Gray makes up 63% of the total pottery (level 1). It should be kept in mind that all of the sherds of levels 2 and 3 in trench IV could have been deposited in Pueblo II times, and if such did occur, we are left with no evidence of a Pueblo I status occupation at Willow Beach. At best, Anasazi ceramic styles of decoration do not appear in significant number until Pueblo II times.

Table 15 lists the various pottery types encountered in the excavations and their dates, and Table 16 indicates the ceramic patterns. These patterns reveal an interesting association within themselves. Pattern #1 contains types common to the area north and east of Lake Mead, pattern #2 reveals types common to western Arizona, and pattern #3 exhibits types from southern Utah and Nevada along with others from western Arizona. The relatively few sherds making up pattern #2 may not represent an actual A.D. 750-900 use of the site, as mentioned above.

"Kirkland Fugitive Red," "Kirkland Orange," and "Kirkland Black-on-orange" are merely names of reference. These are applied to sherds similar to Kirkland Gray except for the surface color, which is tan to orange, rather than gray. These are not to be construed as type names as too few sherds were recovered on which to base type characteristics. Moreover, the roasting pit fires at Willow Beach may have affected these few sherds -- for example, oxidized a normal gray sherd to an orange or tan color.

Colton (1939) also has remarked on the relationship of Aquarius Orange and Verde Gray. Willow Beach material indicates that the former type fits into the class of a western variant of Verde Gray in all respects except for color, which may have been due to accidental refiring or firing variations. It is possible, however, that Aquarius Orange and Aquarius Gray, along with their decorated equivalents, may represent more than just a western variant.

Boulder Gray sherds were not common, but a study of the sherds from different levels revealed a possible trend. Boulder Gray appears in the lowest ceramic horizon in pre-A.D. 750 associations. It is dark gray in surface color, has a dark gray core, normally exhibits large olivine (green) and iddingsite (red) tempering material, and is constructed and finished by the coil-scraper technique (not paddle-and-anvil as originally

Table 15

Occurrence of pottery and dates in trenches IV and V

Trench and Layer or Level		DATES	A. D.				
			800	900	1000	1100	1200
Trench V	Lino Black-on-gray	?					
	Boulder Gray	?					
	"Utah" Gray Ware?	?	?				
	Logandale Gray Ware?	?	?				
	Cerbat Brown	?					
Layer C	Verde Gray	?					

Trench V	As layer C plus						
	Aquarius Black-on-gray						
	Aquarius Brown			?			
	North Creek Gray			?			
	Paiute Ware					?	?
Layer B	Sandy Brown		?				
	Aquarius Gray						
	Aquarius Orange						
	Pyramid Gray			?			

Trench IV	Deadmans Fugitive Red						
Level 3	Aquarius Black-on-gray						

Trench IV	Deadmans Fugitive Red						
	Cerbat Brown	?					
Level	Kirkland Fugitive Red			?		?	
2	Kirkland Orange			?		?	

Trench IV	Boulder Gray	?					
	Cerbat Brown	?					
	Deadmans Fugitive Red						
	Deadmans Black-on-gray (PII)						
	Aquarius Brown						
Level 1	Kirkland Black-on-orange			?			
	Kirkland Fugitive Red			?			
	Pyramid Gray						

Table 16

Ceramic patterns and dates at Willow Beach
 (* Dates based on these excavations)

POTTERY TYPE	Ceramic Pattern #1	Ceramic Pattern #2	Ceramic Pattern #3		
	700	800	900	1000	1100
Lino Black-on-gray	? _____				
*Boulder Gray	? _____				
*"Utah" Gray Ware	? _____	?			
*Logandale Gray Ware ?	? _____	?			
Verde Gray	? _____				
Cerbat Brown	_____				
Deadmans Fugitive Red		_____			
Aquarius Brown		_____			
Sandy Brown		? _____			
*Kirkland Fugitive Red			? _____		
*Kirkland Orange			? _____		
North Creek Gray			_____		
Deadmans Black-on-gray (PII style)			_____		
*Kirkland Black-on-orange (PII style)			_____		
*Pyramid Gray			_____		
Aquarius Orange				_____	
Aquarius Gray				_____	
Aquarius Black-on-gray				_____	
Paiute Ware					? _____ ?

described). In the upper ceramic horizons at Willow Beach and in the Pueblo II status ruins of the Muddy River Valley, this type is usually a lighter gray, often has a light gray to almost white core, and often exhibits smaller olivine and iddingsite temper. If future research so indicates, this variety should be named. A sherd of each extreme variation was placed in an oxidizing kiln, and the results indicate that the clay of the darker variety remained darker than that of the lighter type. This may well represent a development within one type, wherein the temper and color trends merely reflect improved ceramic techniques in Pueblo II times. Boulder Gray, as well as Moapa Black-on-gray (recovered from the pier test), were probably manufactured in the Toroweap Valley region, the only locality near Lake Mead where olivine sands are abundant (McKee and Schenk, 1942, 253-254, 255-257, 259). The distribution of Moapa Gray Ware seems to bear this out: it is most common on the Shivwits Plateau just west of Toroweap Valley; farther west in the Muddy River Valley of southern Nevada, it occurs less often, probably as trade ware; at the Willow Beach site it is rare; in short, the quantity diminishes as one moves west from the Toroweap area.

A rather detailed study was made of Pyramid Gray sherds to determine their relation to other types in the surrounding region. The temper exhibits a preponderance of large subangular to rounded quartz particles. Quite frequently biotite is adhered to the quartz temper and is sometimes visible on the surface of the vessel. Rarely, minute pieces of volcanic glass (obsidian) are also seen. Though obsidian is not common along the Willow Beach portion of the Colorado River, it does occur and is found in small particles in the local washes. The temper indicates that Pyramid Gray was manufactured in the near vicinity.

An examination was made of the terra cotta colored clay recovered from the preceramic levels to ascertain whether it may have been the type of clay used in Pyramid Gray. This clay is composed of fine silt, usually angular; minute particles of calcium carbonate also are present, though rare. This material is fairly typical of the Muddy Creek silt formation, a Miocene deposit (Longwell, 1949, 929, 936), which is encountered in southern Nevada and along the lower Colorado River below Hoover Dam. These silts are exposed in arroyo banks near Willow Beach and some of the clay deposits are fairly extensive. A sample of the clay from the preceramic levels was fired in an oxidizing atmosphere. It fired to an orange color resembling very closely the coloring of Pyramid Gray sherds which had been subjected to an oxidizing atmosphere in similar tests. The result of this test indicates that the iron content and other color determinants of the clay from preceramic levels is the same as that of the clay used in Pyramid Gray. Any slight variation can be explained by variations within the original

clay beds, because iron could easily leach out of one area or level into another. For this reason a chemical analysis to determine the amount of iron was not made.

Interestingly enough, some of the Muddy Creek clays in the Overton area, north of Lake Mead, contain large amounts of calcium carbonate. Since this substance does not vitrify until it reaches about 600° C., it would remain in its original state in the clay of prehistoric vessels, if they were not fired over this temperature. As calcium carbonate dissolves in water, it is highly probable that the clay in the Overton region was used in the manufacture of Logandale Gray, for this ware often exhibits a pitted surface -- each pit being undercut as though some substance had dissolved out. Colton (1945), in referring to an unfired sherd from Black Dog Cave and to a sherd of Logandale Gray, remarks on the solubility of the limestone in the paste. A survey of the area just north of Black Dog Cave, a few miles north of Overton, has revealed that Logandale Gray Ware is quite common in the region, and that it is often associated with pithouses (Schroeder, A. H., 1953a).

In the course of running tests on Pyramid Gray sherds it was noted that in an oxidizing atmosphere the cores and interior surfaces of jar sherds fired to an orange, while the exterior surfaces of all but one fired to a buff or cream-white. In another case, a bowl sherd, the same results were obtained, except that both surfaces turned light buff. This led to a series of experiments to determine the cause of this surface color difference. These were conducted on the premise that a relatively iron-free wash or slip had been applied to the surface prior to firing, the wash perhaps having absorbed an additional small amount of iron from the pottery clay during application. Clay recovered from the preceramic levels was used in the tests, and slugs to which no temper was added were made. The following conclusions are based on the results of the experiments, which are on file at the Museum of Northern Arizona.

The terra cotta clay from the preceramic levels at Willow Beach burns to the same orange color as do sherds of Pyramid Gray when placed in an oxidizing atmosphere (slug 429). It is concluded that the clay recovered is probably identical to that used by the Indians to manufacture Pyramid Gray.

The addition of an organic substance (a saturated solution of sugar) to this terra cotta clay produces a carbon streak in an oxidizing atmosphere. Since Pyramid Gray sherds refired in an oxidizing atmosphere of low temperature do not exhibit a carbon streak, it is concluded that a completely gray core cannot be obtained in an oxidizing atmosphere by adding an

organic material to a terra cotta clay (slug 431).

When this terra cotta clay is fired in a low temperature partial reducing atmosphere the core becomes tan, indicating that a low temperature reducing atmosphere alone will not produce a gray color throughout the core, as is the case with Pyramid Gray (slug 434). When an organic substance is added to this clay and the mixture is fired in a partial reducing atmosphere, of low temperature, a completely gray core is produced (slug 440). This is the only manner in which the gray core of Pyramid Gray could be reproduced in the experiments using terra cotta colored clay.

The application of an organic solution to the surface of a slug will produce a black surface when the slug is fired in an oxidizing atmosphere at the relatively low temperature of 475° C. However, the core remains tan (slugs 436 and 439). When these specimens are refired at a higher temperature, 625° C., the organic solution burns out to a tan and the untreated surfaces fire to an orange (slugs 436 and 439, unnumbered halves). Thus, it appears that an oxidizing atmosphere will burn out an organic slip at a low temperature (around 625°).

When this clay is fired to about 400° in a partial reducing atmosphere (accomplished by placing a few wood shavings in the kiln), the surface near the wood shavings turns gray or becomes smudged (slugs 434-435 and 437-438). Addition of a large quantity of wood shavings and firing to 500° in a partial reducing atmosphere turns all surfaces gray (slugs 440-444). The smudging darkens even more when an organic substance is added and the clay is fired in the same manner (slugs 440-441 as compared to slug 442). Thus a gray surface can be produced at a low temperature in a partial reducing atmosphere, the quantity of fuel also apparently affecting the degree of any smudge that results.

When the gray-surfaced slugs containing an organic slip are refired in an oxidizing atmosphere, the gray coloration remains but the color is a lighter gray (slugs 440-441 and 443-444, unnumbered halves).

Terra cotta clay or a surface slipped with kaolin (or an iron-free clay) becomes gray when fired at a low temperature in a partial reducing atmosphere (slug 442). However, this gray coloration over a kaolin slip burns out when refired in an oxidizing atmosphere at 625° (slug 442, unnumbered half). When an organic substance is applied alone or is mixed with a small quantity of kaolin and applied as a slip it fires black in a partial reducing atmosphere (slugs 440-441 and 443-444). When refired in an oxidizing atmosphere at 800° this slip turns to a lighter gray color than slugs treated with a pure organic slip, but it does not burn out completely.

Kaolin alone will not retain the smudge as effectively as it does in combination with an organic substance or as does terra cotta clay alone (slugs 441 and 444 as compared to slugs 440 and 443, at 800°).

The above experiments indicate that Pyramid Gray was manufactured with a terra cotta clay mixed with an organic substance. Vessels were fashioned by paddle-and-anvil. After a vessel was dried in the sun, a clay slip, with perhaps sufficient iron to produce a light cream to buff color when fired in an oxidizing atmosphere, was often added to the exterior surface of jars and both surfaces of bowls. The product was fired, probably in a small pit in a poorly controlled reducing atmosphere, at a relatively low or intermediate temperature, to produce a gray color. As the result of use over cooking fires, the gray surface of some portions of the vessels turned to a gray buff color, the gray smudge having partially burned out in the oxidizing atmosphere of the cooking fire. Aside from the use of the slip, the above method of manufacture is similar to that of the modern Walapais, Western Yavapais, and Diegueños (Kroeber, 1935, 89; Gifford, 1936, 281; Rogers, 1936, 7-8).

It is also probable that a mucilaginous vegetal juice was added to increase adhesion. The Walapai accomplish this today by adding "tapa" water (boiled cactus juice) as modern ceramists add gum arabic. The slip probably was applied to act as a seal, as Pyramid Gray is quite porous. Unfortunately, no local white clays could be found for the experiments, though such are reported to exist along the river. For this reason kaolin was substituted in the experiments.

The coloring of Cerbat Brown was reproduced in the above experiments. The unslipped surface of the numbered half of slug 436, fired to 475° in an oxidizing atmosphere, is a slightly lighter brown than sherds of Cerbat Brown, and the unnumbered half of the same slug refired to 625° in an oxidizing atmosphere is only a little paler than Cerbat Brown sherds fired in a similar atmosphere. Similarly, the core of the numbered half of this slug exhibits a slightly lighter color than that of Cerbat Brown. The surfaces and the cores of Cerbat Brown sherds are slightly darker than slug 436 (numbered half) but this is probably to a greater iron content or some other color determinant in the clay of Cerbat Brown. This pottery type fires to a red orange in an oxidizing atmosphere while the Willow Beach pre-ceramic clay used in the experiments fires to an orange. The carbon streak occasionally seen in the cores of Cerbat Brown sherds indicates that the clay may have contained organic material either in its native state or that it was added during manufacture. Either is a possibility, as clay varies at its source and the Indian did not use a measuring cup. Moreover,

if the organic substance was added, the viscosity, the quantity used, and the temperature and length of firing would determine whether or not it would survive as a carbon streak in an oxidizing atmosphere. Addition of an organic substance in the process of manufacture is favored and will be discussed later.

One other item remains to be discussed. Colton used the term "scummed surface" (which Rogers originally employed to describe an efflorescent [powdery] finish in connection with some southern Arizona pottery types) to designate the finish of some sherds of Aquarius Orange, Aquarius Black-on-orange, Cerbat Brown, Cerbat Red-on-brown, Aquarius Brown, Aquarius Black-on-brown and Aquarius Black-on-gray. All of these types are limited to northwestern Arizona. The surfaces described as having a "scum" finish, as used by Colton, usually present a sheen that reflects light. Since some tribes smear the exterior of a vessel with grease after firing, we decided to test the "scum" surface for carbon, although we assumed that any grease would have burned off in cooking fires. Schenk heated some scrapings from the scummed surface of a Pyramid Gray sherd in sulphuric acid. The solution turned to a dirty brown, indicating the presence of either carbon or iron. When this solution was treated with phosphoric acid, it cleared, indicating that the scrapings were iron. Had any quantity of carbon been present, the solution would not have cleared.

Pyramid Gray sherds invariably bear evidence of finger wiping while the vessel was in a plastic state. However, there is nothing to indicate that the wiping action continued until puddling occurred, which might have allowed certain ingredients of the clay to work up to the surface and create a true scum (powdery) finish. Since the experiments did show that the exterior surfaces of jars and bowls were slipped with a clay, efforts to solve the problem turned again to ceramic materials. The Bureau of Mines, Boulder City, did a qualitative spectrographic analysis on a sample of Pyramid Gray exhibiting a sheen to determine whether there might be sufficient lead in the clay or slip to cause a slight glaze.

The report listed the following constituents:

<u>Common</u>	<u>Present</u>	<u>Trace</u>
alumina	barium	boron
calcium	chromium	lead
iron	copper	molybdenum
magnesium	gallium	
silica	manganese	
	potassium	
	sodium	
	strontium	
	titanium	
	tungsten	
	vanadium	

It is assumed that the trace of lead in the sample would not be sufficient to cause a sheen or semi-glaze since the Mineral Park clays, which contain a trace of lead, would not produce such a finish. Moreover, since Pyramid Gray is the only one of the types under discussion that exhibits a slip, the answer apparently does not lie in a leaded clay.

In an article on scumming, Rogers presented the possibility that the efflorescent finish, though not always present, was not due to an applied wash but was the result of scumming in the course of firing. It was his contention that this finish is due to soluble salts, probably calcium sulphate (gypsum), working to the surface during firing. ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (gypsum) changes to CaSO_4 (anhydrite) at about 42°C .) Rogers (1928)² indicates that the pits on the vessel surfaces are due to the dissociation and absorption of specific crystals (gypsum). He also observes that this type of finish varies in its distribution on the vessel surface, that it most often occurs on vessel exteriors though it is quite common on bowl interiors, and that it is especially prevalent on certain Yuman wares of the Colorado River.

Dr. Shepard had the following comments to make on the above. Ceramists usually distinguish dryer-white (scum), caused by efflorescence of soluble salts during drying, from kiln-white, which occurs during firing, and wall-white which appears on exposure to weather after firing. Calcium sulphate has low solubility but relatively little is required to produce scum and the slower the drying process the more calcium sulphate goes into solution. It is also reported that as little as .001% vanadium oxide may cause a scum. In some instances dryer-white does not show plainly until after firing. During firing, pyrites in the fuel or clay may react with calcium carbonate in the clay to form a kiln-white. These are some of the

ways by which scums can occur.

One important fact was noted in the experiments. When Pyramid Gray sherds exhibiting a sheen are fired to 850⁰ C. in an oxidizing atmosphere, the gray color, as well as the sheen itself, burns out completely. The experiments conducted indicate that the gray coloration may have been due to a smudging action or to the introduction of a vegetal juice to the clay. Since a high oxidizing atmosphere removes the carbon as well as the sheen, the finish must result from the application of an organic substance to the surface, such as was done in experiment 145.

The Walapai, in fashioning their pottery vessels with the paddle and anvil, always moisten their tools in "tapa" water in the final smoothing process (Kroeber, 1935, 88). This would leave at least a trace of the sticky cactus juice on the surface of the pot. Perhaps the same organic substance that had been mixed into the clay was spread over the dried slip of Pyramid Gray.

The above considerations would seem to indicate that the surface on Pyramid Gray is not a true scummed surface, and that the application of an organic substance to the surface of the vessel may have caused the sheen on various sherds of northwestern Arizona types. A definite answer lies in the fields of chemistry and petrography.

The completion of this report was delayed by the need for a survey along the lower Colorado River from Davis Dam south to the International Border. A study of the sherds collected on the survey revealed that the material from the entire length of the river surveyed could be included under one ware. Moreover, comparisons indicate that Pyramid Gray belongs to this same ware (Schroeder, 1958).

Of the few unidentified types recovered at Willow Beach, one has been identified as Parker Buff as a result of the survey down the Colorado River. This specimen, from layer A-B, exhibits an exterior rim tucker or fillet, notches on the rim, and buff surfaces, and is apparently a late type.

CULTURAL HORIZONS, TRAITS AND DATES

The following is a summary of the cultural material recovered from the various horizons of trench V (Table 17). The traits below which are question marks are not considered particularly dependable as diagnostics (either present or absent) since they are either single occurrences or occur above and below horizons in which they are lacking.

Stone horizon 1 - This is represented by layers N and O. The few artifacts that appear in N also occur in O. The paucity of finds in N and N's relations to O was due, as previously discussed, to flood action and redeposition during flooding. Chief diagnostics are type I, Ia, and Ib points, slab metate, and the dominant use of mottled cherts for flaked implements.

Stone horizon 2 - This is represented by layer L. Since L was completely eroded away, nothing is known of its relation to other horizons.

Stone horizon 3 - This is represented by layer J. The relatively few finds here again hinder comparisons. It differs from horizon 1 in the presence of a single type IV knife, deep oval basin metate, firepit, and hematite (?). Unfortunately, no points were recovered. Otherwise all horizon 3 traits are found to be common with horizon 1.

Stone horizon 4 - This is represented by the contact between layers H and I. Since it was almost entirely eroded away, it is of no comparative cultural value.

Stone horizon 5 - This is represented by layers F and G which were actually one thick layer which was artificially divided in half in the hope that any cultural change that may have occurred would show up. None did, however. This horizon differs from the others in the presence of a hand pick (?), type III points only, and the appearance of a shaped mano for use in a shallow oval basin or on a slab. The absence of large blades, drills (?), type I points, and slab metates mark it as different from horizon 1. Chief diagnostic is the type III point.

Ceramic horizon 1 - This is represented by layer C, where pottery first appears. It differs from the previous stone horizon in the presence of intrusive pottery, types V, Va, and VI points, and cooking pits, and in the absence of type II knives, type III points, manos (?), and metates (?). Diagnostics are the intrusive pottery and types V, Va, and VI points.

Ceramic horizon 2 - The existence of this horizon is questionable. If it did exist, it can only be represented by a few sherds which date

Table 17

Trait list of trench V

TRAIT	HORIZON & LAYER	Stone #1 Layer O	Stone #2 Layer L	Stone #3 Layer J	Stone #4 Between H-I	Stone #5 Layer F-G	Ceramic #1 Layer C	Ceramic #3 Layer B
Point, type I		xxx						
type Ia		xxx						
type Ib		xxx						
Core, stone		xxx						
Metate, slab		xxx						
Bone, burned		x				x	x	x
split		x		x		x	x	x
Hammerstone		x		x		x	x	x
Raw clay		x		x		x		x
Roasting pit		x		x		x	x	x
Scraper, flake		x				x	x	x
spall		x		x				x
rough		x				x	x	
Knife, type II		x		x		x		
Blank		x		x				
Pecking stone		x	x			x	x	
Oval stone disc		x				x		
Knife, type III		x				x	x	x
type I		x				x		
Drill		x						x
Knife, type IV				xxx				
Hematite				x				
Chopper						x	x	
Metate, oval basin				x		x		
Fire pit				x			x	x
Pick, hand						xxx		
Point, type III						xxx		
Mano, shaped						x		
Point, type VI							xxx	
type V							x	x
type Va							x	x
Cooking pit							x	x
Pottery, intrusive							xxx	x
Bone, worked		(xxx - diagnostic trait)						x
Knife, type V		(x --trait present)						x
Reamer								xxx
Point, type Vb								xxx
type VII								xxx?
type VIIa								xxx?
Turquoise bead								xxx
Pottery, indigenous								xxx

A.D. 700-1100. These, however, appear to be associated with the next horizon.

Ceramic horizon 3 - This is represented by layer B and the contact of layers A and B. Since all the traits of A-B are found in B, no distinction is made between the two. This horizon differs from ceramic horizon 1 in that indigenous pottery is present, as are drills (?), reamer, types Vb, VII, and VIIa points, type V knife (?), deep oval basin metates and associated manos (?), and turquoise. Diagnostics are the appearance of indigenous pottery, types Vb and VII (?) points and turquoise.

It will be noted from Table 18 that pressure flaked knives and the practice of retouching are restricted to the stone horizons, and that the point types change from one horizon to the next. Little can be postulated concerning the other artifacts of Table 18 due to their relative sparsity. Those artifacts shaped by pecking are found in all layers except O -- metates in layers J, F-G, possibly C, and B, and a mano in layer F-G. The remaining stone tools from all layers are use-abraded -- a slab metate in O, pecking stones in O, F-G, C, and probably in J, and hammerstones throughout.

The most surprising element of the stone work is the relative lack of definable scrapers. Since the evidence indicates great dependence on hunting, judging by the amount of bones, knives, and points, three explanations for this paucity are offered: 1) Local game was killed purely for food with no intention of using the hides, which seems rather unlikely; 2) Some of the implements defined as knives and blanks were used for scraping the hides; or 3) Game was obtained en route to this camp site to which, perhaps, only a quarter of meat or dried meat was carried.

The cultural materials encountered in the various horizons aid in dating the upper layers of the terrace. The pottery types associated with layer C indicate a Basketmaker III status, presumably before A.D. 750. Types occurring in layer B in the main have beginning dates about A.D. 900. The latest-dated type on the surface of the site, Tusayan Black-on-red, establishes a tentative end date of about A.D. 1150. Establishment of dates for the preceramic levels on the basis of cultural associations is not so easily determined. The earliest lithic culture, which occurs in layer O, is probably Basketmaker II.

Charcoal material from several levels was submitted to the University of Michigan Memorial-Phoenix Project Radiocarbon Laboratory and the following dates were obtained: layer B (ceramic level) 500 ± 250 B.P.;

Table 18
Correlation of the number of occurrences
and provenience of flaking techniques

	FLAKING	Percussion					Pressure				
	LAYER	O	J	F-G	C	B	O	J	F-G	C	B
ARTIFACT											
Core tools							KEY				
Scraper		1-U		1-U			U - unifacial flaking				
Chopper (spall)				1-U	1-U		B - bifacial flaking				
Pick				1-B							
Flake tools											
Scraper, rough				3-B	2-B						
Blank		1-B	1-B								
Knife		17-B		2-B	2-B	6-B	9-B	3-B	5-B		
Scraper, flake							9-U		5-U	2-U	3-U
Scraper, spall							3-U	1-U			
Drill							4-B				2-B
Point							11-B		3-B	8-B	11-B
Reamer											1-B

Summary:

Core tools - all percussion formed, rare

Flake tools - percussion flaking restricted to rough scrapers, blanks, and rough knives.

- pressure flaking restricted to finished knives, flake and spall scrapers, drills and reamers, and points.

- retouching restricted to knives, points rarely retouched.

Techniques - unifacial flaking restricted to scrapers and chopper. All other tools bifacially flaked.

layer F-G (the uppermost preceramic horizon) 1500 ± 250 B.P.; layer J (intermediate preceramic horizon) 1700 ± 250 B.P.; and layer N-O (the lowest preceramic level) 2200 ± 250 B.P.

The radiocarbon date for layer B is acceptable when either the range of experimental error or the post-1150 A.D. occupation by ancestral Paiutes is considered. The ceramic end-date for the use of the site by the makers of Pyramid Gray (layer B, layer A having been mainly sterile sand) is about A.D. 1150, and the maximum radiocarbon date, 750 years, falls around A.D. 1200. The brush hut and Paiute Brown Ware sherds in the upper few inches of the terrace undoubtedly date after A.D. 1150, but whether soon after or considerably later remains to be demonstrated. The Shoshonian entry appears to have taken place close to A.D. 1150 and may have been in part responsible for the discontinued use of this site by the makers of Pyramid Gray. Mixture of some of the Paiute rubbish, including charcoal, into the level of former occupation, may be the cause for the about A.D. 1400 date for layer B.

Layer C, the earliest ceramic level, did not contain enough charcoal for radiocarbon testing. However, the presence of early ceramics, including Lino Black-on-gray, suggests a pre-A.D. 750 date. Two to three feet of flood deposits separate layer C from the topmost preceramic layer, F-G, the latter having yielded a radiocarbon date of 1500 ± 250 B.P., or A.D. 450. Thus, the pottery of layer C falls between A.D. 450 and the suggested pre-A.D. 750 date, a range that agrees very closely with the known tree-ring dates on Basketmaker III pottery in the Four Corners area.

The topmost preceramic horizon, dated around A.D. 450, contains material culture affiliated with or related to that of the southern California desert. This horizon represents the final, complete replacement of the Basketmaker II culture which formerly existed at this site.

Two flood deposits, layers H and I, with a suggestion of human occupation between them, occur between layers F-G and J. The latter (J) yielded a radiocarbon date of 1700 ± 250 B.P., or A.D. 250, and contains both Basketmaker and southern California traits, apparently representing the beginning of the mixture of these two cultures at Willow Beach.

Two additional flood deposits (layers K and M), with a thin cultural zone (layer L), between them, were found under layer J and above the lowest preceramic horizon (layer N-O). Layer N-O, containing Basketmaker II material, yielded a radiocarbon date of 2200 ± 250 B.P., or 250 B.C. This represents the earliest date so far obtained for the Basketmaker II stage. The following summarizes these data:

<u>Layer</u>	<u>Cultural Dates or Stages</u>	<u>Radiocarbon Dates</u>	<u>Probable Dates</u>
A	post-A. D. 1150		post-A. D. 1150
B	A. D. 900-1150	500 \pm 250 B. P. (A. D. 1450)	A. D. 900-1150 or A. D. 1200
C	pre-A. D. 750		A. D. 600-750
D-E	flood deposit		A. D. 500?
F-G	S. California	1500 \pm 250 B. P. (A. D. 450)	A. D. 450
H	flood deposit		A. D. 400?
?	culture?		A. D. 350?
I	flood deposit		A. D. 300?
J	Basketmaker II and S. California	1700 \pm 250 B. P. (A. D. 250)	A. D. 250
K	flood deposit		A. D. 150?
L	culture?		A. D. 50?
M	flood deposit		50 B. C. ?
N-O	Basketmaker II	2200 \pm 250 B. P. (250 B. C.)	250 B. C.

Mention should be made of possible contamination which might have had some effect on the radiocarbon dates. These deposits were subjected to several floods. Late floodwaters percolating through the sands of the previously deposited preceramic levels may have carried more recent organic material in solution into the charcoal of the lower horizons, resulting in too recent dates. On the other hand, since the composition of layer K, for example, proved to be quite calcareous and the efflorescent material of this layer gave a strong reaction for calcium, it is possible that the dates for the preceramic levels may be too old. Whether these two factors had any great effect on the charcoal associated with the site is a moot point. Certainly the tentative dates assigned to each culture and flood deposit are within reasonable bounds.

COMPARISONS

The evidence obtained from the 1950 excavations is quite clear-cut, due mainly to the sharp stratigraphy of the finds. It remains now to compare this material and evidence with that of other excavations and surveys in the area before establishing local phases and diagnostics.

1936 Willow Beach Excavations

Before dealing with this material, a few words are necessary concerning the information available. The 1936 excavations were conducted under the direct supervision of a foreman who had previous field work experience but no formal training. His notes are mainly a daily record of recoveries but do contain occasional sketches and general remarks. Field catalog slips were employed in recording data on each artifact and this information was placed on catalog cards. No final drawings were prepared (or they have since been lost), aside from one incomplete penciled scale drawing of the profile of the northeast side of the excavation. Triangulation sketches were made showing location of artifacts in relation to several station stakes, but no plan of the site has been found which shows the location of these stakes. As a result, comparisons below are restricted to information on the catalog cards, which in most cases is a record of depth alone.

The existing profile sketch mentioned above gives no definite indication of clear-cut stratigraphy, though two figures in a brief report clearly exhibit stratigraphic horizons (Harrington, 1937a, Figs. 17, 19). However, a sketch in the field notes reveals two definite "charcoal and ash" layers separated by a sand layer, this being similar to the situation in trench V. The top ash level ran in a wide band from the surface down to an uncertain depth, about 4 ft. (probably comparable to layers A-C) judging from observations recorded elsewhere in the notes. The lower ash level, also a wide band, was at the base of the trench (probably comparable to layers F-O). The field notes state that little was found between the top and bottom ash levels (probably comparable to layers D-E). In some instances the catalog cards state that artifacts were recovered from the lower or upper ash level. The topmost find mentioned in the lower ash level was 5 ft. 3 in. below the surface. (In trench V, the top of layer F was 5 ft. 1 in. below the surface.) In spite of the above situations, a study of the material on the basis of depth alone appears to correlate reasonably well with the finds of the 1950 excavations.

It might be well to point out that not all material recovered is considered in the discussions below, since a large number of the specimens

were picked up on the gravelly surface of the river bank immediately below the terrace on which the site is situated. Nor has fragmentary material of questionable artifacts been considered. In addition, unfortunately, some of the material is missing. However, the discussions below deal mainly with material of diagnostic value and with artifacts easily broken down into types for comparative study.

Points. A comparison of Figs. 12 and 13 (points from trench V) and Figs. 20 and 21 (points from the 1936 excavations) reveals that the same types occurred in similar sequence. In the 1936 excavations, types VII and VIIa occurred on the surface along with one type V and one type Vb. In the upper level types V and Va occurred between 5 in. and 11 in., along with one type V point from slightly lower (2 ft. 4 in.). Under these there was a gap from 2 ft. 4 in. to 5 ft., probably representing the sterile layer D. Type III points were recovered beneath this sterile deposit, as in trench V, and they were restricted between the depths of 5 ft. and 5 ft. 9 in. From this level down to the base of excavations only type I points were found. However, three type I and five type I-like points were uncovered above the 5 ft. level from 2 ft. 4 in. up to the surface. These latter are designated as Ic and Id. Ic is similar to type I but the base of the stem does not extend out to the blade edges. Id is similar to Ic with the addition of a basal notch in the stem. These types occurred only in the upper level and on the surface. Aside from these additional types, plus one obsidian point mentioned in the field notes at a depth of 7 ft. 7 in., the above indicates a sequence in point stratigraphy similar to that of trench V. The only exception appears to be the occurrence of three type I points above the type III points at 2 ft. 4 in. These may represent true survivals or may be strays picked up from the terrace below.

Drills, graver, and reamers. Though there is nothing particularly diagnostic about these artifacts, it should be noted that the majority occurred in the uppermost level, as in the 1950 tests. Of the two artifacts recovered from the lower depths, one is a chert flake drill unifacially chipped on both edges and the other a chert graver with a well worked point and shaped base. From the upper level, a flake drill unifacially chipped on both edges, a broken point or drill shaft that had been reworked into a drill, two drill bases, and two reamers, all of chert, were recovered. Again, the reamer occurred in the uppermost horizon, as in trench V.

Blanks. These occurred at varying depths from the surface down into the lower ash level. Like the specimens from trench V, these are thick chert implements rudely fashioned by bifacial percussion flaking, probably for eventual use as rough hand knives, scrapers or hand picks.

Knives. Again the same types and materials noted in trench V are encountered. Type II specimens occurred in the lower horizons only, type III in all horizons, and type IV in a low stone horizon, all as in trench V. Type V blades, which are confined to layer B of trench V, were recovered at 8 ft. 10 in., 5 ft. 8 in., 3 ft. 8 in., 1 ft. 4 in., and on the surface. These are triangular or leaf-shaped with bifacial flaking on the edges. Usually one side is practically unworked and concave and the other convex with allover flaking. Type I blades occurred in the upper levels only, which contrasts with trench V finds. Provenience is listed below.

	Type	I	II	III	IV	V
surface to 1 ft. 4 in.		1		21		3
3 ft. 2 in. - 4 ft. 8 in.		1	2	10		1
5 ft. - 6 ft. 8 in.			10	2	1	1
7 ft. 6 in. - 9 ft.			4	2		1

About 100 other small fragments of type III knives were recovered. They were nearly equally divided among all levels.

Manos and metate. Four shaped manos of quartzite were recovered: (A) a loaf-shaped type with one flat grinding surface exhibiting striations across the short axis, at 1 ft. 6 in.; (B) a flat rectangular mano with rounded corners and two practically flat grinding surfaces with striations across the short axis, at 2 ft. 6 in.; (C) a four-sided mano, square in cross-section, all sides of which exhibit striations across the short axis, at 4 ft.; and (D) a rectangular mano with rounded corners and one flat and one convex grinding surface with striations across the short axis, at 7 ft. The grinding surfaces of all of these manos are roughened by pecking. All appear to have been used on a flat or slab-type metate with the exception of one side of D which probably was used with a back-and-forth motion in a shallow oval basin metate. Type B of the above is comparable to the trench IV mano from the ceramic horizon. Types A, C and D are not found in trenches IV or V. Type D was recovered at a depth of 7 ft., which suggests that this type of mano occurred in a horizon comparable to layer F-G or J.

One shallow oval basin metate of malpais was recovered at 5 ft. 3 in., probably comparable to layer F-G of trench V. All surfaces are shaped and the grinding surface, which is concave on both axes, is worn by a linear motion along the long axis.

Hammerstones. These occurred at all levels but were more common near the surface. Specimens are not illustrated because none were specialized, all being similar to those of trench V.

Miscellaneous material. A quartzite rock, found at a depth of 5 ft. 10 in. (probably comparable to layer F-G) with one relatively flat surface exhibiting miscellaneous individually applied striations, and two others, from a depth of 2 ft. 4 in. (probably the same as layer B) with similar markings on both flat surfaces, were recovered. Perhaps these are similar to the stone from layers F-G of trench V.

A fragment of what appears to have been the bowl end of a porous rhyolite pipe was found at 10 ft. Not quite half of the specimen is represented and it is difficult to state whether there was a hole at the base of the "bowl" for insertion of a reed. The bowl bears no evidence of smoking. The interior surface is rough and very small, and the exterior is roughly smoothed down. The complete artifact probably was cylindrical in shape.

At 9 ft. 6 in., probably layer O, a portion of a tubular clay pipe was uncovered. The clay exhibits no visible temper and the bowl interior, to half way through the core, is smudged. There is no evidence that it was ever fired and it probably owes its hardness and survival to the baking received in the course of smoking. The bowl fragment is bell-shaped and a portion of a hole in which a reed was probably inserted is evident at the apex. The bowl-shaped cleavage of the clay is similar in appearance to the piece of hardened clay found in layer O of trench V.

Burned hut. An oval floor area, measuring 10 by 12 ft., containing a central fire area (not a pit) 5 ft. in dia. and 6 in. deep, was uncovered 6 in. below the surface. No other structural details are mentioned in the notes. Numerous fragments of burned willow indicate that the shelter or hut had burned. The following materials were recovered from the floor.

1. Fragments of a calcite cylinder with one tapered end and a central open core (Fig. 22a). This once-complete specimen had shattered along lines of cleavage, probably at the time the shelter took fire. The exterior is finely polished and the rim of the hole, which passes through the center, is well rounded. Its use is not known.

2. A fragment of a tortoise shell (Fig. 22b). Three conical holes are drilled completely through from one side, and half of another hole is visible on the suture edge. In addition there are 15 other cavities, barely 1/16 in. deep, drilled from the same side in no apparent pattern. All edges except that of the suture are ground smooth. The reverse side has no embellishment. This worked fragment may well be a portion of a turtle-shell rattle similar to those reported by Gifford from Santa Catalina Island, the holes of which are also slightly conical and drilled from the outside only. Probably, Olivella disc beads were cemented with asphaltum into the pits of the Willow Beach specimen, as in some of the coast specimens. A good

illustration of this technique is given by Gifford (1940, 176; 1947, 35), though his specimen is a slate pendant.

3. A fragment of a flat, notched bone (Fig. 22c). The back portion is split off, and the front surface is smoothed. Along one edge of the smooth side is a raised border of notches; the spaces in between are rounded and smoothed, and the central area of the bone has been smoothed down. Use is unknown.

4. A complete obsidian scraper (Fig. 22d). Although a portion of the original surface can still be seen, it is flaked almost all over and the edges are retouched.

A number of saucer-shaped Olivella beads also were recovered. In addition were three pieces of hematite, burned turquoise fragments, one knife fragment, one broken point and a broken metate (both of which are missing from the collection), small animal bone fragments, and burned cloth fragments with a simple under-one-over-one weave. The pottery associated with this hut is listed in Table 19 in the ceramics section of the 1936 excavations.

Cooking pits. Three definite cooking pits in the trench are mentioned in the field notes. One, 2 ft. 6 in. in dia. and 8 in. deep, was found at a depth of 1 ft. 9 in.; another, 2 ft. 10 in. in dia. and 8 in. deep, was found at a depth of 1 ft. 1 in.; and the third, 3 ft. in dia. (no thickness given) was found at a depth of 3 ft. 6 in. All contained fire rocks and one was described as being rock lined. A fourth pit, 2 ft. 2 in. by 3 ft. 4 in. and 7 in. deep, was found at the 7 ft. level. It contained fire rocks. Whether the fourth pit represents a fire area, base of a roasting pit, or an actual cooking pit is not known. Since pottery was associated with all of the cooking pits uncovered in the 1950 excavations, as well as with the first three above, there is some doubt that this fourth pit was a cooking pit.

Burials. Six flexed burials were uncovered during the 1936 excavations. The following descriptions are quoted from the 1936 notes.

Burial 1 - Adult burial, with a dog, found in lower ash deposit but not at bottom. Depth from surface to top of skull, 6 ft. Flexed on left side, knees doubled up to chest. Oriented SE by NW, facing south. Diameter of grave SE by NW, 3 ft. 6 in. and NE by SW, 2 ft. 8 in. Right arm bent to south with dog lying on top of arm. Dog on left side, facing toward south, with face up and body lying over human knees and legs. Human body decayed so that it couldn't be saved. Dog skull in good shape. Few flint chips found around body and few animal bones.

piece A large cooking pot had been broken over the body. One large piece over left shoulder, one over pelvis, one over left hand and another beside the legs [sherds missing]. Dog bones decayed. Length of dog body 2 ft. 7 in. Length of dog leg 1 ft. 5 in. Skull of human broken. Pueblo (?) type round skull [undeformed].

Burial 2 - Infant burial. Bones decayed so that they could not be saved. Skull crushed. Oriented WSW by ENE, facing south. Flexed on left side. Legs doubled up. One broken canteen back of head and 4 in. to N, and a broken bowl near the feet, 7 in. to south. A large broken piece of pottery near shoulder 3 in. south. Few small pieces picked up around the body. Eight arrow points found with the body, seven of them at the feet and one at the neck against the skull. Several Olivella beads, large, covered the body. Looked like the beads were on a dress or some kind of coat. Beads from head to foot under the body as well as on top. Several small Olivella beads found around the neck near the jaw. All burned. Several worked bones found around the burial on top and side. Most of them broken and burned. Three broken pieces of flat bones (look like hairpins). Diameter of grave 2 ft. 6 in. N-S, and 2 ft. 3 in. E-W. Depth from skull to surface, 4 ft. 2 in. The baby was small, just born. Found Pueblo type arrow points and pottery. There were 833 large Olivella [biplicata] beads and 27 small ones.

Burial 3 - Adult burial with large griddle stone [latter missing]. Diameter of hole 2 ft. NS and 2 ft. 4 in. EW. Depth from surface to top of skull, 5 ft. Flexed on right side, facing southeast. Left arm doubled up to mouth. Left leg from pelvis to knee remained. The rest of the leg bones were decayed. The pelvis bone appeared to have been broken. The skull round and pretty crumbly. A griddle stone on both knees and partially on the stomach to near the face measured 17 1/2 by 10 1/2 in. and was 1 in. thick. Few pieces of abalone shell, probably for pendant, were found under the neck when uncovered. They were so crumbly that it was hard to tell whether beads or pendant.

Burial 4 - Burial flexed on the left side, face down. The left arm and hand were under the body and the right hand crossed the left wrist. The legs extended in line with the body down to the knees. From the knees to the feet the legs

were doubled back a little past a right angle. The body was oriented in a SW by NE direction with the head to the SW. Length of burial SW by NE, 4 ft. and width SE by NW, 3 ft. Depth from surface to skull, 4 ft. The grave was dug in either a rectangular or triangular shape. No specimens were found with the burial. This burial undoubtedly [?] belongs to the burned willow hut. The burial is situated 3 ft. 6 in. under the SW quarter of the hut. The skeleton is that probably of a woman due to the presence of Olivella shell disc beads, turquoise beads, broken pots, and a broken metate found in the hut [?]. The bones were in fair state of preservation. The teeth were badly worn but there was no decay.

Burial 5 - Depth from surface to skull, 6 ft. 7 in. This burial was directly underneath burial no. 4 and 2 ft. 7 in. deeper. NS diameter of grave 2 ft. 6 in. EW diameter 1 ft. 6 in. The body was flexed on the right side facing the SE. The left arm along the body to the elbow and then bent at right angle to the east. The legs were drawn up in a squatting position with the feet next to the pelvis bone. Bones badly decomposed. The body oriented in a NS direction with the head to the south. A few bone beads and two abalone pendants were found. A large pendant 3 in. long and 2 in. wide and a small pendant 2 1/4 in. long and 1 in. wide were found. All of these objects were lying directly over the spinal column between the ribs and pelvis bone. After removing the skeleton several more bone beads and a large bone from which the beads were to be cut, 2 7/8 in. long, were found. The smallest bone bead was 1/4 in. long and the largest 1/2 in. long. Three abalone beads came from near the skull and a few fragments of turquoise. Child burial estimated between 5 and 6 years.

Burial 6 - Depth from surface to skull, 5 ft. 8 in. EW diameter of grave, 6 ft. NS diameter, 1 ft. 8 in. The body was flexed face down with the face turned slightly to the south. The legs were placed straight out in line with the body [?]. The arms were placed straight down along the sides. The bones are well preserved. A few small plain pot sherds, a dart point directly over the pelvis bone, 1 dart point between the ribs and spine and 3 dart points on the right side of the spine between the ribs and pelvis bone were found. There was no tooth decay except in one molar. There were no other objects found with the skeleton.

The presence of pottery and/or shell removes the possibility that these burials were preceramic, as these materials were encountered only in the upper levels of trenches IV and V, as well as in the same levels of the 1936 excavations. The depth of all of these burials, based on the stratigraphy of trench V, associates four of them with either the ceramic layers or the sterile layers below the ceramic level. Burials 1 and 6 are the only ones recorded in the lower levels. However, pottery was associated, implying that the burials were intrusive. Two additional burials (flexed) were recovered by Baldwin in 1947.

Barton Wright, archeologist, former resident at Willow Beach, has kindly furnished us with notes pertaining to two burials that eroded out of the sand banks during his residence at Willow Beach.

One was a burial of a child about seven years of age, buried face down in an extended position with the left leg partially drawn up. The pelvic region, left femur, and lower arm are missing. The head was surrounded with a red stain about 1/2 in. thick. About the neck was a shell gorget, possibly of glycymeris. Where the pelvis had been was a layer of ash and minute bits of polished and unpolished turquoise.

The other burial was that of an adult between 30 and 35 years of age, found about 2 ft. below the surface. Rocks had been piled above a metate which rested directly on the rib case of the flexed skeleton. One of the rocks was the mano for the metate. Behind the right shoulder lay a perfect hemispherical decorated bowl. The body was complete with the exception of the entire left arm, scapula, and clavicle. The rest of the bones were in excellent condition. In this immediate area three other skeletons washed out during a local cloudburst and could not be salvaged.

The bowl accompanying the second burial is similar to typical Deadmans Black-on-gray except that it has medium rather than small quartz temper and lacks mica. This vessel survived a fire in a cabin where it was stored. As a result, the surface color was altered to a gray tan color.

Ceramics. Unfortunately, few sherds were saved from the 1936 excavations (Table 19). However, the field notes indicate that pottery was restricted to the upper levels. The most definite remark was made on March 20 -- "In general the digging is from the surface to 4 ft. 6 in. ... All the specimens are found from the surface to a depth of 2 ft. 6 in. ... Below that there isn't much save a few bones and some pottery." In regard to the deep sherd finds the field notes state, "First 3 pieces found at this depth. May have been sloughed down from bank. It was near the slope of bank." These three sherds are not in the collection unless one of them is

the Lino Black-on-gray sherd listed in Table 19 at the 7 ft. 6 in. level. The one sherd of Aquarius Black-on-gray at level 8 ft. 7 in. in Table 9 is not mentioned in the field notes. This depth is given on the catalog card and may have been a typographical error for 7 ft. 6 in.

Two worked sherds were recovered. One, from the surface, is an unperforated disc of Pyramid Gray with rough edges. The other is a fragment of a worked sherd of Boulder Gray with one ground edge. This latter was found in the trench, depth not given.

1947 Willow Beach Excavations

The report on these excavations was preliminary and as a result did not contain statistical and detailed analyses. The material recovered consists mainly of potsherds and a few artifacts which were treated in a general discussion along with a quantity of the material from the 1936 excavations. Except in a few instances Baldwin did not differentiate between the 1936 and 1947 material, and for this reason the study of the 1936 excavations is incorporated in this report. Since there are no notes or profile drawings on the 1947 excavations, and none of the material was cataloged, no direct comparisons are possible. However, it is necessary to refer to the report for clarification of various points of apparent disagreement which are discussed below.

Stratigraphy. Baldwin's report states that there was definite stratification and such is illustrated in his Figs. 33 through 37. He modified this somewhat by stating that frequently the deposits were indistinct due to the relatively soft sand and ash contents (Baldwin, 1948, 70). None of the discussion on stratigraphy, however, was restricted to either one of the two trenches excavated, and because of this it is impossible to carry the profile of the 1936 trench through the 1947 excavations into the 1950 trench IV area.

Material density. Throughout the report are several instances in which the material recovered is termed "abundant," "very common," etc. This is somewhat misleading, as the 1947 material, aside from potsherds, was rather limited. The 900 specimens removed in 1936 from an estimated 13,500 cu. ft. indicates about one specimen per 15 cu. ft. In 1950 about one specimen per 10 cu. ft. was recovered. These figures do not include potsherds, which were fairly common in the upper levels only. The dearth of artifacts is due mainly to the wide band of sterile sand in the intermediate horizons and to the relative scarcity of material in the stone horizons, which represented camping debris rather than a sedentary assemblage.

Table 19

Sherd types and provenience
1936 excavations

[illegible]

Firepits. The 1947 discussion states that the firepits were clay lined. A close examination of the two illustrated in the report indicates that they were not clay lined, but were intrusive into a compact silt layer beneath the occupation zone, thus being similar to those encountered in 1950 (see Fig. 7).

Stone. The report states that both flat and basin-shaped metates were used, numerous examples of both being found, but only two are listed in the entire catalog of the 1936 excavations and another is in the 1947 collection; all are basin-shaped and formed by linear abrasion.

In two cases Baldwin refers to a three-quarter grooved maul from Willow Beach as a unique find in this part of the Southwest. In this connection, it is interesting to note that 12 similar specimens were recovered from the Sullivan Turquoise Mine near Hoover Dam, one from Grapevine Wash near Pierce Ferry, one from Boulder City, and 11 other specimens were collected by the C.C.C. from unknown localities in the Lake Mead Area.

A single obsidian point with a broken base, recovered from level 3 of the 1947 excavations, exhibits side notches and may represent the form of the type II point. The fine chipping is similar to the type II point of trench IV.

Two oval stone discs, unworked, were recovered from near the base of the 1947 excavations in levels 4 and 5. Thus, these stones were common to all three excavations at Willow Beach.

Other. In the discussion of bones recovered Baldwin lists, among others, antelope and mule deer. Since the material was not identified by an expert, this should be considered tentative. Others listed, jackrabbit and mountain sheep, agree with identifications on the 1950 material.

Under the discussion of ornaments, Baldwin states that Olivella shell beads were abundant, occurring in some numbers in almost all levels. Since Olivella was sparse in the upper ceramic levels of the 1950 excavations and is not common in the 1947 collection, the 1936 material was checked to determine whether the stated abundance and occurrence applied to those excavations. In three instances they were surface finds. In four cases they occurred within 1 ft of the surface. Two finds were with burial 2, which was associated with the ceramic horizon. Of the remaining two beads, one came from 4 ft. 8 in., just above burial 3, and the other from 7 ft., this latter being the only occurrence in a stone horizon. In all cases one or two beads were involved in the recovery, except for those associated

with burial 2 of the 1936 excavations where two clusters were found, one of 27 beads and another of 833, all apparently belonging to the burial 2 skeleton. Although Olivella beads actually occurred in several different levels, all but one were associated with the ceramic horizon.

Shivwits Plateau Area

Among the National Park Service collections at Boulder City is material collected from the Shivwits Plateau, some of which is identical to that recovered from layer O at Willow Beach. The sites are located in a broken forest of pine, pinyon, juniper, and some oak; the only water comes from springs at the contact of the Kaibab and Supai formations, the Coconino sandstone being practically absent. Several of these sites are about 1/2 mi. in extent. Of 22 sites east of Green Springs Canyon, 11 are pure stone sites and the other 11 contain varying amounts of pottery in addition to the stone material (See Figs. 23-25; fragmentary material, flake and spall scrapers, and pottery are not illustrated).

The pottery is of a Pueblo II category similar to that of the Muddy River and Toroweap Valley. In addition, there are a few brown ware sherds. The type VIIa points and an unidentified point (Fig. 24c) occurred only at sites containing pottery. All pure stone sites exhibited only type I points except for the occurrence of one finely chipped type II(?) obsidian point at one site (Fig. 24b), one doubtful type point along with obsidian chips at another site, the base of what appears to be a Plainview-like point (Fig. 24a) at still another site, and a "fish tail" point (Fig. 24d) at another. Thus it is evident that the Shivwits Plateau was a popular hunting area throughout its entire history.

The correlation of the pure stone site material with layer O is very close. The pottery types accompanying similar stone material in the 11 pottery sites are the same, in all but a few instances, as the intrusives in the later ceramic horizons at Willow Beach. Obviously, in light of the Willow Beach evidence, this pottery was dropped on some of the early stone sites when these occupational areas were reoccupied by hunters during ceramic times. In this vicinity, the early stone culture is apparently restricted to the north side of the Colorado River. As yet, nothing similar has been found on the south side.

1936 Excavations on the Virgin River

During excavation of sites to be inundated by Lake Mead, the National Park Service C.C.C. crew uncovered five pit houses along the lower Virgin

River. Harrington (1937, 122-4), in a brief report, indicates that they differed from the Basketmaker III type pit house in that they were larger and lacked floor features, aside from firepits, as well as pottery and arrow-points.

The following information has been extracted from the field notes and catalog:

Pit house 107 - west side of the Virgin and Muddy River junction.

Walls of natural earth and gravels; floor of adobe, 4 ft. 1 in. below ground surface; circular, 17 ft. 3 in. east-west and 17 ft. north-south; fireplace near center; no evidence of postholes, superstructure or entry. To west of house a number of storage bins were found.

Material. Two of the Willow Beach type III points illustrated by Harrington were found on the floor, the other having occurred in the fill. No type I points were recovered. Material from pit house 107, Virgin River (Fig. 26):

Upper Row -- Chopper from surface, quartzite river cobble, cutting edge formed by percussion; core remnant, dark chert.

Middle Row -- Drill, dark chert, flaked all over, shaped base; drill, white chert, a flake with unifacial flaking on wide base and bifacial flaking on shaft; flake scraper, quartz, both edges chipped unifacially.

Lower row -- mottled gray chert, type III, bifacially flaked, no retouching; knife, brown chert, type II, bifacially flaked, some retouching; point or knife blade, pink chert, bifacially flaked, edges retouched; point or knife blade, brown chert, bifacially flaked, no retouching, type III points, quartzite, chert; and one broken pink chert point.

Pit house 108 - across from 107 on the east side
of Virgin River.

Same as 107 except firepit was built up of
mud and stone 1 ft. 6 in. above floor with
a dia. of 1 ft. 4 in. Circular, 20 ft. east-
west and 19 ft. 2 in. north-south. Floor
5 ft. 2 in. below ground level.

Material. Type I and Ia points recovered.
All material came from the surface except
for the right hand scrapers of the top and
second rows of Fig. 27, and two hammer-
stones which are not shown. Four addi-
tional knives were recovered, two of which
are illustrated by Harrington (1937).
Material from pit house 108, Virgin River
(Fig. 27): Top row -- humped scraper,
jasper; blanks (3), jasper and mottled
chert, percussion formed. 2nd row --
blanks, granitic rock, percussion formed.
3rd row -- scrapers, jasper and quartz,
percussion formed. 4th row -- flake
scraper, mottled brown chert, edges uni-
facially flaked; stone disc, quartzite,
edges battered; long blade, quartz, bi-
facially flaked, no retouching, top portion
broken; obsidian blade, bifacial flaking on
edges only. 5th row -- knives, mottled
and dark chert, bifacially flaked, some
retouching, first four type II, 5th, type III;
point (tip), brown mottled chert, bifacially
flaked, edges retouched; point, (large
notch) mottled brown chert, bifacially flaked,
retouched edges, type I; point, poorly
flaked of white chert, no retouching, type I;
point, jasper, poorly flaked, edges serrated,
shoulder tips and base broken, type Ia.

Pit house 109 - 200 ft. north of pit house 108.

Same as 107. No fireplace mentioned. Floor 3 ft. below ground surface. Circular, 15 ft. in dia.

Material. Material from pit house 109, Virgin River (Fig. 28). Hammerstones and limonite pigment not shown. Top row -- chopper, quartzite river cobble, cutting edge formed by percussion; mano, shaped, quartzite, both surfaces flat on long axis and slightly convex on short axis and both roughened with pecking marks, used on slab metate? Bottom row -- rough scraper, quartz, retouched on one edge; humped scraper, light chert, unfacially flaked on edges only by percussion; bone dice.

Pit house 110 (two found) - 150 ft. west of 109.

#1 - Same as 107. Floor 1 ft. 5 in. below ground. No fireplace mentioned. Circular, 12 ft. 2 in. east-west and 12 ft. north-south.

#2 - Same as 107. Floor 1 ft. 6 in. below ground level. Circular, 11 ft. east-west and 10 ft. north-south. No fireplace mentioned.

Material. Three additional knives were recovered, two of which are illustrated by Harrington. Material from pit house 110, Virgin River (Fig. 29). Hammerstones not shown. Top row -- mano, shaped, granite schist, one surface rough and other convex on both axes, used in shallow basin metate? Bottom row - rough scrapers, jasper, mottled chert, and quartz, all percussion formed on edges. Left-hand specimen retouched on edges.

The artifacts of pit house 108, if the surface finds are included, are similar to those of layer O at Willow Beach and Shivwits Plateau material, especially in the use of mottled chert for flaked implements and the presence of the type I point and a circular stone disc. The material of pit house 107 is like that of layer F-G at Willow Beach in the point type, common use

of plain chert, and the presence of a quartzite chopper. The artifacts of 109 and 110 do not resemble those of either 107 or 108. Shaped manos and large scrapers are common to both 107 and 108. In addition, 109 contained a mortar, a slab metate (Fig. 30), a bone awl and a bone dice (Fig. 28). The awl is 6 7/8 in. long, 5/8 in. across the butt end, and tapers to a point. It is polished all over and there is no evidence of a joint on the butt end. Pit houses 109 and 110 differ from 107 and 108 in the lack of a firepit(?) and in the use of a shallow pit for the house. The culture reflected in the pit house 109 and 110 collections bears some resemblance to layer F-G material of Willow Beach in the relatively meager material representation, shaped manos and scarcity of mottled chert. There is no resemblance to layer O material except for the slab metate.

On the basis of the Willow Beach stratification, the material of pit house 108 appears to be earlier than that of pit house 107. However, contemporaneity cannot be disproved. Dates for pit houses 109 and 110 cannot be determined, but Lost City evidence indicates the shallow pit type is more recent.

1937 Excavations on Grand Wash

At Gods Pocket Spring in Grand Wash is a sizable campsite recorded and excavated by the C.C.C. from February 3 to March 1, 1937. The campsite was then about 3/4 mi. north of the Lake Mead water level and is now under water. The material recovered duplicates that of Willow Beach except for layer F-G. The site was shallow and there was no stratigraphy. The field notes contain the following bits of information:

From the surface to 6 in. were found many potsherds of corrugated, black-on-gray, black-on-gray corrugated, and plain types. Knives, dart points, blanks, a few scrapers, chips, arrow points, "T" drills, metate (mentioned in the field notes but not listed in the catalog) and manos (two of the Pueblo block type, both from the surface) were also found.

A few sherds were recovered from a depth of 1 ft. 2 in. The only lot cataloged indicating this level was marked "surface to 1 ft. 2 in." and consists of five sherds of Boulder Gray and one of Moapa Black-on-gray. At 2 ft. stone tools only are mentioned, namely chips, dart points and knives.

Though the field notes do not record any structures, the catalog lists a blank, long blades, knives, and a dart point from a small round room west of the spring. Material from small round room, Gods Pocket Spring (Fig. 31A) - Blank, gray chert; type VI points, gray chert; type III knives, chert and jasper. The dart point, which might indicate the phase association, is missing from the collection. Depths of the finds in this structure are not indicated except for the blank which is from the 6 in level.

Fig. 31B illustrates material recovered from a depth of 1 ft. to 1 ft. 2 in. - type I point, light chert; type II knife tips, mottled chert; type III knife fragments, mottled and plain chert. Unfortunately, depths are not listed for the remaining material. A representative sample marked "surface finds" is illustrated (Fig. 32A) - type I points, mottled and gray chert; type Vb points, quartz and chert; type VII points, quartz and jasper. Also illustrated is a sample of artifacts whose depth and position is unknown (Fig. 32B) - Blanks, chert; type II knives (3), plain and mottled chert; type I points (2), plain and mottled chert; point, quartz; type I, c?; point, lime encrusted, type I, d?; type VI points, chert and jasper; type VII points, quartz.

Pueblo I pottery was rare. Blanks and type III knives were very common, obsidian artifacts were absent (as were type I knives), and scrapers were few. The great majority of the pottery is Pueblo II, one sherd of Lino Black-on-gray representing the earlier phase of ceramics. The lower level of the site apparently was preceramic.

As there is no detailed information on this site, and since it is a campsite which contained a mixture of material representing different phases, it is of little value in correlating the phases of the various sites considered. However, it does contain material with which this report is concerned, and helps to close the areal gap between the early sites east of the Shivwits Plateau and those at the junction of the Muddy and Virgin rivers in the west.

Point Types of the Lake Mead Area

Since a great deal of the foregoing stresses point types, it is advisable to consider the remaining unpublished material on excavated sites throughout the area. Only by such a survey can the associations and types be determined accurately.

Hell Diver Rapids, Cave 2. This site on the north bank of the Colorado River, 13 mi. east of Pierce Ferry, was excavated in 1936 by the C.C.C. The cave fill was at least 2 ft. deep, but the field notes do not list anything below that level. Pottery was scarce, was found from the surface to a depth of 10 in., and included Pyramid Gray, Tusayan Black-on-red, Sosi Black-on-white and Boulder Gray. No arrow points were recovered, only dart points. This site apparently exhibited a prepottery and a very late ceramic occupation, the former horizon being comparable to layers O and F-G at Willow Beach. (Fig. 33A - Points from Hell Diver Rapids, cave 2 - from left to right: type I, chalcedony, depth 6 in.; type I, mottled gray chert, depth 9 in.; type I, mottled gray chert, from crevice; type I, gray chert, depth ?; type III, mottled pink and gray chert, depth 1 ft.)

Emery Falls, Cave 3. This site, 1 mi. west of Emery Falls on the Colorado River, was similar to cave 2, including the lack of arrow points, scarcity of pottery, and presence of dart points. However, none of these points can be definitely identified as type I. The preceramic content of this site appears to be of late Basketmaker II status. (Fig. 33B - Points from Emery Falls, Cave 3 - from left to right: type (?), chalcedony, depth 8 in.; type III, tan chert, depth 10 in.; type I or II, obsidian, depth 1 ft.; type I?, mottled pink chert, depth 1 ft. 7 in.)

Lost City House Ruins. A few large points were recovered by the C.C.C. salvage excavations in the Lost City area near Overton, Nevada. This area, in the main, exhibited Pueblo II pottery types associated with jacal and surface stone and mud structures. Ceramic materials indicate an end date of A.D. 1150. The few dart points illustrated are mainly surface finds. (Fig. 33C - Points from Lost City area - from left to right: type I - mottled gray chert, surface; mottled pink chert, surface; mottled gray chert, from ash deposit south of house 50; mottled tan chert, from ash dump southwest of house 50; mottled pink chert from surface of house 100 described on the catalog card as Basketmaker II (notes missing); type III - mottled gray chert, surface; type IV - tan chert, surface.)

Fig. 34 contains a sampling of the common, and practically the only, point type (Vb) associated with the Pueblo II house ruins of the Lost City area along the Muddy River.

The only other point types recovered from this area are illustrated in Fig. 35. These are commonly referred to as Paiute points. Those shown in Fig. 35A are either surface finds or from deposits near Lost City houses. Not one was directly associated with a Pueblo II status house though two came from ash deposits close to house structures. (Top row - obsidian point - type VII?; Middle row - type VII-chert and quartz; Bottom row - type VIIa-cherts.) Fig. 35B exhibits points from "campsites" (those lacking any indication of architecture?) in this same region. (Top row - type VII-chert; Middle row - type VIIa-quartz and jasper; Bottom row - type VIII-chert; compare with Hunt, 1953, Figs. 8, 17, and 18, published since this report was written.)

Thus, in review, the occurrences and associations of the dart and arrow points throughout the area appear to correlate with the stratigraphic evidence at Willow Beach. There is nothing to indicate that type I and type III dart points are associated with pottery, and they have not been recovered in direct association with one another. Type II points are scarce, occur after the appearance of, and possibly along with, type I points, and apparently survive into type III point times. Type V and Va points are more or

less restricted to the Colorado River below Hoover Dam, and are the first arrow points noted in the area in early ceramic times. Type Vb and its variations unquestionably are the typical Pueblo II status points of the Lost City area, and they occurred in ceramic associations at Willow Beach as well. Type VII and VIIa points are late types, apparently post-A.D. 1100, and occurred in the Lost City area, as well as at Willow Beach, above Pueblo II status material. Type VIII also is a late type, apparently associated with type VII and VIIa points.

The designation of diagonal-notched type I points as points has been questioned. Kidder and Guernsey (1921, 93-5) considered a similar implement a knife. At a Basketmaker II site, Guernsey (1931, 73) recovered a similar specimen which he again designated as a knife because the notches are diagonal rather than at right angles. However, another similar blade attached to a foreshaft he called a point, commenting that prior to this find all points recovered had been notched at right angles rather than at an angle to the long axis. Morss (1931b, 56) illustrated a like artifact stating that it was the most common point. He described it as being quite flat, in contrast to arrowheads, which have a median ridge, and of proper size for an atlatl. However, he believed it was a knife as the notches were diagonal. Roberts (1930, 152-3) made the same distinction. The University of New Mexico report (Kluckhohn and Reiter, 1939, 90), on the excavations of Bc 50-51, shows another similar blade, which is termed a knife instead of a point on the basis of Kidder and Guernsey's original definition. At Willow Beach, bona fide knife blades (types I, II, and III) are associated with the diagonal-notched implements here designated as type I points. Moreover, both diagonal and right angle notches occur on these points of the early stone horizon. Since the Indian product was hand made, variations should be expected, and it does not seem reasonable to believe that a slight variation in the direction of the notch indicates the use of the blade.

A somewhat similar situation is noted in Harrington's (1948, Fig. 31) recent report on the Borax Lake site. He illustrates blades which he terms knives. One of these is similar to the type III point at Willow Beach. Again at Willow Beach this type of artifact is associated with type I, II, and III knives. Thus, in both situations, if the type I and III points are considered knives, we must conclude that the two phases were "pointless," which is extremely doubtful.

PHASES AND DIAGNOSTICS

The factual material and associations of the cultural manifestations of Willow Beach and several other sites in the Lake Mead area have been considered in the foregoing pages. This evidence must now be correlated to establish whether or not a definite pattern and developmental series exists by which the cultures represented may be defined.

Table 20 contains the distribution and provenience of the traits. In a few instances traits not found in certain horizons are considered present on the basis of other evidence. For example, raw clay and roasting pits are included on the basis of the presence of ceramics in the upper levels and thermal-fractured rocks in various horizons. One group of traits headed "Harrington's Site" (Harrington, 1926, 274-83) has not been previously discussed, but it is included in the table as the traits and architecture appear to carry on the sequence of houses 109 and 110. The occurrence of Lino Black-on-gray pottery at this site indicates a Basketmaker III status for at least a portion of the site. This site is located 20 mi. south of houses 109 and 110 at the junction of the Virgin and Colorado Rivers. Table 21 correlates the architectural traits of the sites under consideration. The structures at Harrington's site are similar in several respects to the nonceramic houses 109 and 110.

The following phase generalizations are based on the traits listed in Tables 20 and 21.

Stone Horizons

Price Butte Phase (2200 [±] 250 B. P.)

This is named after Price Butte on the Shivwits Plateau where material assigned to this phase is common. The culture appears to be that of a hunting group. Both percussion and, more commonly, pressure flaking were employed. The basic traits and diagnostic point type are similar to the Basketmaker II pattern.

The two isolated sites of this phase, house 108 at the junction of the Muddy and Virgin rivers and layer O at Willow Beach, contain two elements not yet noted in Shivwits Plateau sites exhibiting Basketmaker-type material: a pit house and a roasting pit. The Shivwits Plateau material is included in this phase rather than being designated simply as "Basketmaker II." The lack of any perishable material from this area prevents making detailed comparisons with Basketmaker II sites to the east.

TABLE 20

Correlation of
sites and traits

		PROVENIENCE		PHASE	
		Layer O - Trench V 7' - 10' - Trench I Shivwits Plateau	House 108 Pre-ceramic - Trench IV Layer J - Trench V	Price Butte Mixed Phases Nelson	Eldorado
		House 109 House 110 Harrington's Site	Layer F-G - Trench V 5' - 5'9" - Trench I House 107	?	?
		Layer C - Trench V Pattern #2(?) - Trench IV	3'6" - surface - Trench I Layer B - Trench V Pattern #3 - Trench IV	Roaring Rapids Pebble Beach(?) Mixed Phases	Willow Beach
BASIC TRAITS	Traits common to all horizons				
	Knife, type II	X X X X X	X X X X X	X X X X X	X X X X X
	type III	X X X X X	X X X X X	X X X X X	X X X X X
	Blank	X X X X X	X X X X X	X X X X X	X X X X X
	Hammerstone	X X X X X	X X X X X	X X X X X	X X X X X
	Roasting pit (fire rock)	X X X X X	X X X X X	X X X X X	X X X X X
	Split bone	X X X X X	X X X X X	X X X X X	X X X X X
	Raw clay	X X X X X	X X X X X	X X X X X	X X X X X
	Traits apparently common to all horizons				
	Flake scraper	X X X X X	X X X X X	X X X X X	X X X X X
	Rough scraper	X X X X X	X X X X X	X X X X X	X X X X X
	Drill, wide base	X X X X X	X X X X X	X X X X X	X X X X X
	Pecking stone	X X X X X	X X X X X	X X X X X	X X X X X
	Burned bone	X X X X X	X X X X X	X X X X X	X X X X X
	Spall scraper	X X X X X	X X X X X	X X X X X	X X X X X
	Knife, type V	X X X X X	X X X X X	X X X X X	X X X X X
	Traits restricted to stone horizons				
	Knife, type I	X X X X X	X X X X X	X X X X X	X X X X X
	Humped scraper	X X X X X	X X X X X	X X X X X	X X X X X
	Stone disc	X X X X X	X X X X X	X X X X X	X X X X X
TRAITS ONLY IN STONE HORIZON #1	Traits restricted to stone horizon #1				
	Point, type I	X X X X X	X X X X X	X X X X X	X X X X X
	type Ia	X X X X X	X X X X X	X X X X X	X X X X X
	type II	X X X X X	X X X X X	X X X X X	X X X X X
	Obsidian, finely chipped	X X X X X	X X X X X	X X X X X	X X X X X
	Slab metate	X X X X X	X X X X X	X X X X X	X X X X X
	Unshaped mano?	X X X X X	X X X X X	X X X X X	X X X X X
	Stone pipe, tubular	X X X X X	X X X X X	X X X X X	X X X X X
NEW TRAITS OF STONE HORIZON #3	Traits restricted to stone horizon #3				
	Knife, type IV	X X X X X	X X X X X	X X X X X	X X X X X
	Graver	X X X X X	X X X X X	X X X X X	X X X X X
	Traits common to stone horizon #3 and later				
	Metate, oval basin	X X X X X	X X X X X	X X X X X	X X X X X
	Mano, rounded corners	X X X X X	X X X X X	X X X X X	X X X X X
	Pigments	X X X X X	X X X X X	X X X X X	X X X X X
	Hematite	X X X X X	X X X X X	X X X X X	X X X X X
	Limonite	X X X X X	X X X X X	X X X X X	X X X X X

continued on next page

TABLE 20
continued

Correlation of
sites and traits

		PROVENIENCE	PHASE
NEW TRAITS OF STONE HORIZON #5	Traits restricted to stone horizon #5	Layer O - Trench V	Price Butte
	Point, type III	7' - 10' - Trench I	
	Hand pick	Shivwits Plateau	
	Mortar	House 108	
	Traits common to stone horizon #5 and later	Pre-ceramic - Trench IV	Mixed Phases
	Striated stone	Layer J - Trench V	Nelson
	Chopper	5'10" - 6'11" - Trench I	
	Worked bone	Layer F-G - Trench V	Eldorado
	Needle	5' - 5'9" - Trench I	
	Awl	House 107	
NEW TRAITS OF CERAMIC HORIZONS	Dice	House 109	?
		House 110	
		Harrington's Site	?
		Layer C - Trench V	Roaring Rapids
		Pattern #2(?) - Trench IV	Pebble Beach (?)
		3'6" - surface - Trench I	Mixed Phases
		Layer B - Trench V	Willow Beach
		Pattern #3 - Trench IV	
	Traits restricted to ceramic horizon #1 (layer C)		
	Point, type VI		
	Intrusive pottery only		
	Traits restricted to ceramic horizons #2 and #3		
	Point, type V		
	type Va		
	type Vb		
	type VII		
	type VIIa		
	Cooking pit		
	Bone beads		
	Shell		
	Olivella biplicata beads		
	Abalone pendant & beads		
	Turquoise beads & fragments		
	Steatite		
	Asphaltum		
	Cloth		
	Worked calcite		
	Drill, type?		
	Reamer		
	Worked sherd		
	Indigenous pottery		
	Intrusive pottery		
	Point, type Ic		
	type Id		
	Mano, loaf shape		
	Dog		
	Griddle stone?		
	Flexed burial		
	Undeformed skull		
	Tortoise shell, worked		
	Fur cloth		
	Cordage		

Table 21

Correlation of architectural traits

ARCHITECTURAL TRAIT	PHASE	Price Butte	Eldo- rado	?	?	Willow Beach
	PROVENIENCE	House 108	House 107	House 109	House 110	Harrington's site Trench I 6" below surface
Circular house	X	X	X	X	X	
Firepit	X	X	-	-	-	X
Prepared floor	X	X	X	X	(X)	-
Plastered wall	-	-	-	-	(X)	
Pithouse, deep	X	X				
Jacal, (Semi-pit)			X	X	X	
Jacal, Surface						X
Storage bin		X			X	
Oval house					X	X
Rocks rim depression					X	
Post holes					X	
Wattle-and-daub wall					X	
Large pithouse, deep			(ceremonial?)		X	
Ceramics					X	X

X - present

- - absent

Nelson Phase (1700 \pm 250 B.P)

This is named after the town of Nelson 3 mi. west of the Colorado River slightly south of the Willow Beach site. The validity of this tentative phase will depend on future data. It occurred only at Willow Beach as layer J, where material returns were scant. The few new traits that occurred in this layer, however, merit a phase status primarily because of the first appearance of the shaped mano and oval basin metate, type IV knife and paint pigment, plus the lack of the usual hunting and fleshing tools. Apparently most of the basic traits of the Price Butte phase persist, and this horizon may represent only a later development.

Eldorado Phase (1500 \pm 250 B.P.)

This is named after Eldorado Canyon which drains into the Colorado River from the west several miles below Willow Beach. Present evidence restricts the diagnostic material to the desert area (west of the Shivwits Plateau) on the lower Virgin River and in layer F-G at Willow Beach. Some of the basic traits of the Price Butte phase occurred along with the traits introduced in the Nelson phase. The new point type (III) is basically similar to those of the California desert region and bears no resemblance to anything on the plateau or to the east. Pit house 107 on the west side of the Virgin River contained type III points and is similar to another pit house on the east bank of the same river.

The material of this phase manifests a pattern lying between the extremes of the hunting and gathering stresses of the two previous phases.

Roaring Rapids Phase (pre-A.D. 750?)

This is named after Roaring Rapids, a few miles below Willow Beach. This phase is restricted to Willow Beach, where the cultural yield was scant. The bow and arrow is introduced (based on the appearance of the small points), and Basketmaker III pottery, intrusive from the north and east, appeared for the first time.

Throughout the report mention has been made of the apparent lack of a Pueblo I equivalent at Willow Beach or other sites. However, ceramic pattern #2, as shown in Table 16, indicates the possibility of deposition in Pueblo I times. It is quite possible that the Roaring Rapids phase of pre-A.D. 750 may have lasted as late as A.D. 900 with little change. On the other hand, since Willow Beach represents a periodically occupied campsite, rather than a permanent village, it is also possible that it received little visitation during Pueblo I times. It will be noted that "Pebble Beach

phase" is included with the Roaring Rapids phase in Table 20, this being purely tentative and restricted to the Willow Beach site, to take care of a possible Pueblo I equivalent. The name is derived from Pebble Beach, about 1/4 mi. north of Willow Beach.

It must be kept in mind that our present knowledge of northwestern Arizona pottery dates is none too certain, and that the dates of the ceramic phases of this report are based on intrusives only. Several of the types may well have existed or may have been restricted between A.D. 750-900, but the lack of any associated datable Pueblo I intrusives hinders the establishment of either possibility. Moreover, since this phase (if it existed) could not be stratigraphically recognized in any of the tests, stone and other cultural material possibly associated could not be separated, though a few general traits, which occurred in the windblown sand above layer C, are designated as Pebble Beach phase in Table 20. Thus, the only indication of a possible Pueblo I equivalent at Willow Beach is intrusive pottery with date ranges that would allow for Pueblo I status deposition.

Willow Beach Phase (A.D. 900-1150 or 1200 ?)

This is named after the Willow Beach site, and is represented by the continuance of some of the preceding phase's traits, plus the appearance of indigenous pottery along with Pueblo II status intrusives, point type Vb, worked turquoise, worked shell, worked sherd, asphaltum and reamer. In addition, the following, which occurred in the ceramic levels of trench I, were introduced at this time or possibly earlier: bone bead, cloth, worked calcite, loaf-shaped mano, dog, flexed burial and cordage.

Two elements, the type VII series of "Paiute" points and Paiute Ware, appeared in the upper stratum of layer B of the Willow Beach excavations of 1950 as well as in the 1947 excavations. They occurred at higher levels than the first appearance of, or along with, Tusayan Black-on-red. The late association of these traits indicates a post-A.D. 1100 date. The same situation seems to have existed in the 1936 excavations (see Fig. 20 and Table 19), during which a burned oval brush shelter was discovered 6 in. below the surface; four sherds were on the floor, one of which is Paiute Ware. Moreover, this structure resembled the historic winter or temporary Paiute thatch-covered structure in its circular floor plan and central fire area (Watkins, 1945, 13-18; Steward, J. H., 1939, Plates 9, 10, 13, 14, 20, 21; Dellenbaugh, F. S., 1906, Fig. on p. 195).

Because of the late appearance of these "Paiute" traits at Willow Beach and the lack of definite stratigraphy separating these traits from the Pueblo II status material of the Willow Beach phase, we cannot ascribe them

to a separate phase, but must consider them intrusives, as with the Muddy River Pueblo material associated with the Willow Beach phase. Harrington (1927, 271) similarly found Paiute pottery on or near the surface at late Pueblo sites along the Muddy River. It remains for future excavations to determine whether this material slightly overlaps or completely post-dates the Willow Beach phase. However, there are sites in the Muddy River area that do contain Paiute Ware and Shoshonian type points without associated Pueblo material. These sites can be assigned to another branch and phase for which the names "Piedes" and "Moapa" are proposed. "Piedes" is taken from an early reference to the Southern Paiute of southern Nevada and southern Utah (Irish, 1865, 145-6) and "Moapa" from the Moapa Valley of southern Nevada. The Moapa phase, with its conical-based pottery, high side-notched and sometimes tanged, concave-based point, and circular thatch-covered hut, appears to represent the first dominance of the Shoshonian culture in this region of the Southwest.

Note: Since this report was written, Rudy has excavated the Pine Park Shelter site in southwestern Utah. It is interesting to note that he found Pyramid Gray and Pueblo II types associated with Paiute pottery in the upper and lower levels. Paiute ceramics were not as common as Pyramid Gray in the lower level and the reverse held true in the upper level (Rudy, 1954, Fig. 14). None of the other Pueblo-type ceramics recovered at this site survived much beyond A.D. 1150. This is the strongest evidence we have that the Paiute ancestors entered the region slightly before or, at least by, A.D. 1150 (Schroeder, 1956, 60).

Also see Alice Hunt's Archeology of the Death Valley Salt Pan, California, University of Utah Anthropological Papers, No. 47, 1960, especially pages 1-3, 62-65, 111-113, and 163-174, for trait similarities and chronologies of preceramic, ceramic, and Shoshonean occupations.

CORRELATIONS

Preceramic Horizons

Price Butte Phase (250 B.C.)

This phase appears to be essentially Basketmaker II with the addition of western traits. The notched point (type I) of Willow Beach and the Shivwits Plateau area are similar to the generalized Basketmaker II dart points recovered at Marsh Pass, Arizona, and Du Pont Cave, Utah, as well as points from the Fremont area (Nusbaum and Guernsey, 1922, 149 and Pl. LXVI; Guernsey, Pl. 31e, 34e; Morss, 1931b, Pl. 32). West of the Four Corners area this point type is found on the north side of the Colorado River across the Shivwits Plateau to the mouth of the Virgin River and down to Willow Beach.

Farther west, in the Amargosa River area, Rogers (1939, 61-5) subdivided what he described as the "Amargosa Industry," containing material somewhat similar to Basketmaker II, into two phases. His phase I contains notched points usually of equilateral proportions, though many are longer than they are wide. Phase II contains points which are similar, but which are usually long and slender (see frontispiece). Side and diagonal notches occur in both phases. Amargosa phase I is a stone assemblage which, according to Rogers' evidence, gradually changes to phase II as a few new traits are added, the latest being intrusive pottery (of pre-A.D. 750 types) and arrow points. Amargosa phase II is similar in several respects to what Rogers terms the southern Nevada Basketmaker III pattern. On this basis, Amargosa phase I precedes the introduction of Basketmaker III pottery.

The 1936 excavations at Willow Beach uncovered an Amargosa II point (illustrated in the frontispiece) at a depth of 7 ft. 7 in., probably in Price Butte association with Willow Beach type I points. In the 1950 excavation, the tip of a similar point was encountered in the stone horizon of layer O, the Price Butte phase.

Four additional stone horizons were encountered above the Price Butte horizon in 1950; in these horizons notched points of any type were absent, and only above these horizons did ceramics and arrow points appear for the first time. Thus it appears, when the stratigraphic evidence of Willow Beach and Rogers' conclusions (based on surface finds in the Amargosa River area) are compared, that the Amargosa phase II point was preceramic in its beginnings and possibly lasted into ceramic times.

The preceramic material of phase I of the Amargosa Industry is similar to that of the Price Butte phase in several respects. Both exhibit a few flake scrapers and rough scrapers, ovate blanks or scrapers, "T" drills, thin parallel-sided knives, slab-type metates, roasting pits, and diagonal- and side-notched points. Only one point of the Price Butte phase resembles the Amargosa phase I point of equilateral proportions, and it appears to have been reworked (Fig. 13a). Thus on the basis of Rogers' deduction that phase II was similar to phase I, except for a few, gradually added traits, the Price Butte phase and at least some portion of the earlier Amargosa development bore a close resemblance.

There is close similarity between the point type and other material of the Price Butte phase and the Basketmaker II materials of Du Pont Cave and Marsh Pass. Six non-perishable items are common to all: the atlatl (probably), notched dart point, unfired clay objects, tubular stone pipe, stone knife, and probably the bone awl. In addition, ceramics and arrow points are lacking and scrapers are rare. Table 22 indicates a very close correlation of non-perishable and perishable traits between Du Pont Cave and Marsh Pass. The Price Butte phase, west of these two sites, exhibits some similarity in non-perishable traits. Lovelock Cave, some distance to the north, yielded what might be considered diagonal-notched points, but remains from this site do not, in general, correlate closely with the others.

The stone work of the Price Butte phase reveals many striking similarities to the Fremont Culture, especially in diagonal-notched points, "T" drills, knives (type 3), and lack of developed scrapers. The distribution of the Fremont moccasin and figure-8 sandals would seem to indicate that these articles may also form a part of the Price Butte phase or a similar western pattern. Morss (1931b, 58 and Plates 32, and 33) remarked that the Fremont Culture appears to be more closely related to the pattern of western Utah rather than to that of the Four Corners area (also see Wheeler, 1942, 11-15, 30). It appears that the basic Basketmaker culture of this entire area contained several variants -- the Anasazi in the east, the Fremont in the center (north of the Colorado River, with a possible separation in western Utah), the Amargosa in the west, and the Lovelock in the northwest -- with blends occurring between each sub-area. The Price Butte phase at Willow Beach apparently represents an intergrade between the Fremont and Amargosa variants, or perhaps the Fremont alone with a few western traits included.

Nelson Phase (A.D. 250)

The meager material yield of the tentative Nelson phase, layer J, presents little that can be utilized in making comparative studies. The

Table 22

Correlation of traits of Du Pont Cave, Marsh Pass,
Willow Beach, and Lovelock Cave
(Note higher correlation among first three sites
as compared to Lovelock Cave)

	number of non-perishable traits	SITE					number of perishable traits	SITE			
		Du Pont Cave	Marsh Pass	Willow Beach	Lovelock Cave			Du Pont Cave	Marsh Pass	Willow Beach	Lovelock Cave
Du Pont Cave	20	x	9	7	4		19	x	15	recovered	6
Marsh Pass	14	9	x	6	3		19	15	x	recovered	7
Willow Beach	14	7	6	x	1		0	none recovered			
Lovelock Cave	10	4	3	1	x		11	6	7	none	x

Non-perishable traits
common to first three
sites

atlatl
notched dart point
unfired clay objects
tubular stone pipe
stone knife
bone awl

shallow oval basin metate is an important new trait. The absence of any points in the material recovered and the scarcity of fleshing tools is interesting in view of the general lack of the same traits among the historic River Yumans. The roasting pit and a few other objects are basic to all horizons. The cultural relationships of this tentative phase are not known, but the roasting pit may suggest non-Basketmaker affinities. This horizon may represent a basic Basketmaker culture with a few intrusions from the west.

Eldorado Phase (A.D. 450)

The cultural assemblage of the Eldorado phase, layer F-G, requires some background discussion, since it was in this horizon that a stemmed dart point (type III) occurred for the first time. This point has affinities only with the stemmed types centered in the California desert far to the southwest of Willow Beach, where all such points exhibit more or less convex sides with wide, straight-sided stems. (Compare the Eldorado phase type III stemmed points with Campbell, 1935, Pl. 13, 14f; Campbell *et al.*, 1937, Pls. XLI, XLII; Harrington, 1948, Pls. 19, 23 and Fig. 31; Rogers, 1939, Pl. 9 a-f., Pl. 13 type 2 and 3 points, Pl. 20 g-h; Campbell, 1931, Pl. 47 lower right half.)

A review of the "archaic" points of southern California is necessary in determining their relation to the Willow Beach stemmed type point of the Eldorado phase. Rogers (1939, 56-7) considers the points of the San Dieguito-La Playa complex the earliest type of the southern California desert, and these are highly similar to the Lake Mohave and Silver Lake points originally described by Campbell, *et al.* (1937). The Lake Mohave point has a long tapering stem with a convex base and the Silver Lake point exhibits a shorter, somewhat tapered, wide stem with a convex base. In the succeeding Pinto-Gypsum complex there are five point types, the first four Pinto or Pinto-like and the fifth leaf-shaped. Rogers (1939, 56-7) observed that the Gypsum Cave points occur with types he labeled 3, 4, and 5, and concluded that his types 1 and 2 are probably more or less contemporaneous and the oldest of the group, because they are either dominant at the sites or occur without the other three types. These conclusions, it should be pointed out, are based on surface finds only. Regardless of the sequence of the points in his Pinto-Gypsum complex, one factor stands out: The Pinto types appear to have developed out of the earlier Silver Lake point of the San Dieguito-La Playa complex. The stem treatment differs in that the later points exhibit shorter and parallel-sided stems as well as flat or concave bases, rather than tapering stems and convex bases.

On the basis of the above, stemmed points must be considered the early and basic manifestation of this artifact type in the southern California

desert. Rogers' chronology does not indicate a development of the stemmed point beyond the Pinto type. Yet at Willow Beach, in trench V, the horizons with notched points are capped by four stone horizons, the highest of which contains Eldorado phase stemmed points. Farmer (personal communication) reports similar points, apparently in preceramic associations, from the Providence Mountains west of Needles, California. We can only conclude that stemmed points must have continued in use in the California desert, from which region they were introduced to Willow Beach in the Eldorado phase.

When the stemmed points from various California sites are studied, there is found to be some variation in the point type within each site as well as similarities between apparently non-related sites. This is not to imply that points exhibiting similar form necessarily bear the same time relationship. It might be suggested, however, that at least some of the stemmed points termed atypical at various sites might more properly be designated as possible intrusives or overlays. Clear-cut evidence of the stratigraphic and areal relationships of some stemmed point types in the California desert is yet to be established. The relatively recent appearance of the stemmed point at Willow Beach, just prior to the introduction of pottery, helps to close the gap between the dates attributed to the earlier stemmed types and the earliest ceramic horizons in the west.

In regional distribution of the preceramic points east of Willow Beach the Shivwits Plateau sites displayed notched points only. West of the plateau, along the lower Virgin River, both stemmed and notched points occurred in preceramic pit houses and other sites, but they have never been found in definite association. At Willow Beach both types occurred, but were stratigraphically separated, the stemmed type occurring above the notched type. To the west, on the southern California desert, stemmed points occurred alone in the earliest complexes and were mixed with other points in late preceramic horizons in the northern part of the desert (Rogers, 1939, 61, 72; National Park Service files, Boulder City; Wallace and Taylor, 1955, 88-92; Wallace and Taylor, 1956, Fig. 1).

Present evidence indicates that the side-notched points are common in the general Basketmaker II area and that the diagonal-notched variety, as well as the more finely chipped points, are restricted more to the western portion of the range, perhaps influenced by coastal or more northern cultures through the Amargosa variant. Geographically the notched point seems to represent a plateau pattern that spilled into the desert to the west of the Grand Wash Cliffs, while the stemmed points represent a California desert distribution that later approached the Grand Wash Cliffs from the west.

Ventana Cave material exhibits a development in point types which is remarkably similar to that of the California desert (Haury, 1950, 194 and Pl. 22). The Red Sand or Ventana-Amargosa horizon in Ventana Cave, southern Arizona, contained Silver Lake-like points, above which were found Pinto-like points in the Chiricahua-Amargosa II horizon. Associated with this horizon was a point of the Gypsum Cave type which Rogers also included in his Pinto-Gypsum complex. Simpson (1949, 19) reported briefly on the stratigraphic occurrence of a Gypsum Cave point above a Pinto point in a cave near the Stahl site, which further supports Rogers' conclusion that the Gypsum Cave point appeared in the latter portion of the Pinto-Gypsum complex. Thus, aside from earlier Clovis points, such as those reported from Ventana Cave, Naco, and Organ Pipe Cactus National Monument in southern Arizona and the prehistoric Lake Mohave area of southern California (Haury, 1950, Pl. 22; Haury, 1953, 1-14; Schroeder, 1951a; Simpson, 1947, 24), the stemmed point appears to have been basic, at least in the region from southwestern Arizona and into the southern California desert. It is only from development and diffusion out of the southern California area that the later Eldorado phase point type can be typologically derived.

Following the above point types at Ventana Cave, there appears a side-notched point which Haury (1950, Pl. 22) has placed in the San Pedro stage, immediately preceding the introduction of ceramics. This point is basically the same as the Basketmaker II side-notched point (Anasazi variant). Since present evidence indicates that the Cochise culture did not contain an indigenous point type in its earliest stage and adopted the southern California desert point pattern (stemmed) in its second stage, and since notched points of the Basketmaker II style of the third stage are lacking in the California desert adjoining western Arizona, the notched points of the San Pedro stage could only have been introduced from some area north of the eastern limits of the Cochise culture. This possibility is plausible, since the San Pedro state (radiocarbon dates A.D. 190-430, and 510 B.C.-A.D. 310) and the Basketmaker II stage (radiocarbon date 250 B.C.-A.D. 250) overlap considerably. Thus, the Eldorado phase stemmed point appears to be a late survival of the California tradition.

Other elements that first appear in the Eldorado phase, in addition to the stemmed point chopper, are the striated stones and percussion formed hand pick (?), which are non-Basketmaker traits. The striated stones may or may not bear any relation to the incised pebbles of California or the striated slates which Rogers (1939, 63-4) found concentrated along the western periphery of the Amargosa phase I complex, and which Wallace and Taylor (1956, Figs. 2, 3) recovered in Death Valley. The better slates are decorated on one or both sides with simple incised lines at all angles

without order. Biconically drilled holes were evidently for suspension (also see Pilling, 1957; Elsasser, 1957). Wheeler (1942, 40-1) reported similar slate artifacts, in association with Pueblo II type cultural material, from the stratified deposits of Etna Cave just south of Caliente, Nevada. He also describes a similar engraved slate, but without a hole for suspension, below the Gypsum Cave point type level and in the same stratum as a Plainview-like point, the lowest layer of the excavation. Incised slates thus appear to have a considerable time range. The small flat river-smoothed stone from Willow Beach has no holes for suspension, but exhibits haphazard striations on one or both flat faces. Similar markings, on a larger scale, occur on boulders along the Colorado River at a site below Eldorado Canyon (Schroeder, 1952, Fig. 14; Weight, 1949). As in the previous phases discussed, the new, non-Basketmaker, traits appear to have been derived from a western source.

Interrelated Preceramic Factors

Two features of the preceramic development at Willow Beach and the lower Virgin River area which do not fit into the normal Basketmaker II pattern are the roasting pit and the circular pit house. Roasting pits are common to all phases at the Willow Beach site but have not yet been reported from the Shivwits Plateau north of the Colorado River in association with Basketmaker II type sites. South of the Colorado River they occur at least as far south as the Mexican border, and they range from the Colorado River along the Arizona-California boundary east to the Verde Valley of central Arizona and west into the Mohave desert; no particular area bears definite evidence of a primary focus. However, the roasting pits are distributed throughout the Hakataya (Yuman) area. Until there is more information on the initial focus of the roasting pit, we can assume only that it was introduced to the Price Butte phase at Willow Beach by people of a culture bordering somewhere on the lower Colorado River basin below Hoover Dam, perhaps the California desert.

The inclusion of the circular pit house as a possible nonconforming feature of the Basketmaker II pattern is based on house 108 on the east bank of the Virgin River near its junction with the Muddy River. This structure, without pottery, exhibited Basketmaker II type points on the surface and was fairly deep. On the basis of the stone assemblage from the surface, plus the lack of ceramics in this pit house, this house is assumed to be pre-Basketmaker III in time, and probably Basketmaker II. If the Nelson phase should prove to be a late Basketmaker II development, house 108 may possibly be assigned to it, rather than the earlier Price Butte phase.

Data on pit houses in the Lake Mead area, particularly around Moapa and Overton, suggest that the deep pit house was the common struc-

ture in preceramic times. Several variations of the deep type are known. One, excavated by amateurs, on the mesa above Black Dog Cave west of Moapa, is circular, about 9 ft. in dia. and 6 ft. deep, containing one posthole in the center. The firepit consists of two up-ended slabs, on each of the two long sides of the rectangular pit, on which a griddle stone rested. Quartzite chippings and quartzite dart points, described as square stemmed, were reported. This may represent the oldest house type. The other deep preceramic pit house type is much larger, from 16 to 20 ft. in dia., and shallower, 4 to 5 ft. in depth. No evidence of postholes was found in these structures, nor, apparently, were the walls plastered. The firepit in one structure (house 108) was of caliche and stone built up 1 ft. 6 in. above the floor, while the firepit in another pit house (house 107), which contained Eldorado phase dart points, was a circular depression in the floor. A structure of another type, excavated by amateurs, is just south of Black Dog Cave. It is about 4 ft. deep and about 16 ft. in dia. with a central posthole. The walls are slab lined and the firepit is oblong and clay lined. An outdoor slab-lined cist occurred within 3 ft. of the structure. A slab metate and dart points were reported to have been removed from this pit house.

Harrington has reported pit houses containing ceramics, with associated storage pits, near the mouth of the Virgin River. He believes they were pre-Pueblo (Basketmaker III). A National Park Service survey of the White Narrows area above Moapa encountered pit houses of the same size, but of undetermined depth, with Basketmaker III pottery. The majority of houses excavated by the National Park Service C.C.C. project in the Lost City area near Overton contained Pueblo II ceramics, ranged from 10 to over 20 ft. in dia. and from 1 to 3 ft. in depth, and had plastered or natural earth and gravel walls (Harrington, 1926a; Harrington, 1937b; Harrington, et al., 1930; Schroeder, 1953a).

It appears, then, that the pit house had a continuous local development from Basketmaker II into Pueblo II times, deep in the early phases and becoming more shallow with the introduction of ceramics. From evidence in the Muddy River Valley it seems that the surface association of Basketmaker II dart points with a deep pit house (house 108) may be valid, and such can be considered a trait of the Price Butte phase. However, since the same type of pit house has been excavated with points of the Eldorado phase in definite association (in house 107), the pit house may have been introduced in Nelson or Eldorado phase times from the west, possibly from the Oak Grove culture of California (Wallace, 1955, 220), and then adopted by the western Basketmakers. In short, the Eldorado phase and the Nelson phase may well have been partially contemporaneous, and shared the same type of pit house. It would seem that the deep pit

house trait, along with the roasting pit, came to the Lake Mead area from the west in preceramic times.

The diagonal-notched dart point of Lovelock Cave already has been mentioned. Some of the points from Lovelock Cave exhibit a basal stem notch (Loud and Harrington, 1929, Pl. 56a, d, f, g and q), but their relative stratigraphic position in relation to the unnotched stemmed types is not indicated in the report. The base-notched points are identical to Willow Beach type Id (Fig. 21), which were associated with arrow points in the lowest ceramic level (2 ft. 4 in.) of the 1936 Willow Beach excavations.

Lister (1951) recovered somewhat similar points, which he compares to the Pinto Type, in his levels 4 and 5 (preceramic level) at the Hells Midden site in northwestern Colorado. He dates this point type pre-A.D. 400, which may well correlate with the similar point at Lovelock Cave, where it appears to have lasted longer. Since arrow points and Lovelock Cave dart points are found at Lovelock Cave in the transition zone, which lies between the lower dart point level and the upper arrow point level, the period of association probably can be dated roughly at pre-A.D. 750 on the basis of the association of arrow points at both sites and the presence of associated pre-A.D. 750 pottery in the lowest ceramic level of trench I at Willow Beach. The evidence thus would seem to indicate that at least the base-notched variety of the Lovelock Cave dart point survived up to the time of the introduction of the arrow point at Lovelock Cave, and that this same variety reached Willow Beach directly or indirectly from the northwest at about the same time the arrow point and pottery appeared, if the association at Willow Beach is valid.

In summary, the preceramic cultural development in the Lake Mead area indicates that elements of two cultures came together in this region. This development is marked in the beginning by the dominance of Basketmaker II traits to which non-Basketmaker II elements, probably from the west, were gradually added throughout preceramic times. Just prior to the introduction of ceramics, traits from southern California had completely supplanted those of the Basketmaker just below the bend of the Colorado River at Hoover Dam. The exact affinities of these western elements cannot be definitely established at present since the late preceramic cultures to the west have not been defined. Whether the mixture that occurred at Willow Beach during the lithic phases is a true cultural blend, or represents the dominant use of one campsite by one of two different groups over a period of time, cannot be stated with certainty. It would seem, however, that the Basketmaker groups were the initial venturers who moved west for trade or other purposes, beyond Willow Beach, and that later, after having established contacts with the southern California groups, the trend reversed

itself, with the lower Virgin River area becoming the westernmost outpost of the Basketmakers, Willow Beach thus becoming a campsite for the westerners. If such occurred, these postulated preceramic developments undoubtedly brought about the beginnings of the Mohave-Pacific trade trail, as well as the mixture of traits at Willow Beach.

Ceramic Horizons

Roaring Rapids Phase (pre-A.D. 750)

Pottery is first encountered in the Roaring Rapids phase at Willow Beach. The types recovered, none of which occurs in quantity, indicate a beginning date before A.D. 750. All types are definitely intrusive in the area, with the possible exception of Cerbat Brown which forms the largest percentage of the relatively few sherds recovered. Since Cerbat Brown does occur in small quantities in later horizons at Willow Beach and has a focus in northwestern Arizona, it must be considered indigenous to or neighboring on the local area.

The pottery of this phase can be broken down into three divisions as follows:

- | | |
|---|--|
| 1 - Lino Black-on-gray
Boulder Gray
Utah Grayware?
Logandale Grayware? | Gray pottery finished by the <u>scrape</u> method and fired in a <u>reducing</u> atmosphere. |
| 2 - Verde Gray | Gray pottery finished by the <u>paddle-and-anvil</u> method and fired in a <u>poorly controlled</u> atmosphere favoring reduction. |
| 3. - Cerbat Brown | Brown pottery finished by the <u>paddle-and-anvil</u> method and fired in an <u>oxidizing</u> atmosphere. |

The first division represents various western elements of the Anasazi or the Virgin branch of the Anasazi-like culture of southwestern Utah, the second the Prescott branch, and the third the Cerbat branch (Fig. 37). The four Anasazi pottery types could only, with the possible exception of Lino Black-on-gray, have reached the Lake Mead region from the north

side of the Colorado River. These coil-scape type trade pieces undoubtedly were products of the Basketmaker III descendants of the Price Butte phase peoples or other similar groups responsible for the earlier Basketmaker II developments ranging from the Fremont River area south and west to the Lake Mead region.

The percentage variations of the intrusive pottery types first appearing in the Roaring Rapids phase (layer C) are indicated in Table 23. The possibility that the one sherd of Verde Gray and the one of Pyramid Gray, in layer C of trench V, are strays from layer B must be kept in mind. Layer B of trench V could not be stratigraphically separated from layer C except where the windblown-sand fill of the bed of the arroyo was encountered. The pier test, which was sunk through the windblown sand layer above the arroyo bed, did not yield either Verde Gray or Pyramid Gray in layer C. The two sherds of Pyramid Gray recovered from the top portion of the windblown sand in the pier test were directly under layer B, from which they undoubtedly were introduced.

The evidence indicates that during the Roaring Rapids phase Tusayan Gray Ware was dominant over Tizon Brown Ware, that the gray types were intrusive from different areas, that Cerbat Brown and Boulder Gray were the dominant individual pottery types, and that Verde and Pyramid Gray probably were not associated with the ceramics of layer C. For this reason the beginning date of Pyramid Gray is set at post-A.D. 750 -- possibly as late as A.D. 900. The dominance of Cerbat Brown and Boulder Gray suggests that the Cerbat branch and the Virgin branch both made use of this campsite.

Along with the introduction of pottery came the first arrow points. Many of these blades are fairly thick with flaking confined mainly to the edges, one side of the blade being relatively flat and the other somewhat humped. They are stemmed points and have horizontal to slightly projecting shoulders. The bowed longitudinal cross-section of these points is a common feature. A similar curved point is reported from Hells Midden where it occurred with material tentatively dated A.D. 400-800 (Lister, 1951, 15).

The Roaring Rapids phase was the first to yield evidence of the bow and arrow and of ceramics at Willow Beach. Its beginning is dated before A.D. 750 on the basis of Basketmaker III ceramic associations. The Virgin branch cultural material of this phase bears no close relationship to the Basketmaker III culture, but resembles the Fremont pattern more than any other.

Table 23
Pottery variations by layers in trench V and pier test
(Percentage values below 15% are exaggerated)

DATE		PHASE	PROVEN- IENCE	TRENCH V				PIER TEST				
				POTTERY	ANASAZI WARES	TIZON BROWN WARE	PRESCOTT GRAY WARE	PYRAMID GRAY	ANASAZI WARES	TIZON BROWN WARE	PRESCOTT GRAY WARE	PYRAMID GRAY
					←100%→				←100%→			
A. D.	Willow Beach	Layer A									Layer A	
1150		Layers A-B contact										
		Layer B							Upper	half of	Layer B	
900		Layers B-C contact							Lower	half of	Layer B	

Directly over the material of the Roaring Rapids phase (layer C) throughout trench V at Willow Beach there is a thin deposit of windblown sand which contains a sparse amount of cultural material of the Willow Beach phase (layer B). Moreover, directly over the arroyo bed, the windblown sand deposit was thick and culturally sterile, further indicating that the artifacts in the thin windblown deposit occurring throughout the remainder of the trench probably were strays, most likely from layer B. Since the ceramic content of the Willow Beach phase establishes an about A.D. 900 to 1150 date range and that of the Roaring Rapids phase a pre-A.D. 750 beginning date, we are faced with the possibility of a complete lack of any Pueblo I material between the two phases. Perhaps the windblown sand deposit represents the interim, if there really was such an interval.

This situation, the apparent lack of a Pueblo I horizon, is not confined to the Willow Beach site. It occurs, too, in the Muddy and Virgin River valleys, Zion National Park, Fremont River area, and, according to Morss, in Utah generally (Morss, 1931a, 5; Morss, 1931b, 78; Harrington, *et al.*, 1930, 20; Rudy and Stirland, 1950, 46.) More recent National Park Service surveys north of the Colorado River on the Shivwits Plateau have failed to turn up any evidence of a Pueblo I equivalent in that area. Thus the entire region north of the Colorado River from Willow Beach to the Fremont River appears to lack material which can be specifically dated between A.D. 750 and 900.

It is unreasonable to expect that such a large area was completely depopulated for 150 years or more, only to be reoccupied again by the same people. In Arizona north of the Colorado River this seems especially unlikely. Boulder Gray (pre-A.D. 750), which could only have been manufactured in the Toroweap area on the east end of the Shivwits Plateau where the tempering material (olivine and iddingsite) occurs, "reappears" at A.D. 900. Apparently there was little or no contact with the true Pueblo I Anasazi culture of the Four Corners area and as a result the expected Pueblo I elements are lacking. It is probable that the Cerbat branch people continued to occupy the area immediately south of Lake Mead between A.D. 750 and 900 (as Cerbat Brown also "reappears" at A.D. 900), and that the groups responsible for the western Basketmaker III development remained in southern Utah, southern Nevada, and northwestern Arizona in Pueblo I times, but in a Basketmaker III cultural status. Rudy and Stirland (1950, 9) suggest, on the basis of their architectural finds, that the transition from Basketmaker III to Pueblo II status in southwestern Utah was slow and gradual. In view of the general lack of Pueblo I intrusives throughout the area their suggestion bears considerable weight, since local developments exhibit no evidence of Anasazi influence from the Four Corners region to suggest Pueblo I contacts.

Steward (1936, 16, 59) notes that a few Pueblo I-like sherds occurred in the Salt Lake area (perhaps late Pueblo I trade pieces representing the beginning of Pueblo II contacts), and Hall (1942) has reported some evidence of Pueblo I occupation on the north rim of the Grand Canyon. It is quite possible that the few intrusives at Willow Beach with dates spanning both Pueblo I and II represent occupation during this time. Stratigraphically this could not be definitely shown. This entire problem of a "Pueblo I stage" in the west and northwest requires further detailed excavation and study. At present there is no evidence to explain why the western Basketmaker II groups, who did develop a Basketmaker III type culture (containing gray ware types such as Logandale Gray and Boulder Gray and possibly Sevier and Great Salt Lake Gray, implying contact with the Basketmaker III of the Four Corners area), did not borrow new elements from their neighbors in the Four Corners region in Pueblo I times.

Willow Beach Phase (A.D. 900-1150)

This period at Willow Beach is marked ceramically by the appearance and dominance of Pyramid Gray pottery. The abundance of pottery, as compared to the ceramic yield of the Roaring Rapids phase, indicates that the site received greater use by one culture group rather than sporadic visitation by several groups that might have camped there while traveling along a trail. The characteristics of Pyramid Gray cannot be assigned to the lower Virgin ceramic complex or to that of the Cerbat branch. It exhibits some of the traits of Prescott Gray Ware but more closely resembles the pottery found along the lower Colorado River south of Davis Dam as well as that of the Mohave Desert. Relations with the neighboring groups during this phase are quite evident. The presence of point type Vb, flexed burials, turquoise, and intrusive Moapa Gray Ware pottery, traits typical of the Muddy River Valley, indicate close contact with the contemporaneous Lost City phase of that region. The occurrence of Prescott Gray Ware pottery from the south and Cerbat Brown from the southeast as intrusives is evidence of association with two additional groups. Thus several components are represented.

The material recovered in the Willow Beach phase indicates that the preponderant traits cannot be assigned to or derived from any one of the neighboring branches (Table 24). The effect of the Prescott, Cerbat and Cohonina branches apparently was slight and in the form of intrusive pottery only. However, the natives of the Virgin branch, who were geographically close to Willow Beach, apparently maintained greater contact with the local group. The presence of Lost City phase material and flexed burials indicates actual visitation to the site by the natives of the Muddy River region. The dominance of material that cannot be assigned to the

Table 24

Probable branch derivation of the traits of the
Willow Beach Phase

<u>Traits of the Willow Beach Phase</u>	<u>Branches From Which Traits Were Derived</u>
Point, type Vb.	Virgin
Turquoise	Virgin
Reamer	Virgin
Flexed burial	Virgin
North Creek Gray	Virgin
Boulder Gray	Virgin
Verde Gray	Prescott
Aquarius Black-on-gray.	Prescott
Aquarius Orange	Prescott
Aquarius Brown	Prescott
Aquarius Black-on-brown.	Prescott
Deadmans Black-on-gray	Cohonina
Deadmans Fugitive red	Cohonina
Kirkland types.	Cohonina
Cerbat Brown	Cerbat
Sandy Brown.	Cerbat
Paiute Ware	Piedes
Point, type VII	Piedes
Oval jacal	Piedes
Cooking pit	Amacava
Shell.	Amacava
Steatite	Amacava
Asphaltum.	Amacava
Pyramid Gray	Amacava
Cremation.	?
Roasting pit.	Amacava
No stone points	Amacava

? - Origin questionable

Lost City phase, and its similarity to that of the Mohave Desert, suggests that this campsite was most often visited by groups from the south and west who occasionally also visited as far north as the mouth of the Virgin River. The association at Willow Beach of steatite, asphaltum, turtle shell rattle and Olivella shell -- trade material from California which undoubtedly reached the Colorado River via the Mohave Desert -- and the distribution of Pyramid Gray to the west of the Colorado River into the Mohave Desert, indicate that this phase was originated by a group of people who ranged back and forth between the Mohave Desert and the river, Willow Beach being the northernmost site in their range. This pattern is being assigned a new branch name, Amacava, the first name applied to the Mohaves by the Spanish, and is being included in the Laquish (riverine) rather than the Patayan (upland Arizona) grouping (Schroeder, 1952, 53-4; 1957, 176-8).

In Southwestern terms, the Hakataya (Yuman) would be the root, the Laquish (riverine) and Patayan (upland Arizona) groups would become stems, and the divisions within each would be branches. The Patayan and Laquish appear to be separate but closely related stems, and in addition the branches of each exhibit traits which indicate that considerable borrowing took place between neighboring groups. Table 25 lists the traits of the Laquish and Patayan stems and selected branches for the period A.D. 900 to 1150. These data are based on publications of the Museum of Northern Arizona, Rogers and Schroeder. Those elements marked with an "E" on the table imply that the trait was influenced by the environment, but not that it developed as a result of the environment. Present data are neither complete nor detailed enough to determine more exact relationships.

The Pueblo II traits intrusive at Willow Beach were not derived directly from the Anasazi of the Four Corners region, but from the Virgin branch in the Muddy River Valley. These latter people were affected by the Anasazi who, coincident with the development of the Willow Beach phase, expanded west across the Colorado River onto the Paria Plateau (Judd, 1926, 129-35) into an area which previously, apparently, did not reveal any Pueblo I culture. From this vicinity, or perhaps from the Kaibab Plateau area west to the Muddy River, an "altered" form of Pueblo II culture is evident, as a result of selective borrowing by groups to the west. This western culture differed from true Pueblo II in having quasi-rectangular mud and rock walled rooms as opposed to the strictly rectangular coursed masonry rooms of the Anasazi, black-on-gray, fugitive red, and corrugated pottery as opposed to black-on-white, polychrome, black-on-red, and corrugated types of the Anasazi, and stone balls, Utah-type metate, stone discs, clay figurines with square shoulders, and certain large "gaming" bones, traits generally absent among the Anasazi of Pueblo II times. A complete comparative list of traits probably would indicate several other distinctions, a project which is beyond the scope of this report.

Table 25

Comparative Trait List of the Laquish and Patayan Stems

TRAIT 900- 1150 A. D.	<u>Laquish</u> <u>Stem</u>	Amacava Branch	<u>Patayan</u> <u>Stem</u>	Cerbat Branch	Prescott Branch	Cohonina Branch
ECONOMY						
Gathering	Mainly*	x E	Some	x E	x E	x E
Hunting	Little	x E	Mainly*	x E	x E	x E
Fishing	Some*	x E	None	- E	- E	- E
Agriculture	Some	x	Some	x?	x	x
STONE WORK						
Point	None	- B	Stemmed*	x B	x? B	Cohonina
Metate	Oval basin	x B?	Platform*	?	x S	x S
Mano	Rounded block?	x B?	Block type*	?	x S	x S
ARCHITECTURE						
Rock wall	-	-	x*	?	x C	x A
Rectangular floor	?	?	x*	?	x C	x A
MISCELLANEOUS						
Cremation	x	x B	x	x B	x B	x B
Roasting pit	x*	x B	Some	?	?	-
Cooking pit	x*	x B	?	?	?	?
Shell	x	x	x	?	x	x
CERAMICS						
Paddle & anvil	x	x P?	x	x C	x L	x S
Scraped	-	-	Some	-	-	x A
Polished	-	-	Some	-	-	x A
Fugitive Red	-	-	Some	-	-	x ?
Decorated Red	x*(2)	rare(1)	-	-	-	-
Decorated Black	-	-	x*	-	x C	x A
Broad lines	x	-(1)	x	x	x C	x A
Gray ware	x	x	x	-	-	x A
Brown ware	-	-	Some	x S	x S	-
"Tapa" water	Some	x Ce	Some	x S?	-	-
White slip	Some	x C?	-	-	-	x A
Figurines	x	x(3)	Some	-	x	-
Oxidizing fire	x*	-	Some	x S	-	-
Reducing fire	-	-	Some	-	-	x A
Poor fire	x	x	Some	-	s	-
PROBABLE	River	Mohave	Upland	Walapai	Walapai?	Havasupai?
SURVIVALS	Yuman		Yuman			

Key: * - diagnostic trait x - present - - absent

Trait Derivation: E - environmental factor B - basic trait

Derived from: A - Anasazi Ce - Cerbat branch

C - Cohonina branch S - Sinagua

P - Prescott branch L - Lower Colorado River

Footnotes: (1) Pyramid Red-on-gray from Mohave Desert

(2) From Cottonwood Valley and south on Colorado River

(3) One found in 1947 excavations at Willow Beach

The evidence discussed above suggests that the descendants of the Price Butte phase withdrew east to the Virgin River and farther east in Basketmaker III times and adopted ceramics. They manufactured Boulder Gray, Logandale Gray and probably other "Utah" wares of the Arizona Strip-southern Utah country. In Pueblo I times these people had little contact with the east. They apparently continued to live in the same region, since Boulder Gray and other early ceramic types also occur in association with Pueblo II intrusives. The architectural development was unbroken. Evidently these people maintained their locally developed Basketmaker culture until Pueblo II times. Then they were influenced by the Four Corners Anasazi, and several traits, some of which they accepted with slight alterations, were adopted.

Post-A.D. 1150

By about A.D. 1150 the western Anasazi-like culture disappeared from Utah, southern Nevada, and from northern Arizona north and west of the Colorado River. In addition, occupation at Willow Beach ceased as far as the Amacava branch is concerned. Throughout this general area two new traits are found associated with (?) or lying above the last phase of occupation (after A.D. 1150) -- base-notched points with or without side notches and corner tangs, and a brown to gray-black, paddle-and-anvil thinned pottery with a somewhat conical base, sometimes decorated with fingernail indentions (Paiute Brown Ware). Eight of these sherds were recovered at Willow Beach in level 2, in blocks E-4 and F-3 on the contact between layers A (sterile sand?) and B (Willow Beach phase), covered only by 1 to 2 cm. of windblown sand. One of the four sherds from the oval jacal uncovered in trench I in 1936 was this same type. This association, in addition to the presence of a discoidal scraper similar to one reported by Rudy from a level containing Paiute material at Pine Park Shelter, may imply that the structure was Paiute, as it was a round brush hut found only 6 in. below the surface. Most investigators have considered the above traits Shoshonian (Steward, 1937, 83-7; Harrington, 1926b, 71; Baldwin, 1948, Pl. 94, and 1950, 50-6; Rudy and Stirland, 1950, 46; Campbell, 1931; Rudy, 1954, 12), and they are here assigned to the Piedes branch in Table 24. On the basis of language studies, Kroeber (1925, 578), over 25 years ago, postulated a Shoshonian move into southern California which he estimated had taken place about 1000 or more years ago. His figure is remarkably close to the archeological evidence, which tentatively places the earliest possible appearance of the above Shoshonian traits around A.D. 1150 in the Willow Beach region.

Steward roughly estimated the appearance of the Promontory culture on Salt Lake as about A.D. 1100, and the disappearance of Pueblo II-like

culture in Utah slightly later. Rudy and Stirland have pointed out that the Washington County sites of southwestern Utah were abandoned at the end of Pueblo II times, as Pueblo III intrusives were lacking. National Park Service data indicate that the lower Virgin and Muddy River valleys were probably abandoned about A.D. 1150, and the Shivwits Plateau and Black Canyon areas at about the same time. In addition, Hall (1942) has indicated that Virgin branch traits appeared about A.D. 1150, on the north rim of the Grand Canyon. Thus, this suggested Shoshonian arrival from the north may have coincided with the general Pueblo-like withdrawal from the area. This influx may have forced the native groups of Utah and southern Nevada out of the area (to the east and south), by causing an unbalance in the wild food economy, by upsetting trade relations, or, possibly, by actual pillaging of crops and warfare.

It has been suggested that the Promontory-type pottery of northern Utah may have been near the ancestral line from which Apache-Navajo, Ute-Paiute, and lower Colorado utility wares sprang. This suggestion was based on the use of doctored mixing water in the manufacture of Navajo pipes, Ute utility ware, Lower Colorado utility ware and Paiute cooking pots. The Athabaskans were considered the possible agents in the dispersal of this practice (Huscher and Huscher, 1942, 87).

Since the Willow Beach excavations and a survey on the lower Colorado River indicate that Pyramid Gray and other utility types on the lower Colorado River predate the estimated time of appearance of Promontory Ware, as well as of the other types listed above, it appears that the practice of doctoring the mixing water may have been of southern origin. It seems more likely that doctored mixing water was a Hakataya trait originally and that this practice was adopted by the ancestral Paiutes after their arrival around A.D. 1150. Later it was passed on to the Navajos in historic times, probably around A.D. 1700, when the latter expanded west into Arizona. In turn this practice was adopted by the Apache groups bordering the Navajo area.

By the time the effects of the postulated A.D. 1150 Shoshonian influx reached the Amacava branch, including the inhabitants of the Mohave Desert, they no longer needed to travel to the campsite at Willow Beach on their northern periphery, because the recipients of their trade articles in the Lost City area had left their homes. Since Kroeber believes that a Shoshonian influx spread into California (and such presently can only be correlated with this about A.D. 1150 period), the Amacava living on the Mohave Desert probably were affected at the same time, situated as they were in the direct path of Shoshonian expansion to the west. Probably it was at this time that the Amacava moved south or southeast onto the

Colorado River proper (Schroeder, 1952, 57). When the area affected by the postulated Shoshonian drive is considered (Utah, southern Nevada, and adjacent portions of California and northern Arizona), it appears that there would have been a sizable population shift. The local pueblo-like pattern with its regional variations was replaced by the Shoshonian pattern throughout, and the northern Hakataya (Amacava specifically) were forced south and east.

The cause for such a wide-scale disturbance is not evident, but ecological change, which led to the droughts of the 1200's west of the continental divide, may well have been the major factor. Amacava trade with coastal tribes, however, was not disrupted by the intrusion. Rogers has pointed to the continued use of the Mohave-Pacific trail after the abandonment of the Mohave Desert region, and historical sources have recorded Mohave travel over this trail into fairly recent times. The area around Needles became the eastern junction (Rogers, 1941; Rogers, 1945; Coues, 1900). The turtle shell rattle fragment in the probable Paiute hut at Willow Beach also indicates post-A.D. 1150 trade from the coast.

Thus the Willow Beach site bears evidence of having been an important link in the trade between California and the Southwest along the Mohave-Pacific trail, which ran through the Mohave Desert and Cajon or Tehachapi Pass into Los Angeles and Santa Barbara counties, California. In the course of preceramic time, several traits (oval basin metates, short wide manos, hearths, choppers, stone discs, and incised stone) were introduced to Willow Beach from the west. A number of these traits are found in an early coastal culture which has a lithic assemblage showing affinities with San Diego County and the Mohave Desert (Treganza and Malamud, 1950, 135-6, 150-1). These traits may have reached Willow Beach via the Mohave-Pacific trail. During ceramic times such trade items as shell, ceramics, and stone work evidently went in both directions over the Mohave-Pacific trail (Farmer, 1935; Brand, 1938; Walker, 1938; Colton, 1941; Rogers, 1941; Heizer, 1941; Simpson, 1950). Evidence at Willow Beach indicates that steatite, turtle shell rattles and asphaltum reached northwestern Arizona. It appears that the Mohaves and their ancestors were the middlemen in this traffic which was carried on into historic times.

SUMMARY

The 1950 excavations at Willow Beach revealed several successive periods of occupation, beginning in preceramic times and extending up to about A.D. 1150. Of the five preceramic habitation layers, the lowest (layer O) contained material assignable to the Fremont variant of the Basketmaker II culture (or this can be termed an intergrade). Because of the roasting pit, which is common to the southern California-western Arizona region and which has not been reported with typical Basketmaker sites, this lowest level has been designated the Price Butte phase.

The next cultural layer (L), separated from that of the Price Butte phase by sterile silt, as is the case between all preceramic horizons, contained one pecking stone in addition to bits of charcoal, which is sufficient only to indicate continued occupation of, or visits to, the site.

Layer J revealed a thin occupation layer and yielded a small amount of material which is apparently a continuation of the earlier Basketmaker material with some new additions -- shaped mano and oval basin metate. This has been named the Nelson phase.

On the line of contact between layers H and I a few items indicating the presence of man were found, but as in layer L, the cultural material is merely sufficient to indicate use of the site.

The items recovered in the topmost preceramic layer (F-G) manifest new traits suggestive of the southern California tradition. Stemmed dart or spear points and incised stones were recovered. The assemblage has been named the Eldorado phase.

Layer C is the lowest level in which pottery and arrow points appeared. The majority of the pottery is gray-surfaced and manufactured by the coil-scape technique representative of the Basketmaker III culture of the Virgin River-Arizona Strip region. However, the dominant single type is a brown-surfaced pottery, thinned by paddle and anvil, Cerbat Brown, a type native to northwestern Arizona south of the Colorado River. The paddle-and-anvil pottery and the other traits of this horizon manifest cultural ties with the Hakataya to the south and west, in western Arizona and southeastern California. The poorly fashioned points, however, show affinities with the Virgin branch to the north. This material has been designated as the Roaring Rapids phase, and suggests that the site of Willow Beach was used by both the Cerbat (Hakataya) and the Virgin groups, although not necessarily at the same time.

Layer B, the topmost cultural level (aside from the surface layer), revealed quantities of gray-surfaced, paddle-and-anvil pottery, stemmed arrow points somewhat similar to those of layer C, shell fragments, asphaltum and roasting pits, all indicative of neighboring southern and western influences, particularly from the Mohave Desert. Two associated elements -- a small quantity of gray-surfaced, coil-scraped pottery and finely chipped diagonal-notched arrow points with projecting shoulders -- are common in the Muddy River and lower Virgin River valleys farther north. In the extreme upper portion of this level first appeared side- and base-notched points, with or without tangs, and Paiute Brown Ware. Layer B, the Willow Beach phase, apparently represents occupation and use by the Amacava branch and occasional visitation by the Pueblo-like group of southern Nevada. Either close to the time of the abandonment of the site or after its abandonment by the Amacava, it was visited by Shoshonian bands.

A restricted study of the 1936 material from this site manifests similar associations and patterns. In addition, there were several flexed burials, typical of the Muddy River Valley, with associations indicative of the Willow Beach phase. All side-notched points, with or without tangs, and Paiute Brown Ware were found on or near the surface, again indicating that these traits probably appeared at the very end of, or subsequent to, Amacava occupation.

Willow Beach traits conform to and interrelate with those of the surrounding areas and neighboring cultures. The Grand Wash Cliffs, where the plateau breaks off and the desert begins, apparently mark the dividing line between the Fremont variant of the Basketmaker II culture on the east and an intergrade between the Fremont and Amargosa variants on the west, which exhibit such traits as roasting pits and the relatively common use of diagonal notches on dart points. In the Muddy River valley, deep circular pit houses most probably were introduced from the west in the Price Butte or Nelson phases.

The material from succeeding preceramic phases at Willow Beach and similar finds in the Lake Mead area indicate that a cultural pattern from the south and west gradually supplanted that of the Basketmakers just south of the bend of the river below Hoover Dam. A blend of a western element and the Basketmaker pattern seems to have survived in the desert just west of the Grand Wash Cliffs in the lower Virgin and Muddy River valleys.

Pottery was first traded into the general area from two directions and at about the same time (before A.D. 750). Gray-surfaced, coil-scraped pottery represents types from north of the Colorado River that came from the Virgin River-Arizona Strip region and was traded south and west to

Willow Beach as well as into the Mohave Desert region. Brown-surfaced, paddle-and-anvil pottery apparently came in from the south and east of the Colorado River, from the Cerbat branch located in northwestern Arizona, and was traded west of the river below the bend (Rogers, 1945, 175, 191; Colton, 1939, 9). Following the introduction of pottery to Willow Beach in the Roaring Rapids phase, a type from the Mohave Desert, Pyramid Gray, was introduced, possibly before A.D. 900.

With the surface appearance of side- and base-notched points, with or without tangs, and/or brown conical-based pottery in the Lake Mead area, the culture patterns of Willow Beach and Muddy River valley disappear. The association of these new point types and conical-based pottery, sometimes found with historic trade beads in the Muddy River valley, indicates that this last pattern continued into historic times (Harrington, et al., 1930, 23-24; Baldwin, 1950; Schroeder, 1953a).

Thus, four culture groups were represented at Willow Beach and in the Lake Mead area in general -- a preceramic Basketmaker variant which survived into ceramic times east of Hoover Dam, an unnamed preceramic culture from southeastern California which gradually supplanted the preceramic Basketmakers below Hoover Dam, the Hakataya who appeared in ceramic times, and a Shoshonian group which entered the area about A.D. 1150 and replaced the pattern of the Virgin branch and northern Hakataya.

It is evident that Willow Beach served as a campsite on an east-west highway between the lower Virgin River and the Mohave Desert at various times. The proximity of a ford across the Colorado River at the mouth of the Virgin River which enabled travelers to by-pass the deep river canyons to the west, the first and only sighting of the Colorado River (at Willow Beach) from the pass south of the ford, and trails and sites down the river from Willow Beach, as well as to the west, are primary factors which led to the development of the campsite at Willow Beach. When the Shoshonians entered from the north, causing the Pueblo-like groups to leave the area, they disrupted the trade which the Amacava carried on with the lower Virgin River pueblos. In turn, the abolishment of this market for trade goods sounded the death knell for the Willow Beach campsite and probably heralded the birth of the Parker-Needles development farther south.

In 1776, when Padre Garces came to the Mohave villages on the Colorado River near present-day Needles, he found Yavapai, Walapai, Chemehuevi, and Halchidhoma Indians visiting there (Coues, 1900, 308). These people had come to trade with the Mohaves as had the probable predecessors of the first three groups, the Prescott branch, the Cerbat branch, and the ancestral Shoshoni, respectively. Ancestors of the

Halchidhomas apparently moved from below the Gila-Colorado River junction to the Blythe-Ehrenburg region between 1605 and 1700 (Bolton, 1930, 276; Hammond and Rey, 1953, 1021), and probably were not involved in the prehistory of Willow Beach.

Culturally, the prehistory of Willow Beach and environs fits into a rather widespread pattern. During archaic times, several regional variations of the Basketmaker culture are evident -- the Anasazi variant in the Four Corners, the Fremont variant to the north and west (possibly including the Willow Beach-lower Virgin River area), the Amargosa variant in the extreme west, and the Lovelock variant to the northwest (see Fig. 37). These in turn undoubtedly are related to other more outlying variations farther north into Oregon and south into the Guadalupe Mountains (southeastern New Mexico), the general Big Bend area (trans-Pecos Texas), and perhaps an extension into Coahuila.

In Basketmaker III times, however, new elements from the south, and perhaps a few from the west, were introduced to the Anasazi variant in the Four Corners area. Introduction of the new elements led to a more sedentary existence and probably marked the beginnings of a formalized social and religious order. Some of the traits introduced to the Anasazi variant -- such as ceramic, architectural and communal patterns -- diffused at different times farther north and west into the area of the Fremont variant, but were adopted in altered form. However, the more outlying groups of the Fremont area, to the west and north, adopted or accepted less of these southern traits than did those closer to the Anasazi sphere, perhaps because their submarginal agricultural environment would not permit large village concentrations that depended primarily on horticulture. During the early ceramic Developmental Period (about A.D. 750 to 900), the Willow Beach area was not affected directly by the Four Corners area, other than through occasional use of the site by Virgin branch people, who did receive some elements from the east.

In the late Developmental Period (after A.D. 900), however, Willow Beach had come under the domination of the pattern of the Hakataya, specifically the Amacava branch to the west. By the middle 1100's, the culture patterns of the region were replaced by a new pattern, that of the Shoshonians.

The economy of these newcomers was similar to that of the earlier Basketmakers. The return to a hunting-gathering complex may imply that the Pueblo type of existence was doomed to fail, as so often occurred in other areas at different times (where it was introduced rather than developed in place), because of its demands on the soil and the ecologically

destructive effects of concentrated, restricted hunting and gathering techniques in marginal desert lands. On the other hand, since a large portion of the Basin and Range country, from at least northern Utah to southern Arizona, underwent cultural changes and population shifts and exhibits evidence of stress or unbalance in the 1100's it is quite likely that an ecological shift was responsible for the collapse of the Pueblo-type existence in submarginal areas. A minor ecological change could have affected agriculture in marginal regions, but it would have had to occur over a large territory to bring the Shoshonian pattern south into Colorado, northern Arizona, Utah, Nevada, and southern California.

The Shoshonian pattern is apparently a survival of what might be termed a far northern variant of the Basketmaker culture, which was affected by cultures to the east of the Rockies, rather than by southern developments, in early times. Strangely enough, when it entered the Southwest, the Shoshonian pattern spread over the region that included all of the cultures in the areas originally occupied by the southern Basketmaker variants, with the exception of the southernmost Anasazi, who by this time had developed a strong local culture.

It should be emphasized that the Shoshonian culture pattern replaced that of the former occupants, and was not a development out of the former Fremont, Amargosa, and Lovelock variants. This is the only manner by which the Basketmaker-Shoshonian comparisons of Zingg and Steward can be reconciled. In short, the Shoshonian variant developed in the north, probably at the same time the better-known Basketmaker variants differentiated in the Southwest, and then, relatively unchanged, between A.D. 1100 and 1200 supplanted the considerably modified later developments of the southern variants.

NOTE: The above discussion of the Shoshonian-Basketmaker pattern was written in 1952, and was briefly noted in Vol. XIX, No. 3, p. 9, of Southwestern Lore, 1953. Reference also was made to this concept by Wormington (1955, 119).

Jennings, more recently, has proposed labeling all of the archeological materials in the Great Basin as the "Desert Culture" (1957, 280).

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APPENDIX I
PLANT MATERIALS FROM THE WILLOW BEACH SITE, ARIZONA

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Eight lots of plant materials from the Willow Beach site were received in 1950 for identification and interpretation, and have been on hand since that time. These were submitted by Albert H. Schroeder, Archaeologist, National Park Service. Some of the lots were from excavations carried out in 1936 by M. R. Harrington, and others were recovered in the then current program of the National Park Service in preparation of the Lake Mead region as a recreational area.

This constitutes Report No. 311 of the Ethnobotanical Laboratory, covering our serial numbers 4176-4183. The lots are listed under these numbers, followed in parentheses by the catalog numbers and the provenience data under which they were submitted. However, the lots are grouped for discussion on the basis of associational data rather than placed in numerical order.

Cache of Materials from "Paiute" Brush House

- 4176. (21, 425 "Burnt food from burnt hut")
- 4177. (20, 883 "Burnt cloth from burnt hut")
- 4178. (20884 "Burnt food from burnt hut, found with beads")

These three lots were recovered from the floor of a burned brush hut, which floor was found at a depth of some 6 in. below the modern ground level, superposed over the earlier archeological levels. Presumably the house had been constructed within the last few centuries. Harrington, who excavated it in 1936, interpreted it as likely a Paiute Indian brush hut.

Although the lots were collected under separate field numbers there is considerable overlap in their content. The major material is the "burnt food," which we feel is actually pine resin, which adheres to the other things. Among these latter are textile fragments, bits of cord, and small branches which we take to be basket splints. Harrington mentioned beads as also associated, but none of these came to us. Apparently these items

were adjacent to each other, if not in actual juxtaposition, so that the resin, in melting, flowed onto and over them. Such close association may suggest that the objects formed a cache. As the three lots have equivalent provenience data, and as there is duplication in their content, the items will be discussed topically rather than under lot numbers.

1. Pine resin

Description. The material described by the collector as "burnt food" consists of many carbonized masses which do indeed look like food left on the fire too long. Apparently the various pieces once formed a continuous aggregate, as some of them can be fitted together. The maximum thickness is about 1.5 cm. and the minimum thickness about .5 cm. the thinner pieces apparently being peripheral. The upper surfaces are undulating, as if solidified in the midst of a rolling boil, with craters where bubbles have burst. The interior is honeycombed with air pockets indicative of violent bubbling prior to charring to a crust. The interior exhibits a glossy black color, while the exterior has a more grayish cast, but everywhere it presents an almost metallic sheen. The texture is quite consistent throughout, with no cellular structure, and thus no evidence of plant or animal tissues.

Various characteristics of the material indicate that originally it was in a solid state, but with the igniting of the house it melted and flowed, burned freely, and solidified again on cooling. The bottom surfaces are mostly smooth and free of debris, suggesting that the substance originally rested upon some firm and relatively clean surface. A few pieces show adhesions of soil and sand, and in other instances there is adherence to the textile and other cultural objects, indicating that the viscous material was not restrained by any container, but flowed freely from its original base, onto and over these things, and eventually to thin edges.

Tests and identification. Three products which might behave in the manner indicated and which might acquire the characteristics of the specimen suggest themselves, and have been reported in use by the Paiute and other peoples nearby: 1) lac from the creosote bush, used as an adhesive and plastic; 2) honeydew gathered from reed grass, used as a food; 3) pine resin, utilized as an adhesive and waterproofing agent. Perhaps we are overlooking other likely candidates, but nothing else occurred to us.

Samples of each of these were melted and burned on a flat surface under conditions simulating as nearly as convenient those under which the unknown specimen became charred. On heating, all three melted and flowed from a thicker center to a thin periphery, and, when allowed to catch fire,

each burned to a porous crust. Superficially, all present fairly reasonable facsimiles of the unknown specimen. On closer examination distinctive differences were observed in consistency of texture, porosity, coloration, sheen, and manner of flow, which set them quite apart among themselves. On comparison of each to the unknown, the burned pine resin was found to be exceedingly close in all its features and almost indistinguishable from the unknown. The other two seem to be sufficiently dissimilar to be eliminated from consideration.

In view of the exceedingly close match of the burned pine resin, we feel fairly secure in offering a tentative identification of the specimen as resin from some species of pine (Pinus sp.). Several species of pine would be available within the range of the Paiute. The specimen to which comparison was made is also unknown as to species, as it was taken from a resin-coated basketry water bottle in our ethnographic collections, but its identity as pine was validated by several traits which are not applicable to carbonized materials.

Sand inclusions. Embedded in the carbonized resin are many minute particles which are translucent and which reflect light. These are quite uniformly distributed through the masses, and, on visual judgment, appear to constitute about 5% of the volume. As these were apparently unaffected by the fire which burned the resin, they were considered to be of mineral nature. A quantity of the interior of the masses was selected for experiment, with care exerted to avoid the basal portions with adhering soil. This was burned to an ash, and then the ash was dissolved away with hydrochloric acid, thus removing all organic matter. The mineral residue was found to be small granules of quartz. These fine grains of sand are exceedingly small, averaging about 1/5 to 1/4 mm. in dia.

It is a matter of record that some Indian groups added sand or other grit to resins and gums to be used as adhesives and plastics, apparently to reduce tackiness and to enhance working properties. The even distribution of the sand through our specimen, its uniformity of size, and the absence of other contaminating materials suggest that perhaps it was an intentional ingredient of the resin. If it could be established that the sand was a deliberate additive, this would strengthen our interpretation that the material is a resin rather than a food, as it is improbable that sand would be worked into a food.

For comparison, the mineral residue was extracted from pine resin coatings of two basketry water bottles from our collections. In both instances the volume of residue was much less than that from our charred resin, and the content was quite miscellaneous, just what would be expected

from fortuitous entry. In the view of the uniformity and small size of the granules in our specimen, they were examined to ascertain whether they might have been prepared by grinding, but apparently they had not, as there is no evidence of jagged edges and the granules appear smooth and water-worn. Comparisons of the sand were made to that which is found accompanying and adhering to other specimens from the Willow Beach site and it was found that it is quite similar, but somewhat more uniform in size.

It thus appears likely that the sand was not deliberately worked into the resin, but rather that it entered accidentally during the handling and processing, and that the uniformity came about because these activities were carried out on the beach area where fine sand would be the only likely contaminant.

2. Carbonized cotton textile

Nature and treatment. The objects referred to in Harrington's notes as "burnt cloth" consist of about 150 small bits of carbonized textile, none of which is over about 3 cm. in greatest dimension. As these fragments were quite fragile they were treated by immersion in a hot solution of paraffin in xylene, which had the effect of reducing brittleness and fragility and preventing further fragmentation in handling. Twenty-five of the more intact and better preserved examples were selected for detailed study, and the quantitative expressions which follow are based on this sample.

Material. A series of random yarns, withheld from chemical treatment, were examined under high magnification. All of the fibers containing these yarns exhibited characteristics typical of cotton fibers. Particularly diagnostic are the thickened fiber margins and the unique twist of the fibers. Cotton appears to be the sole material in the yarns. Presumably this is Gossypium hopi, the only species known to have been cultivated and used by the Indians of the Southwest (Kent, 1957, 465-70). The total carbonization precludes any possibility of determining whether any dyes were used or whether the fibers were natural color.

Yarns and spinning. The yarns without exception are of single ply, twisted in a counter-clockwise or Z-twist direction. Extremes of yarn diameter observed were a minimum of .4 mm. and a maximum of 1 mm. The majority fall between .65 and .85 mm., with the average about .75 mm. The sample fits quite comfortably within the range of yarn diameters observed by Kent (1957, 477-8, 489-90), who states also that "virtually all" yarns in Pueblo plain-weave fabrics are single-ply Z-twist.

Basic weave and thread counts. The weave is consistently plain weave (plain plaiting) with no deviations from simple under-one, over-one interlacing of the yarns. The number of yarns per centimeter was found to vary from a minimum of 8 to a maximum of 14, with a mean of 12.7, but counts below 10 were rare and the predominating numbers were 13 and 14. These features again accord well with the findings of Kent (1957, 489-91), who indicates that plain weaves were the most common type among the Pueblo Indians, particularly for the production of utilitarian cloth. The thread count in our samples tends to run slightly higher than normal for such textiles.

Variations in texture - "balanced close weave." Generally in our sample, the two sets of yarns exhibited essential equality in tightness of spinning, diameters, and spacing, and, therefore, the thread count in both directions was about equal. Thus, if no selvages are present, it is not possible to distinguish the warp and weft sets of yarns. The result is a symmetrical texture, with the warp and weft about equally prominent, forming small uniform squares. Such a weave is commonly referred to by such terms as "balanced weave," "50/50 weave," and "squared weave" (Tidball, 1953). About three-fourths of our sample showed essential equality of warp and weft, and further were uniformly closely woven with adjacent elements impinging on each other with no interstices visible between. The term "balanced close weave" seems most appropriate to designate this category of plain weave. Apparently the proportion of balanced weave in our sample is higher than ordinary, for Kent (1957, 489-490) implies that "square weave," although adequately present, are generally in the minority among Pueblo textiles.

Variations in texture - "weft-emphasis close weave." More often in Pueblo textiles, according to Kent, there is an imbalance in the weave in favor of emphasizing the weft. She explains that this results from the warp threads being more tightly spun, of finer diameter, and more closely spaced than the weft threads. These attributes may be intentional or may come about from the tension to which the warp is subject in pulling it tightly on the loom. The weft elements, by virtue of their larger size and looser spinning, become more conspicuous and tend to dominate the texture of the cloth, while the warp elements may become less evident to the point of obscurity.

Several of the fragments in our sample show clear dominance of one set of elements over the other, and in these it seems safe to consider the more conspicuous set as the weft. In our most extreme example, the warp yarns averaged about .65 mm. dia. and were spaced at 14 per cm. The weft yarns averaged .9 mm. dia. and were spaced at 10 per cm. Kent

(1957, 490) remarks that in Pueblo textiles the weft often tends to obscure the warp, and to give a "weft-face" appearance, but she further implies that such textiles among the Pueblos are never completely weft-faced in the sense of the warp being completely hidden. Certainly none in our sample was entirely so, and for those with a tendency in this direction we adopt the term "weft-emphasis" furnished by Tidball (1953). If this term is adopted, and "weft-faced" reserved for absolute examples, the virtue is that various degrees of weft-emphasis can be expressed.

About one-eighth of our sample exhibited degrees of weft-emphasis and in addition were closely woven, and for these we establish the category "weft-emphasis close weave."

Variations in texture - "weft-emphasis open weave." The remaining one-eighth of our sample, although exhibiting weft-emphasis, was of more open weave with interstices clearly visible between the structural elements. In one extreme example the warps averaged .5 mm. dia. with spacing of 11 to the cm., thus occupying only 55% of the area in that direction. The weft elements averaged .9 mm. dia., were spaced at 8 per cm., and thus occupied 72% of the area. Other lesser degrees of openness were noted. We classify this category as "weft-emphasis open weave."

Surprisingly, we do not find that Kent has any reference to open weave cloths in her discussion of Pueblo plain-weaves. She utilizes the term "open-work" but only in relation to weft-wrapped and gauze weaves in which there is manipulation of the warp and weft out of line to leave openings. Certainly there must have existed various degrees of the firming of Pueblo cloth due to lighter and heavier beating. If our sample is of Pueblo manufacture as we suspect, it attests to variations in firming and the need for a descriptive term. It is not possible to judge from the specimens whether the openness was intended as a means of varying the texture, or whether there may simply have been negligence in the diligence with which the cloth was compacted.

Selvage. Only one example of selvage was found, a portion about 2.5 cm. long, which is fragile and unsatisfactory for dissection. The selvage area is about 2 mm. thick, presenting an appearance of being somewhat bulky and out of proportion to the woven area. The yarns forming the selvage follow a spiral clockwise or S-twist at about a 45° angle to either axis of the textile. There is some contrast in the diameters of the sets of yarns forming the weave, and we assume this to be weft-emphasis cloth. If this assumption is correct, the selvage is a warp selvage (end selvage), for the spiraling yarns turn in through the loop ends of the slenderer set of yarns.

Clearly this is not a simple two-yarn selvage, but instead appears to be composed of three strands, two smaller ones of equal size and a larger one. Possibly it could be a "three-thread" selvage of the type illustrated by Kent (1957, 577, Fig. 93f), but more likely it is composed of an original two-thread selvage with overcast of an additional larger thread lashed in between the warp ends.

Interpretation. There can be little doubt that the specifications of the Willow Beach cloth qualify it as a fairly typical Pueblo plain-weave textile. The relatively slight deviations noted fall well within the range of variation. Conceivably, it could be from some non-Pueblo source in the area of the lower Colorado River or its tributaries, but this appears to be less likely. Whatever the precise source, it can be considered a product of the Southwestern industry involving cultivated cotton, the spindle, and the heddle-loom.

The textile is definitely out of context in its location in a presumed Paiute house a short distance beyond the geographical and cultural boundaries of cotton cultivation and loom weaving so must have been an article of trade. This should occasion no surprise, as Pueblo-type cotton cloth has turned up rather frequently in sites in the Great Basin and even in the central valley of California. The Willow Beach fabric is in no respect greatly different from textile fragments found in Zion Park in southern Utah, which we have described previously (Jones, 1955, 191, 193) and which were also interpreted as likely trade items.

It seems wise to evade the question of whether more than one piece of cloth was represented in our fragmented specimens. In spite of the minor variations represented there is no necessity of postulating more than one textile. Such deviations could occur in a single piece of cloth either from lack of care in the preparation of materials and in weaving, or from intentional dissimilar treatment of zones of the same fabric.

3. Yucca fiber cordage

Nature and treatment. Among the other materials from the Paiute house was a quantity of carbonized cordage consisting of about 85 pieces, none of which was over about 2 cm. long. Several of these are crudely knotted and spliced and most show evidence of wear. These were treated with paraffin in xylene, as were the cotton textile fragments, and again 25 pieces were selected as a sample for study. These are described by the criteria employed by Jones and Fonner (1954, 101-4) in reporting cordage from the Durango region of southern Colorado.

Material and its preparation. The cords are composed of fiber bundles from the leaves of yucca (Yucca sp.), but we do not venture to suggest which species. The fiber bundles, after removal from the leaves, have been cleaned of other tissues. The intact bundles are clearly evident and there is no indication of any maceration or breaking down of the bundles. Cordage composed of such intact bundles is coarse and relatively impliable, as compared to softer and more flexible cordage achieved through maceration (Jones and Fonner, 1954, 103).

Plies and twist. All of the specimens are two-ply, with the individual strands first twisted in a counterclockwise or Z-twist direction, and then rolled together in the reverse direction (clockwise or S-twist) to form the two-strand cord. Jones and Fonner (1954, 101-3) have reviewed the method of spinning such cord, pointing out that it cannot be accomplished with the spindle, and describing the almost universal way of rolling it on the thigh under the palm of the hand. As both the number of plies and the direction of twist seem to be culturally controlled, it is significant that the Willow Beach specimens exhibit complete uniformity in both of these features.

Size. The minimum dia. is about 1 mm. and the maximum about 2 mm., but of the 25 specimens tabulated, 18 fall within a narrow range of 1.25 to 1.5 mm. There is thus striking uniformity of size.

Quality and purpose. Using the terms of Jones and Fonner (1954, 102-4), most of the cords would be classified as having "medium" tightness of twist, and only a few would be judged to have quality as high on the scale as "good," for most reveal irregularities in diameters and in evenness of twist. Thus, the sample seems to represent utilitarian cordage for such purposes as tying, binding, and lashing. It can be assumed that the uses for which it was intended did not justify the lavishing of meticulous care and excessive time. Had the cordage been destined for textiles, and particularly for clothing to be worn next to the body, it would be expected that the fiber bundles would have been softened by maceration (which also would facilitate the absorption of dyes), and that more care would have been given to uniformity and quality of construction.

4. Basket splints

Description. Along with the resin, cloth, and cordage were several miscellaneous pieces of charcoal, including one large piece and a number of smaller bits. These appear to be about what might be expected as fall from the burning structure. More closely associated with the resin were a larger number of carbonized small branches which stand apart from the other charcoal items because of their uniformity and consistency. Several of these adhere to the resin masses and are partially embedded in the upper surfaces; others of the twigs have resin on them.

The small branches or twigs are straight, smooth, slender and mostly unbranched, representing mostly if not entirely first year growth. The diameters range from 1 mm. to 2.5 mm., with exceptionally large pith areas constituting a high proportion of the volume. The structure and relationship of tissues indicates a single plant source. The bark is completely absent in all instances.

Identification. Twigs of a number of desert shrubs were charred for comparison to the unknown sample. Young branches of the three-leaved sumac or squawbush (Rhus trilobata) were found to match the specimens precisely and no others showed very close resemblance. We feel quite secure in offering this as an identification. The new-growth terminal shoots of this shrub are slender, flexible, and offer an extent of several inches unbranched and of almost uniform diameter. These characteristics and others made the branches an almost ideal basketry material, the wide use of which is well documented. Coville (1904, 210) remarked on the extensive use of this material by various tribes of the Colorado Plateau and the Great Basin, including the Paiute specifically. Although Coville refers to some utilization of it as weft, he emphasizes its adaptability for warp elements, remarking that "for warp the peeled branches are used."

Interpretation.

As the charred twigs were observed on and in the upper surfaces of the resin, this might suggest that they too were a part of the house structure which, on burning, fell into the resin. Several factors seem to render this interpretation unlikely. First, the sample is too uniform to suggest random fall, and, further, it is most improbable that such highly prized basketry material would be devoted to house construction. Most telling is that the bark apparently had been peeled from twigs. The bark could hardly have burned away so cleanly, and must have been removed in advance of the fire. We noted that in charring of comparative specimens the bark did not burn away but remained in place. In view of these considerations it appears more reasonable to interpret the twigs as basketry material which had been prepared.

Mason (1904, 258-9, 361, 490) studied pine resin coated basketry water bottles collected by J. W. Powell and his associates from such Paiute bands as the Kaibab, Shivwits, and Moapa of southern Utah and Nevada not far distant from Willow Beach. These are described as of both coiled and twined technique. It is not stated specifically that sumac twigs entered into the construction of this particular form of basketry, but Coville's statement concerning the use of sumac by the Paiute might possibly apply to basketry bottles. We are leading here to a conjecture that it would not

be out of line to suggest that a lump of pine resin and a bundle of peeled sumac branches might have been cached in the Paiute house for future manufacture of a water bottle.

There remains the further less secure step of postulating that a basketry water bottle coated with pine resin may actually have rested in the house in completed form. If so, during the conflagration the resin might have melted away and flowed beneath the carcass of the basket, and as the latter was consumed, bits of constituent twigs fell onto the resin. We find no strong support for this reconstruction, but do not dismiss it entirely. In a few instances some two or three of the twigs were found lying on the surface of the resin in virtual alignment a few millimeters apart, but this may have been entirely fortuitous. In no cases were the twigs found at right angles to each other or in any position to show interlacing with one another as if incorporated in a basket weave. All of the twigs are straight and reveal no crimp as might result from being bent around each other. One might attempt to escape from this corner by pointing out that unsplit sumac twigs would not be used for both warp and weft, and that foundation (warp) splints would not be bent or crimped, so what we have may be residual parts of the foundation from which a less substantial weft had burned away completely. The fact remains, however, that we have been able to find no positive evidence of weaving.

Aided by a vivid imagination, one might even conjecture that what was represented by the cache in the Paiute house was a Paiute basketry water bottle essentially identical to that illustrated by Mason (1904, Pl. 117, lower figure). An unsubstantial argument might be made that the sumac splints were from the basket warp, the resin from the coating, the cordage from the lugs on the side of the vessel, and the cotton textile was the carrying band. Thus, the materials submitted to us from the cache would be accounted for neatly and in full. What of the beads? Why, they had been stored in the bottle, of course.

Items Apparently of Late Intrusion

- 4179. (21,344 "Ash layer, 5 ft. below surface")
Pit or "seed" of domesticated olive, Olea europaea.
- 4182. (8386 trench V level 3 block D-5 layer B 50-75 cm.)
Pit or "seed" of domesticated plum, Prunus domestica.
- 4181. (8385 trench V level 3 block D-5 layer B 50-75 cm.)
Portion of shell of eastern black walnut, Juglans nigra.

These three specimens appear distinctly out of place at Willow Beach because of their histories involving presumed origins distant from the site. The olive and the plum are assumed to have been derived from the Old World and hardly could have been available prior to the historic period. Recorded disturbances in the areas of the site where each was found appear to relieve the necessity of attributing any great antiquity to them. It seems reasonably safe to suggest that all three were intruded into the site in relatively modern times through activities of the white man.

1. Olive Pit

This specimen is a single "seed" or pit of an olive, 1.5 cm. long, which compares well in all respects with pits of modern commercial olives of smaller grades. It is well preserved and "fresh" looking, without noticeable erosion of features. When it was opened, the "meat" (seed) in the interior was found to be plump and not at all shriveled nor discolored with age. The olive is thought to be native to western Asia, but has long been cultivated in the circum-Mediterranean region, from whence it was introduced to California during the mission period.

The olive pit was found during the excavations by Harrington whose notes state that it came from an ash layer 5 ft. below the surface. He remarked, however, that there were abundant rodent burrowings in the area, and further that at one point there had been a slump with materials falling in from above, but there is no direct evidence that the olive pit was directly involved in the slump. Whatever the precise manner by which the pit reached the location where found, it seems safe to assume that this did not occur very long before the 1936 excavations.

2. Plum Pit

This pit or "seed," which is 2.4 cm. long, compares well in size and other features to those of the smaller types of cultivated plums. It is quite distinguishable from those of the native wild plums of the area, or any which might have been transported there in aboriginal times. The plums have a complicated history, but seem to have stemmed originally from the Near East, with introduction into the Americas in early historic times.

The plum pit and the walnut shell were found 50-75 cm. below the surface in layer B, which is datable primarily in the period of A.D. 900-1150 but which contained some materials possibly attributable to the historic Paiute. Schroeder's notes on the plum and walnut have the entry "from pit, modern?" Judging by the nature of the specimen, it would appear justifiable to delete the question mark, but to leave open the ques-

tion of whether it was carried there directly by the white man or whether the Paiute should be credited with an assist.

3. Walnut Shell

The projection of the curvature of this portion of a walnut shell, constituting about one-third of the total shell, indicates a dia. of about 3 cm. for the whole shell. Comparison of the specimen to the eastern black walnut reveals exceedingly close similarity, and it is considered to be unquestionably of this species (Juglans nigra). Comparison was made to nuts of the native western walnuts which would be available moderately close by, such as Juglans major, Juglans californica, and Juglans hindsii, but it was necessary to dismiss these possibilities because they contrast too strongly in both size and the pattern of sulcation, or furrowing, of the surface.

At the present time, the eastern black walnut grows no nearer to the site than the wooded eastern portions of Nebraska, Kansas, Oklahoma, and Texas, approximately a thousand miles distant. It is by no means inconceivable that the specimen may have reached the site by aboriginal trade, but in view of the derivation of this item from what likely was a modern pit, and its association there with the seed of cultivated plum, such aboriginal transport seems not indicated. Again we are inclined to place the blame on the white man.

Roots and Wood from Trenchs IV and V

4183. (F:2:1 trench V level O block C-3 "Among rocks at base of trench")

This specimen consists of a mass of filamentous plant material in a matrix of fine sand. The plant portion is small roots wadded together in a manner that precludes this having been their natural position of growth. The presence of profuse root hairs and the branching habit leave no doubt that these are roots rather than some other filamentous material such as fibers. The roots have not been identified further than a hazarded guess that they are grass roots. Although the mass of roots apparently has been wadded together by human agency there is nothing to suggest directly the purpose of the wad. Possible explanations are packing, padding, or perhaps medicine. There is no evidence that the wad has been chewed and ejected as a quid.

4180. (8052 test trench IV "Piece of wood with bark adhering")

This is a piece of wood about 5.5 cm. long and 1.5 cm. wide and of about 1.5 cm. thickness. Some of the surfaces are corrugated by

checking and warping in such a manner that at first we thought these areas were plates of roughly fissured bark. On closer examination we found that the wood structure continues throughout. The wood is from oak (Quercus sp.) but we do not venture to suggest what species. The heavy checking suggests that the wood has been subjected to some moist situation and perhaps it was drift wood taken from the river. We observed what seemed to be marks of cutting indicative of handling by man, but we cannot vouch for this. A not too helpful suggestion that the wood was likely discarded from some technological activity is about all that seems warranted.

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Fig. 1. Willow Beach (center foreground)
looking west

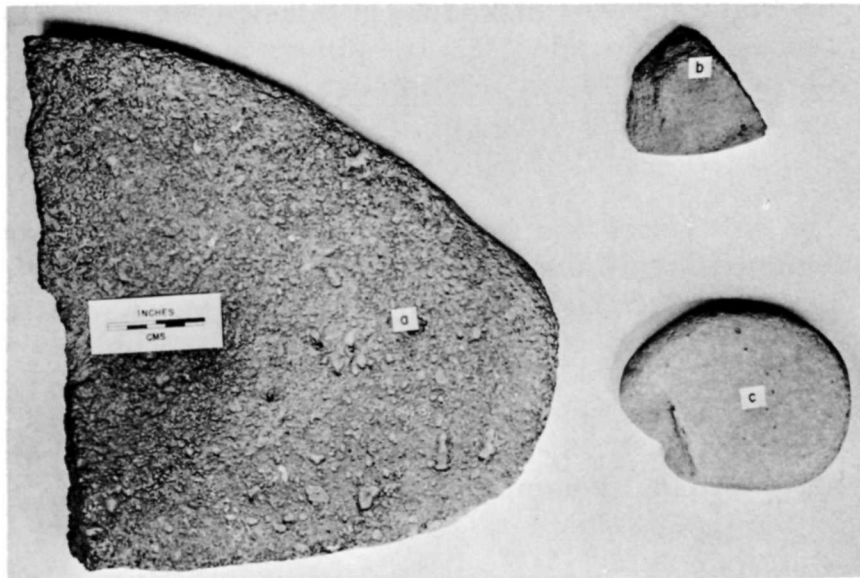


Fig. 2. Manos and metates, trench IV

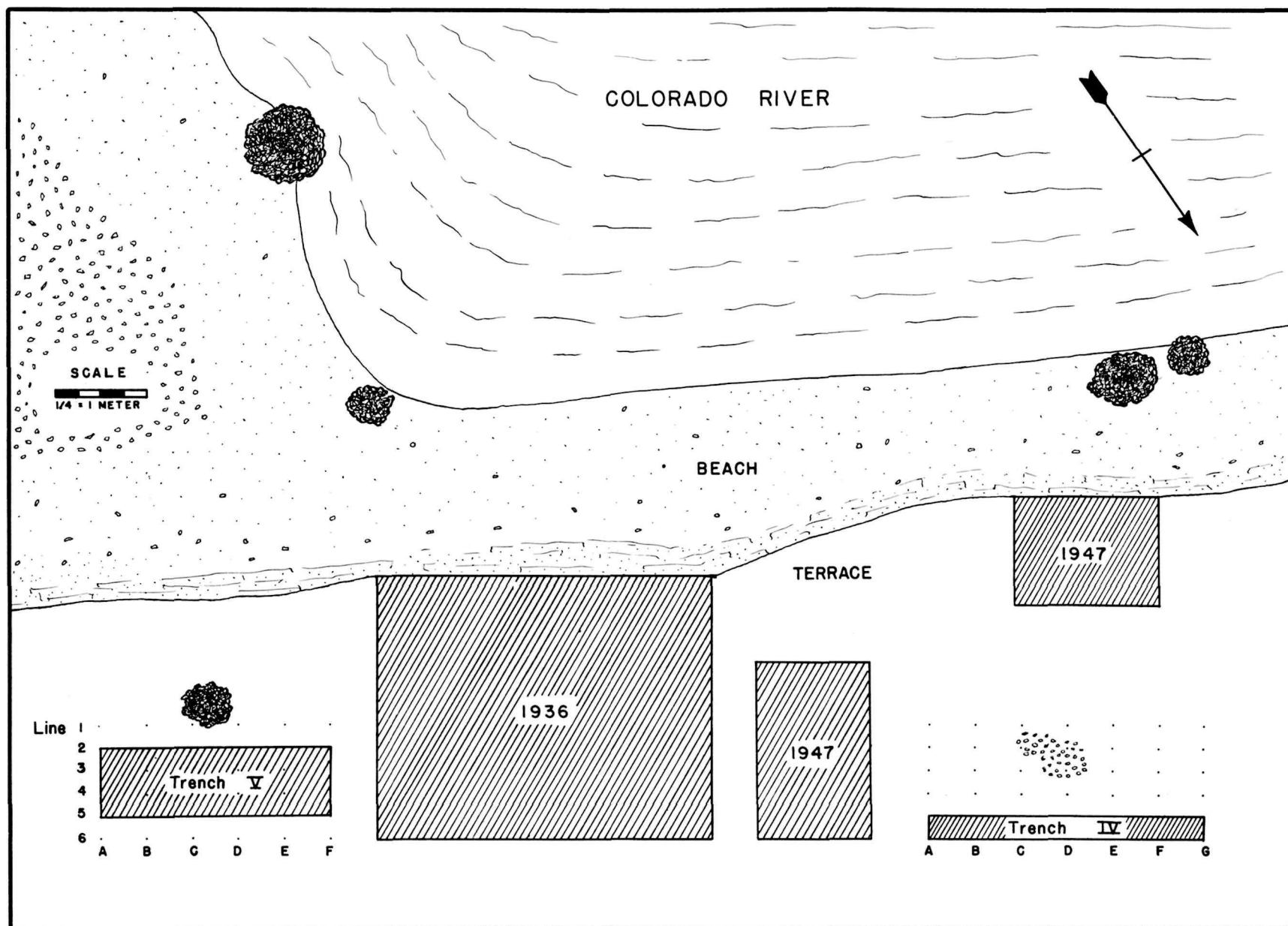


Fig. 3. Plan of excavations



Fig. 4. Cooking pit in D-2, trench IV

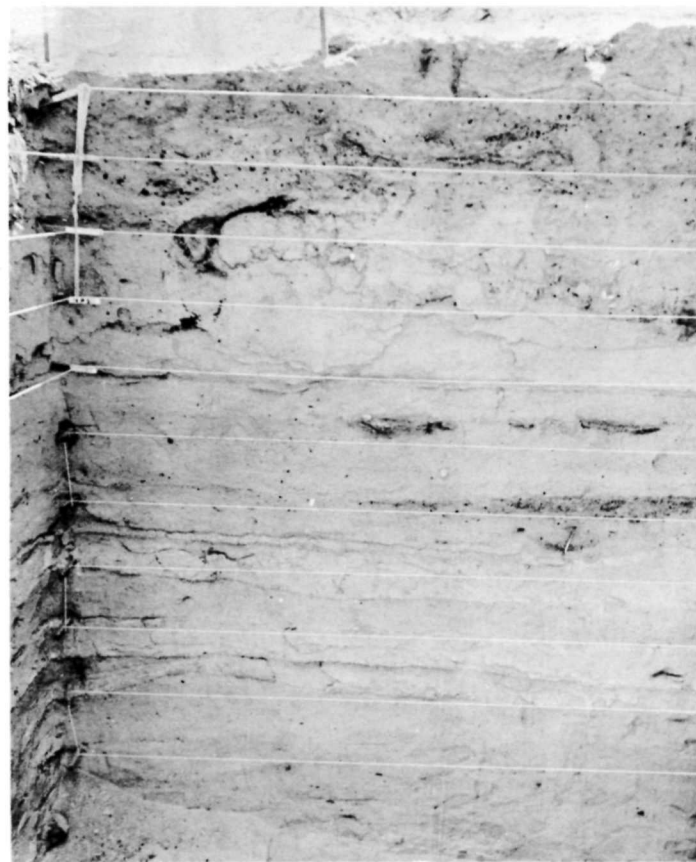


Fig. 5. Southeast wall, trench V. Strings are 25 cm. apart

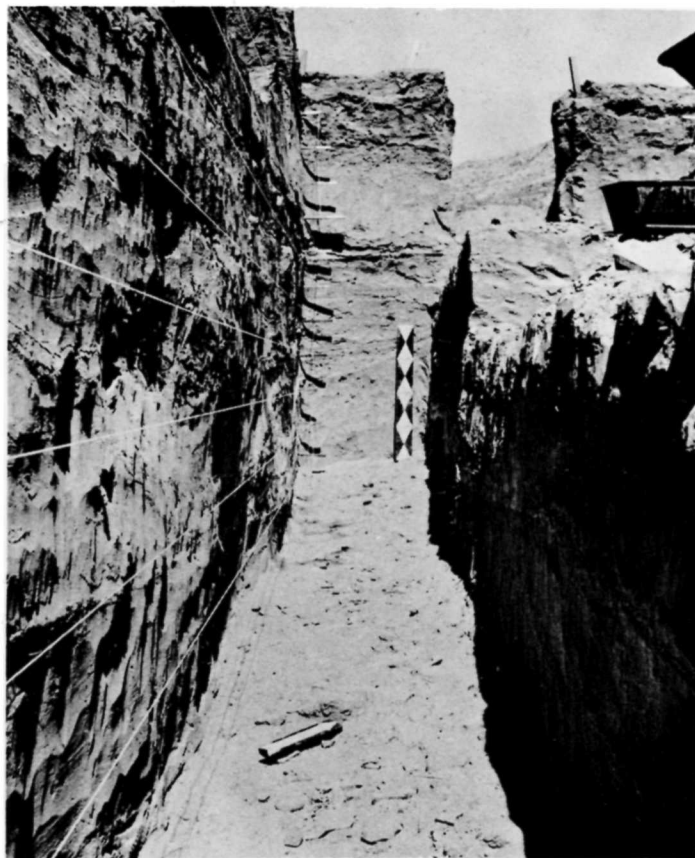


Fig. 6. Trench V, arrow resting on layer O



Fig. 7. Firepit, layer C, and questionable post hole, trench V



Fig. 8. Layers A, B, and windblown sand over wash, trench V

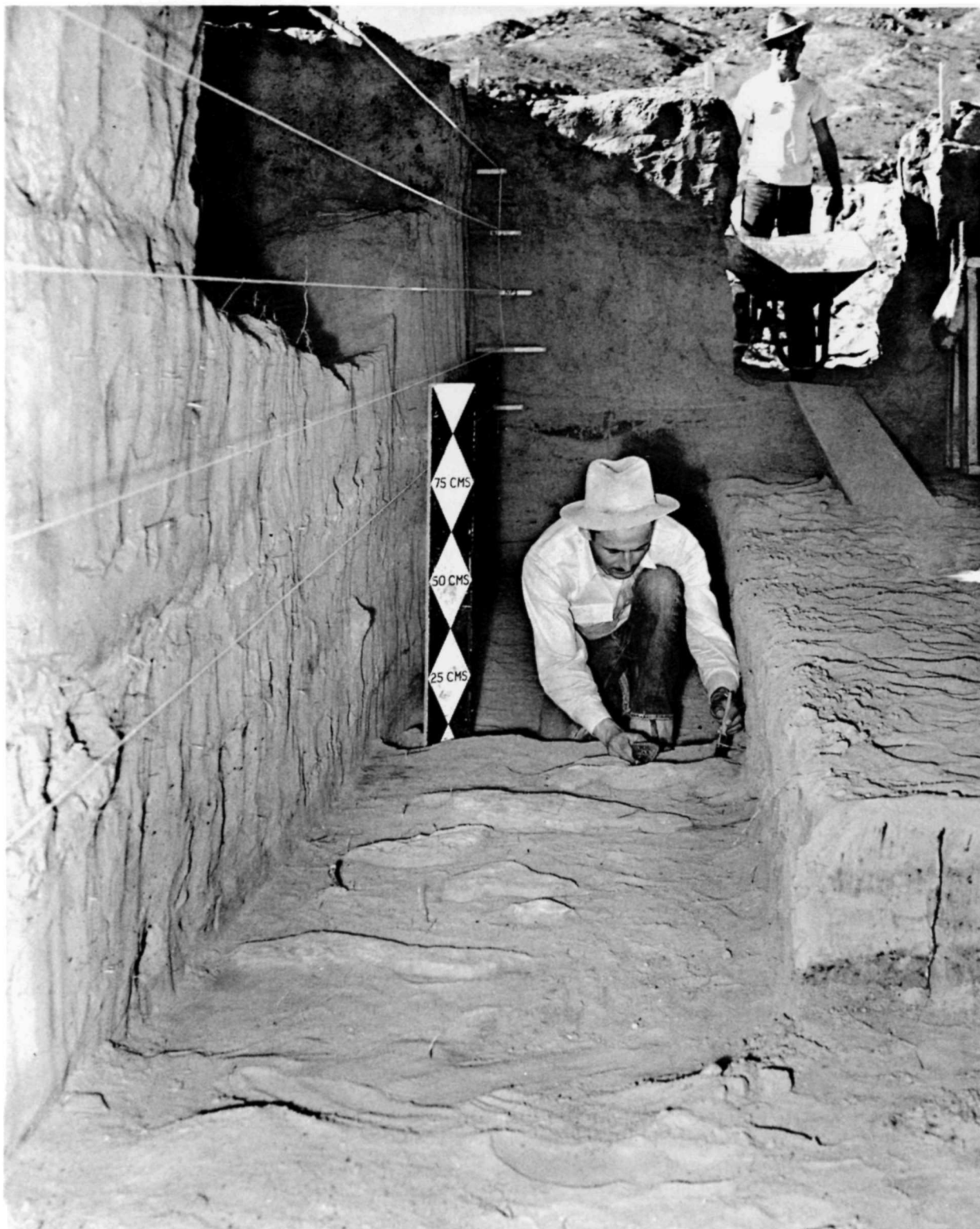


Fig. 9. Wash cut in layer D, which separates ceramic and preceramic levels, trench V

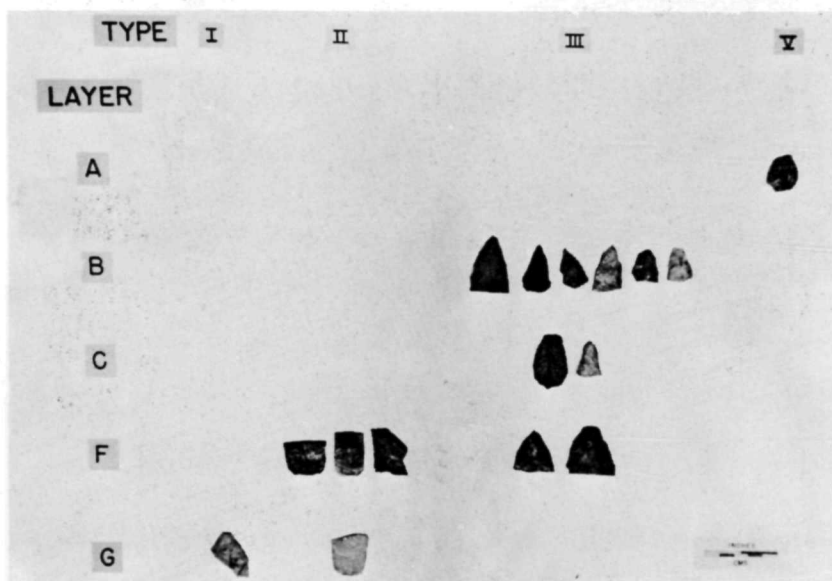


Fig. 10. Knives, trench V, layers A through G

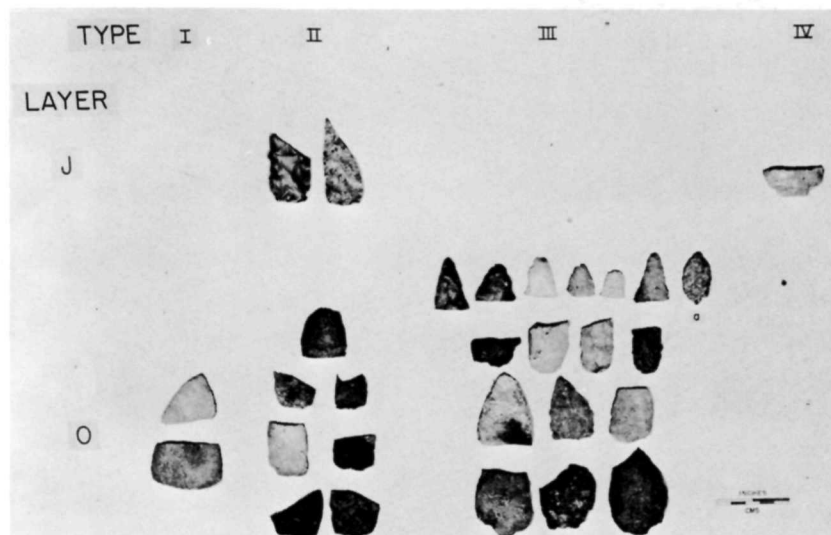


Fig. 11. Knives, trench V, layers J and O

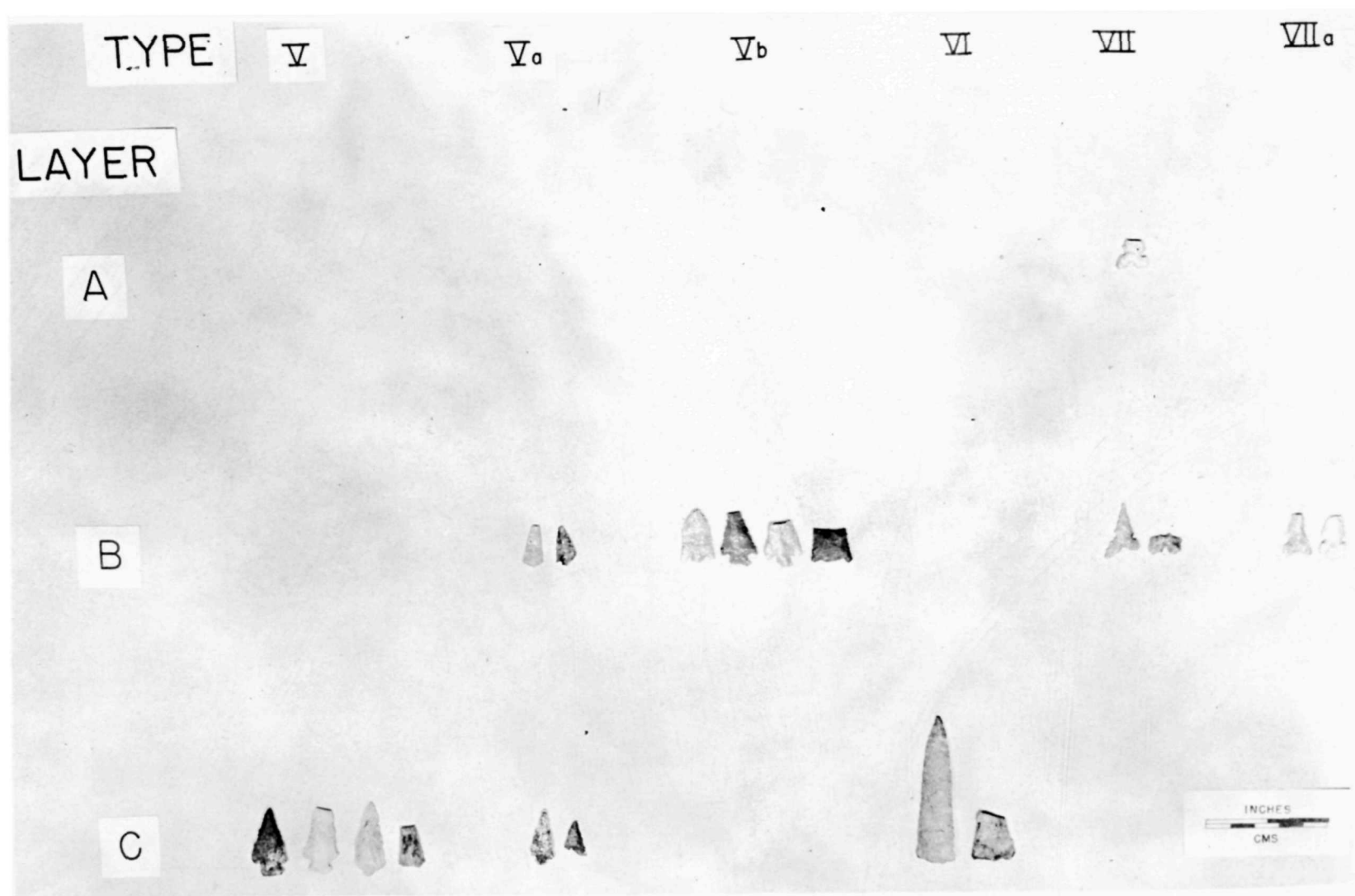


Fig. 12. Points and blades from layers A, B, and C, trench V

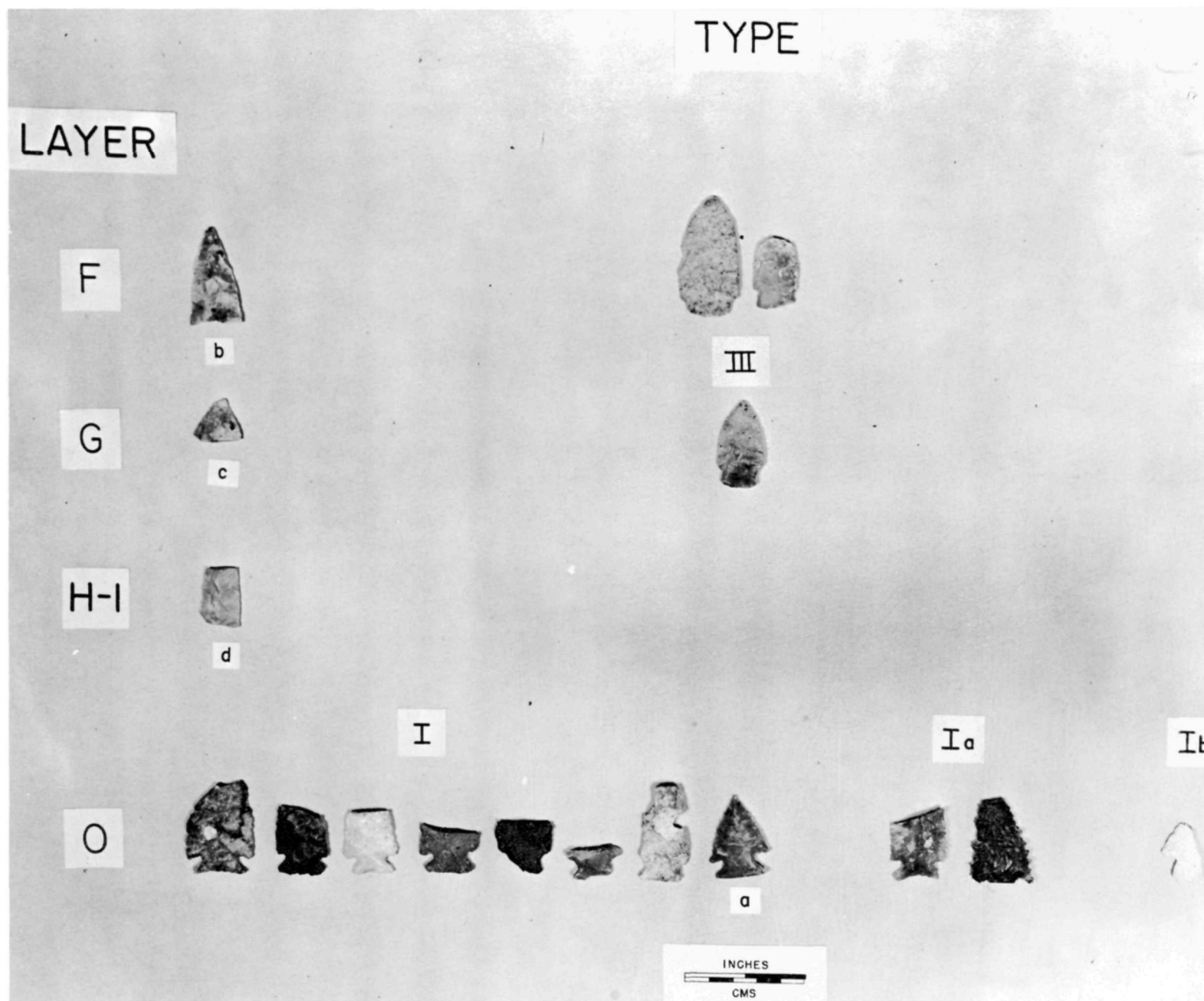


Fig. 13. Points and blades from layers F through O, trench V
(a, reworked specimen; b-d, fragments)

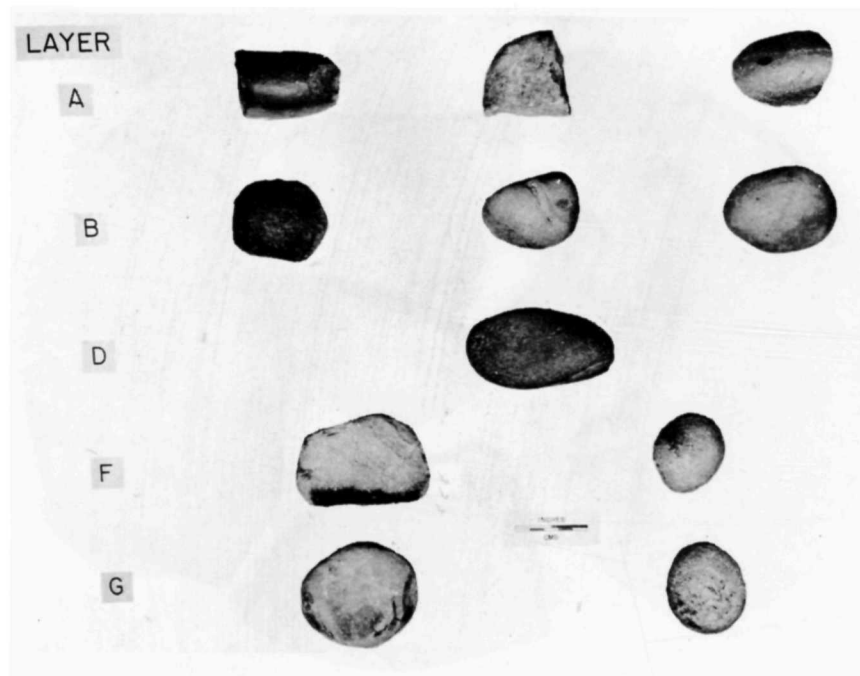


Fig. 14. Hammerstones from layers A through G, trench V

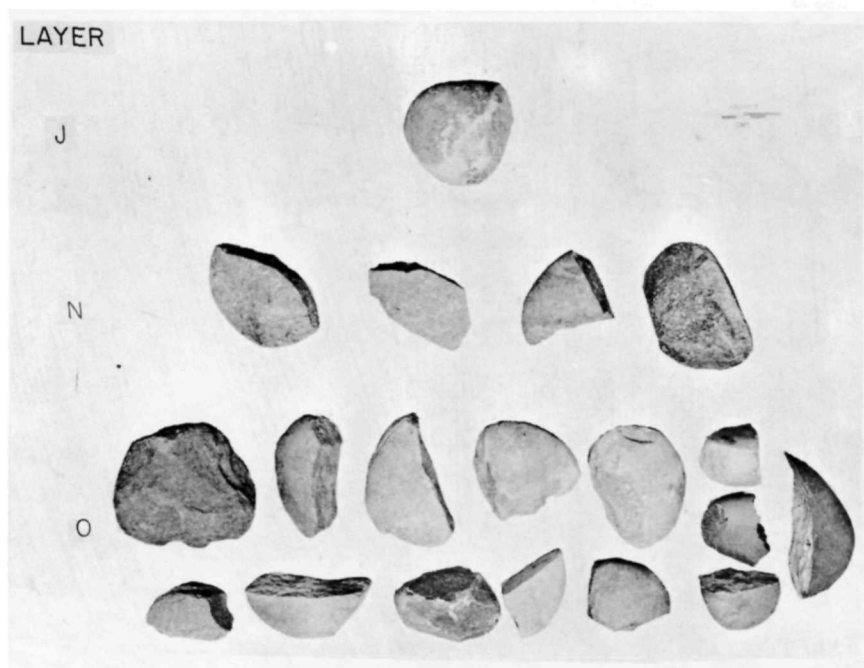


Fig. 15. Hammerstones from layers J through O, trench V

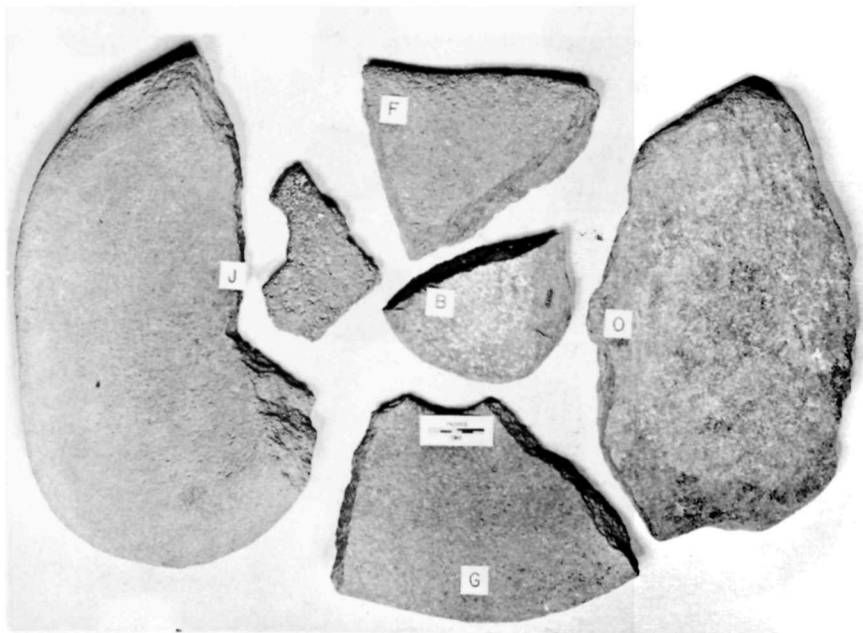


Fig. 16. Metates, trench V

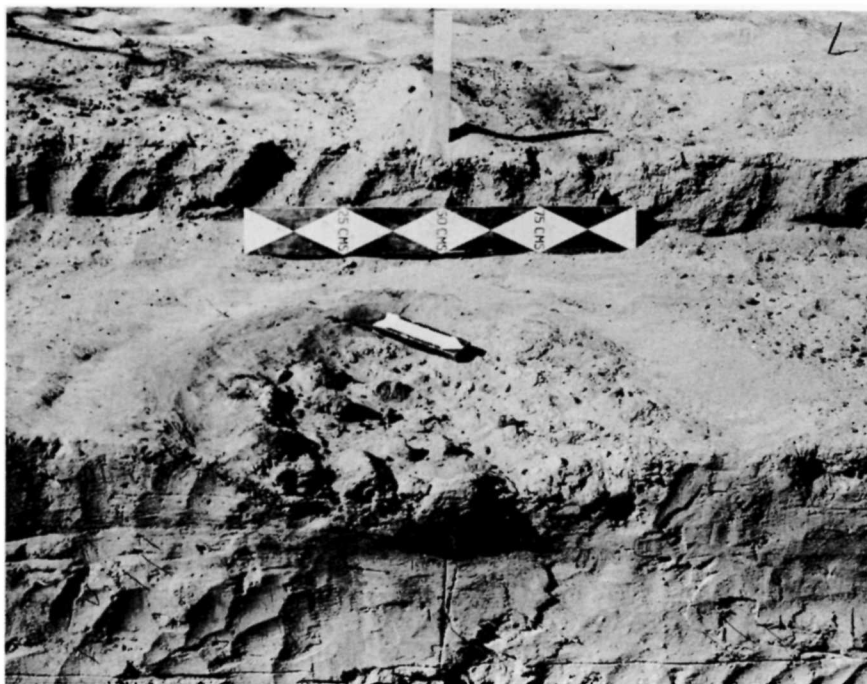


Fig. 17. Cooking pit in layer B, trench V

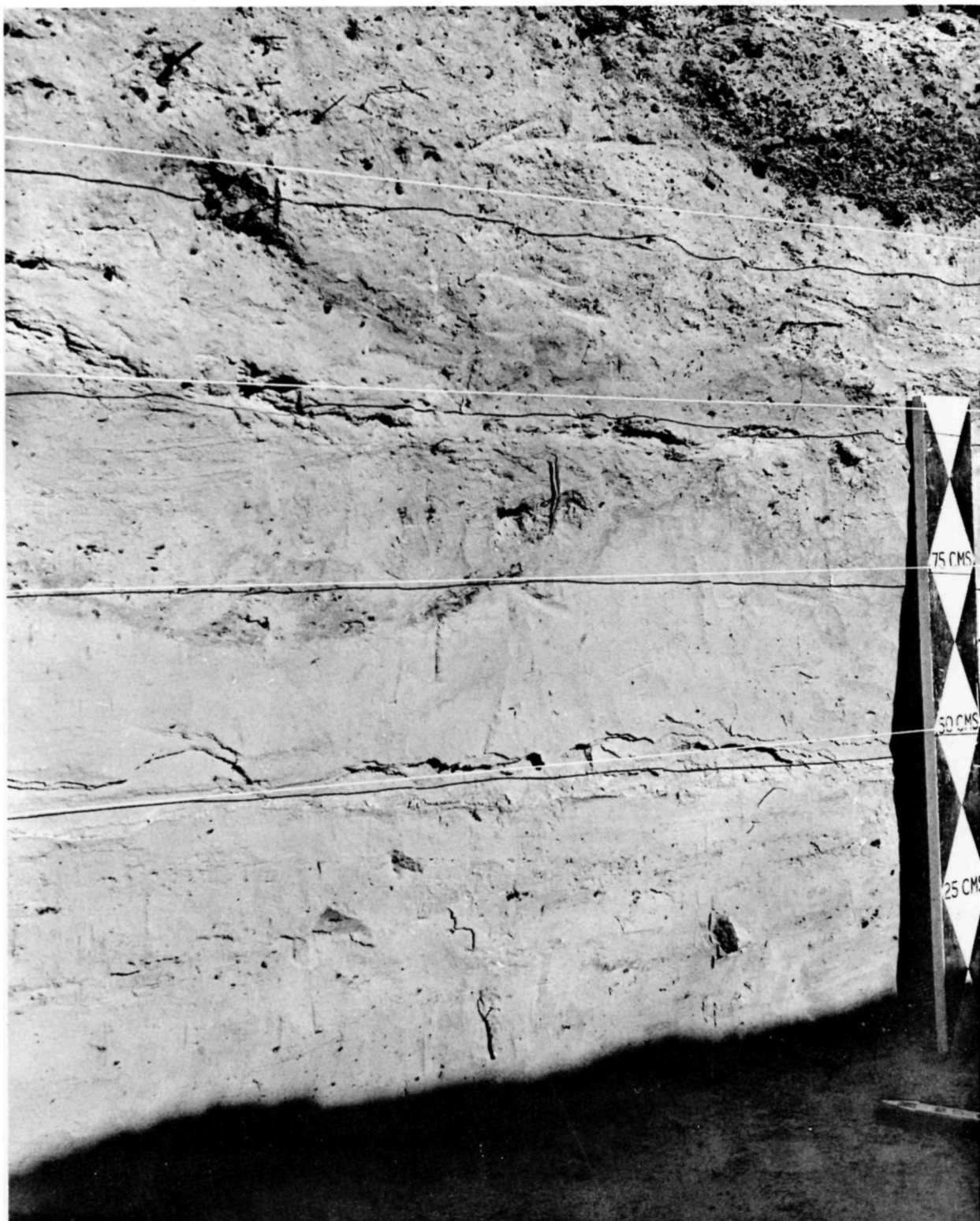


Fig. 18. Cooking and roasting pits in line
5 profile, trench V

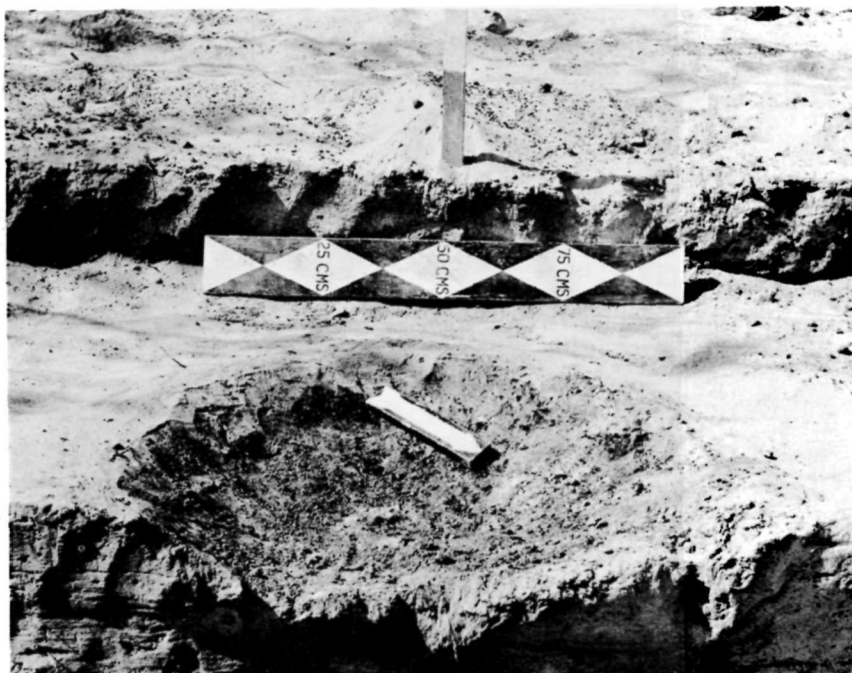


Fig. 19. Cooking pit in layer B after removal of contents, trench V

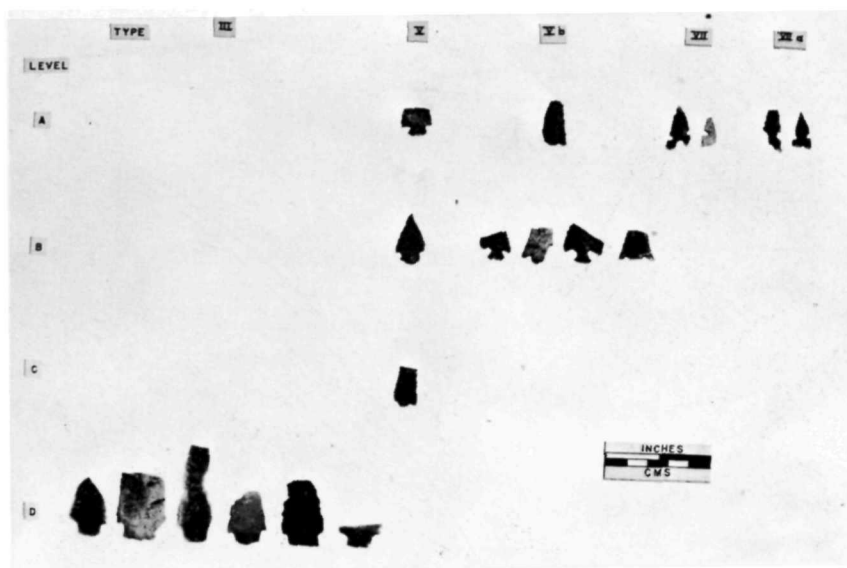


Fig. 20. Points from upper levels, 1936 Willow Beach excavations. A-surface; B-5"-11"; C-2'4"; D-5'-5'9"

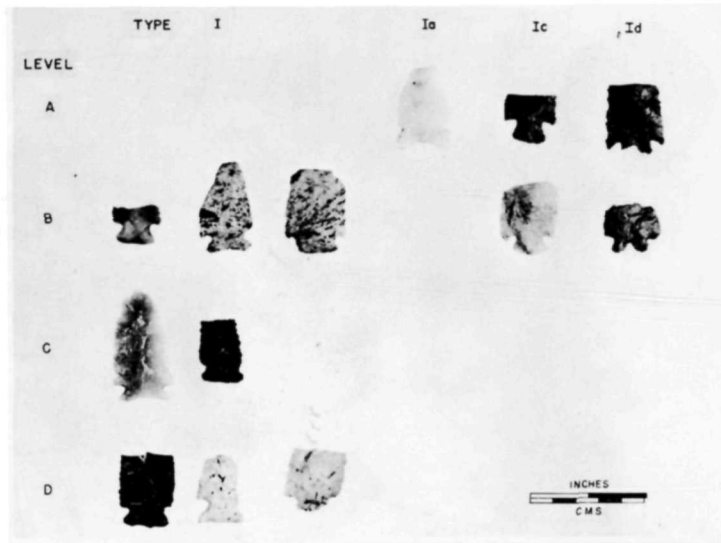


Fig. 21. Early type points from various levels, 1936 Willow Beach excavations. A-surface; B-2'4"; C-5'10"-6'9"; D-7'-8'6"

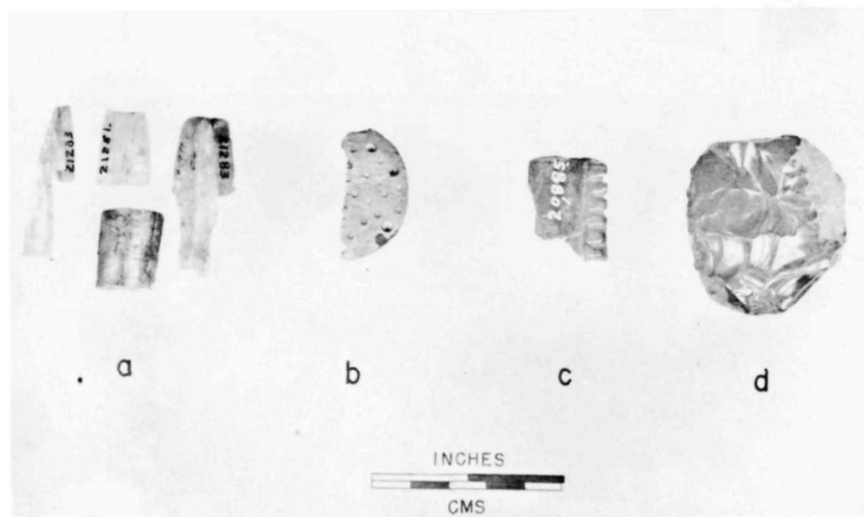


Fig. 22. Material from burned hut, 1936 Willow Beach excavations. a, calcite cylinder; b, tortoise shell rattle (?); c, notched bone; d, obsidian scraper

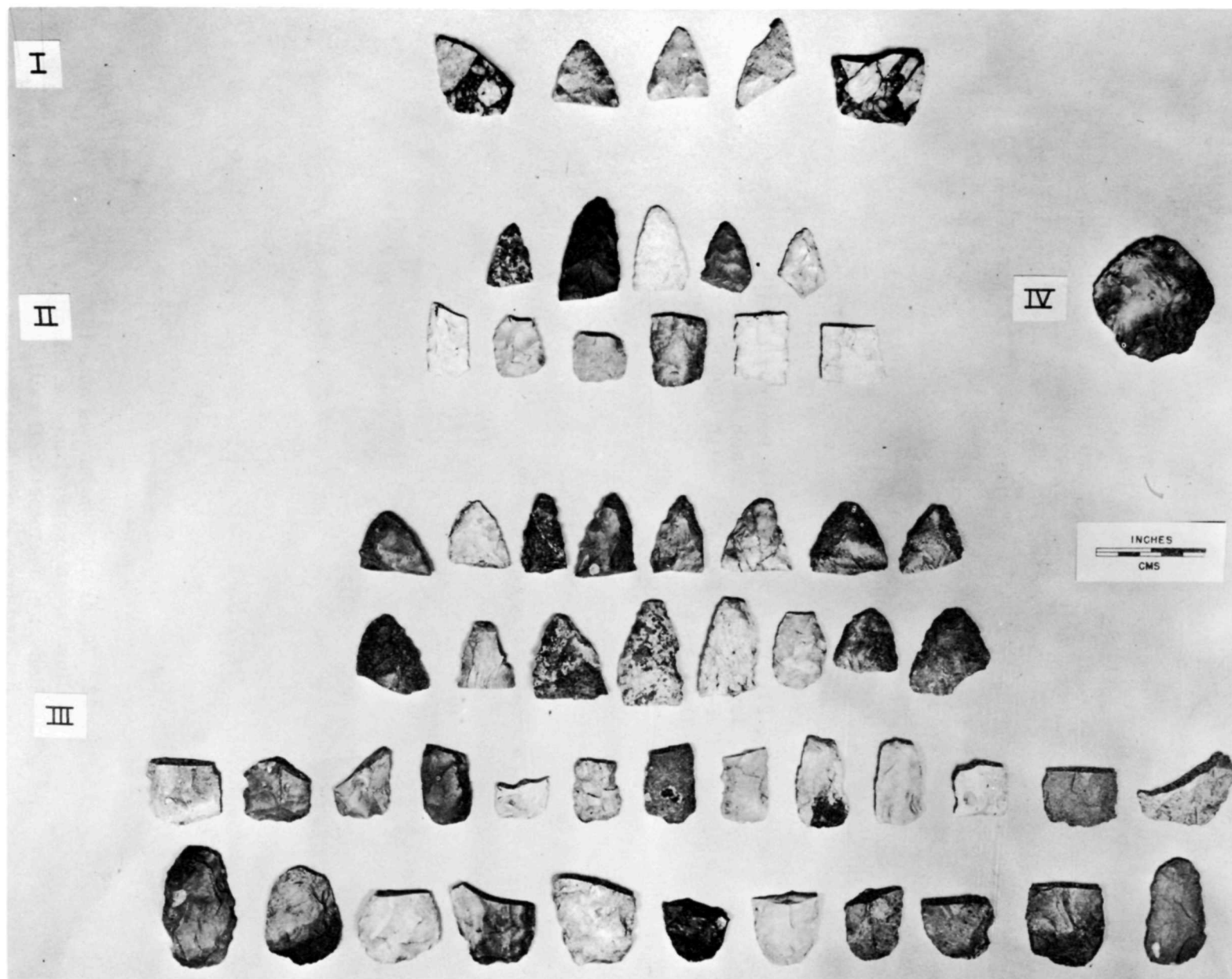


Fig. 23. Knives from surface of Shivwits Plateau, types I-IV

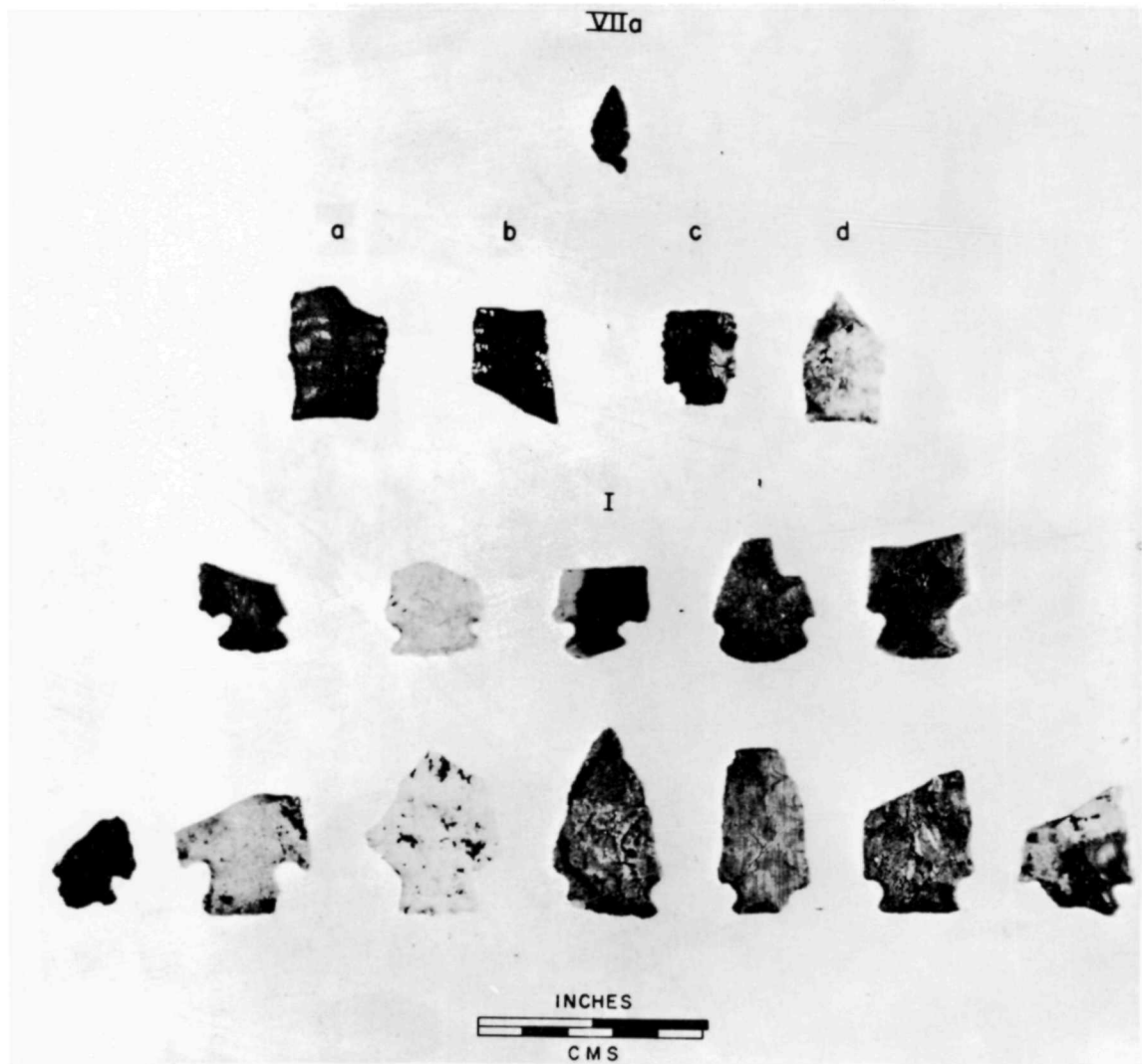


Fig. 24. Point types from surface of Shivwits Plateau

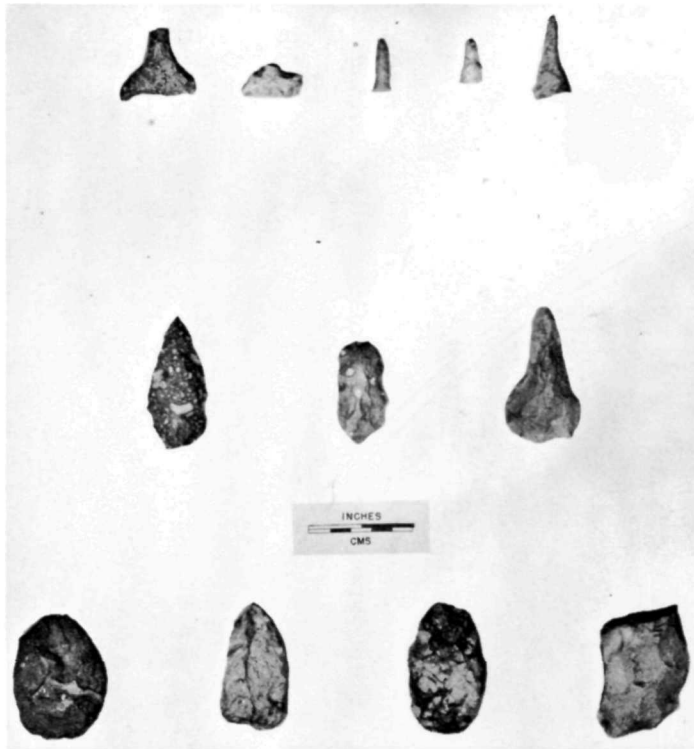


Fig. 25. Drills and blanks from surface,
Shivwits Plateau

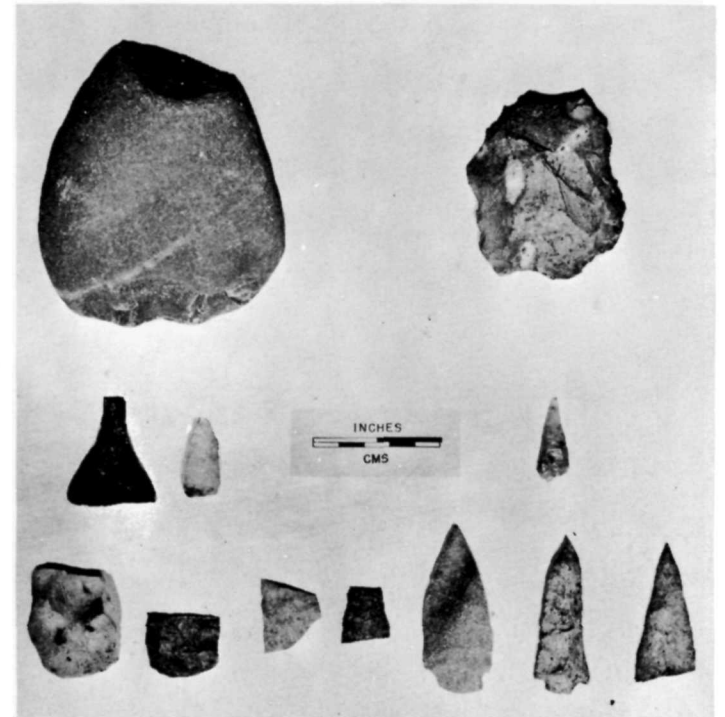


Fig. 26. Material from pit house 107,
Virgin River

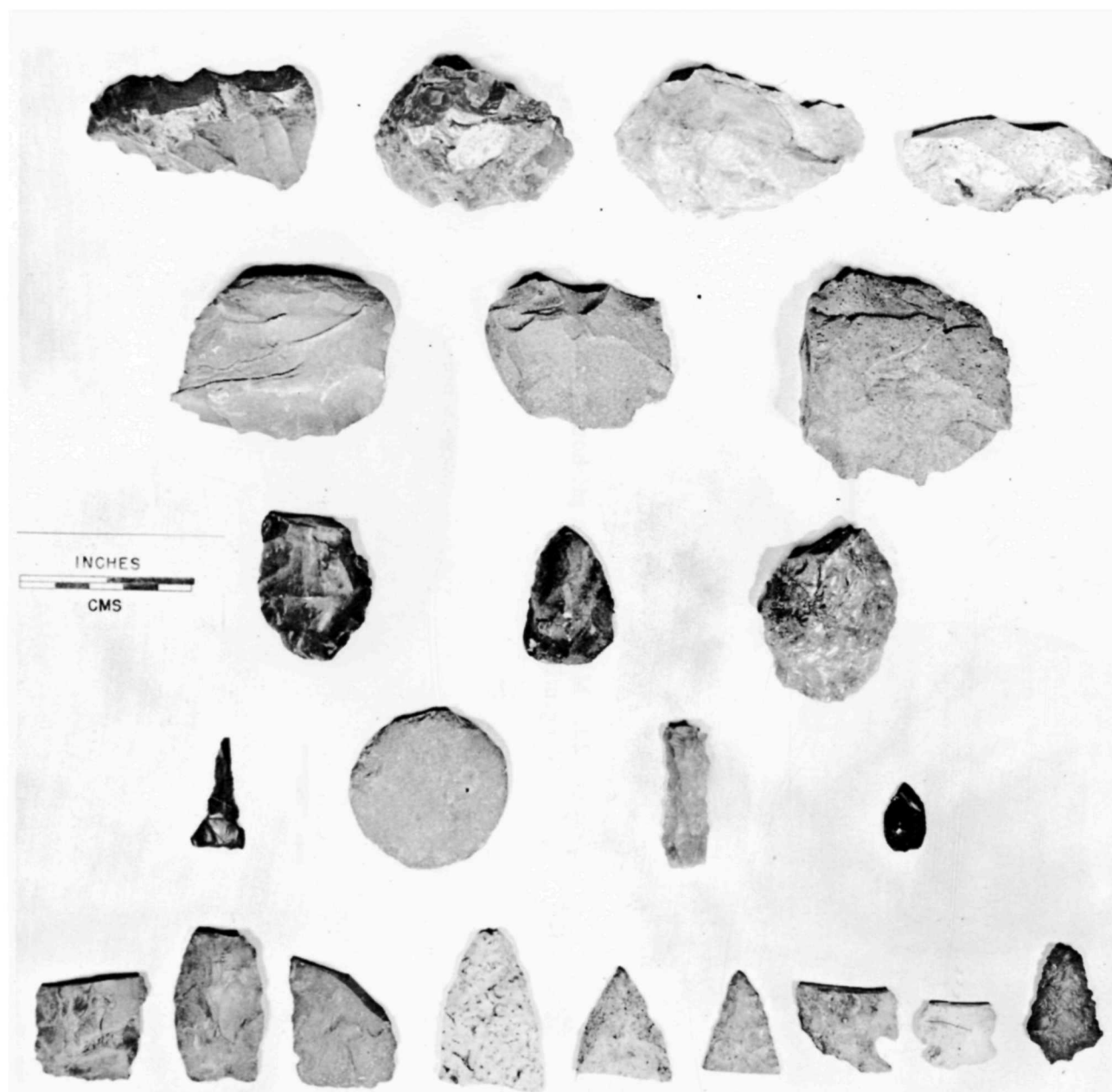


Fig. 27. Material from pit house 108, Virgin River

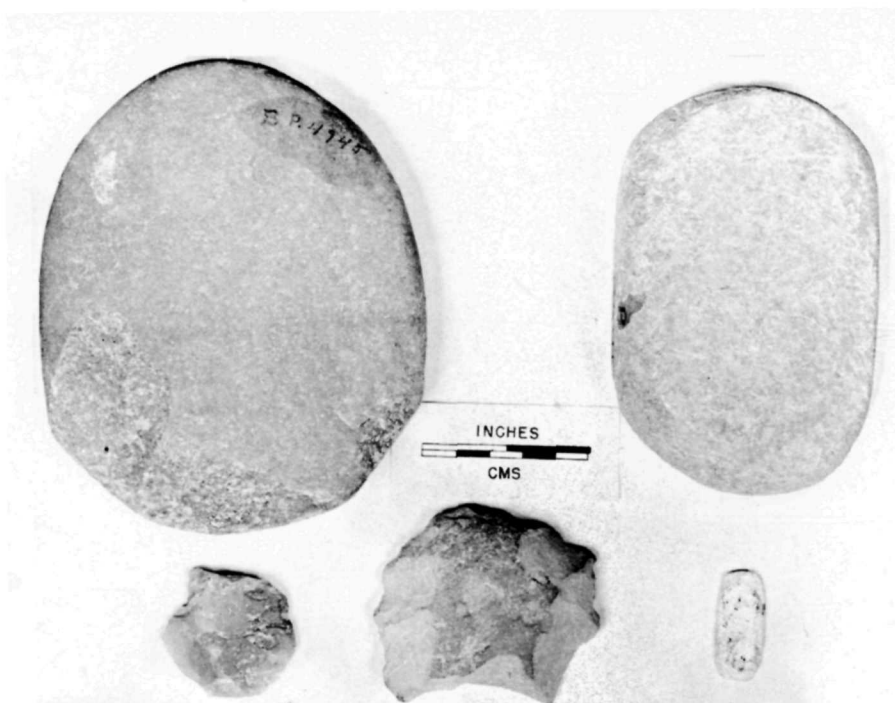


Fig. 28. Material from pit house 109,
Virgin River

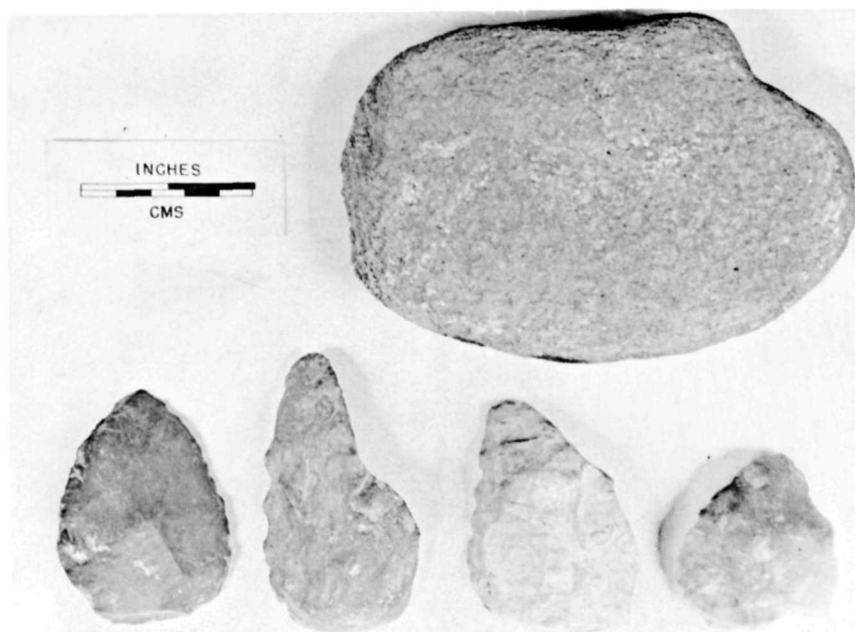


Fig. 29. Material from pit house 110,
Virgin River



Fig. 30. Metate and mortar from pit house 109

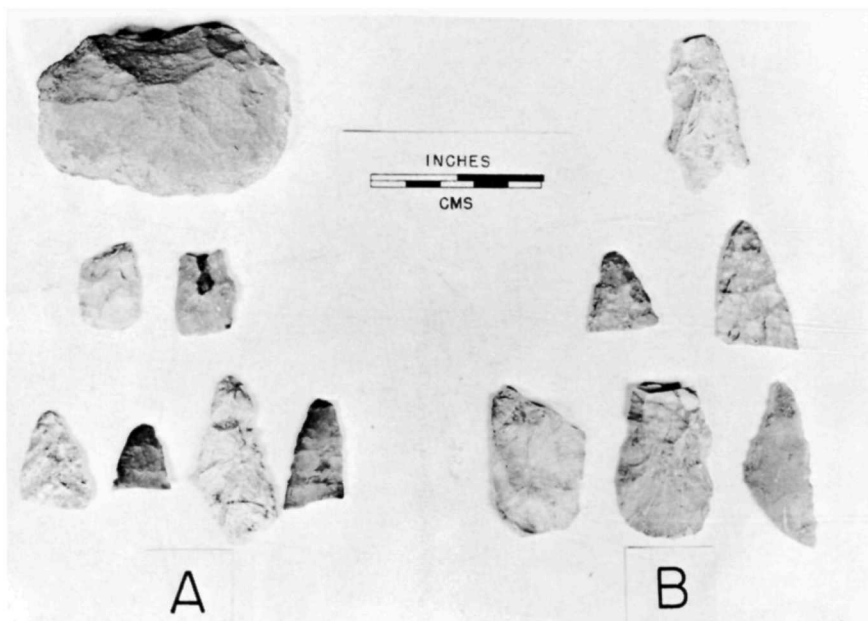


Fig. 31. Material from Gods Pocket Spring. A-from room, B-from campsite

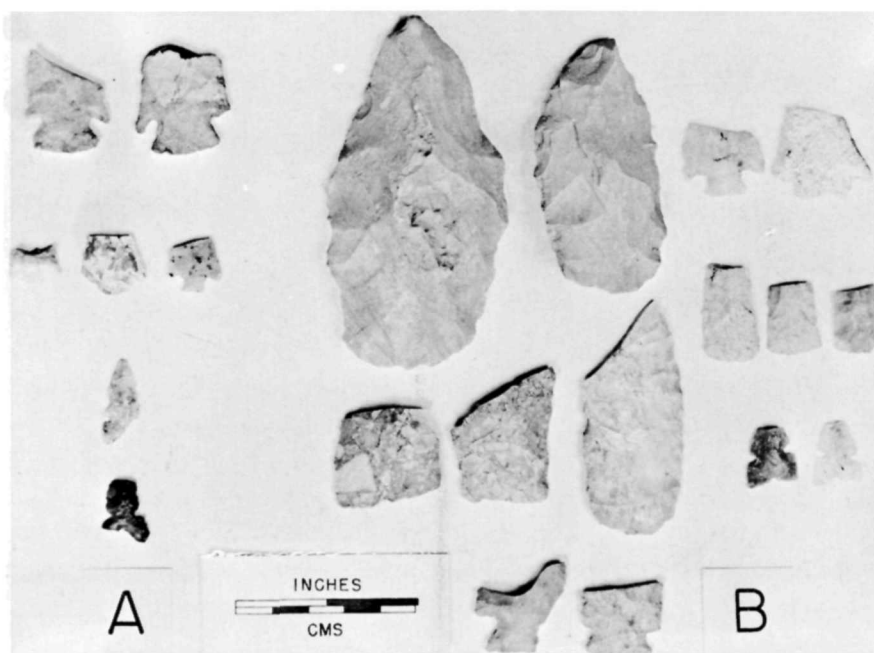


Fig. 32. Material from Gods Pocket Spring. A-from camp surface, B-position unknown

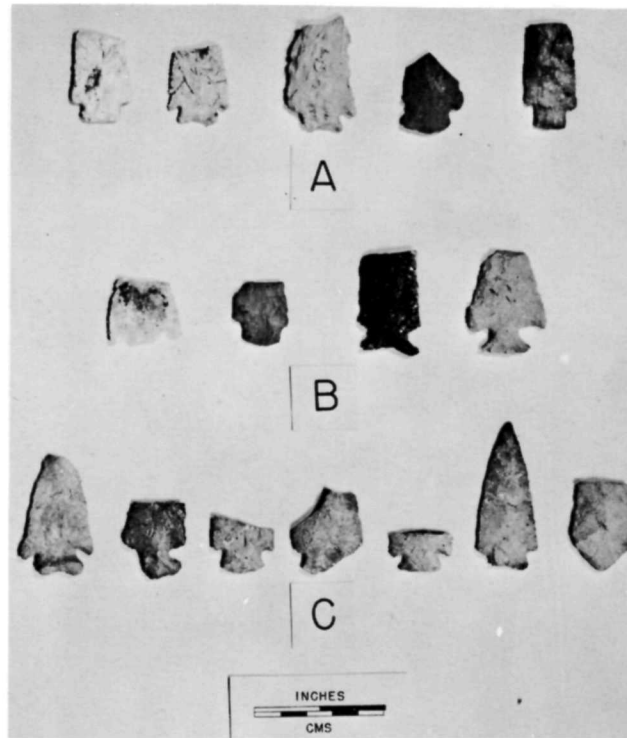


Fig. 33. Preceramic points from A-Hell Diver Rapids-Cave 2, B-Emery Cave, C- and Lost City

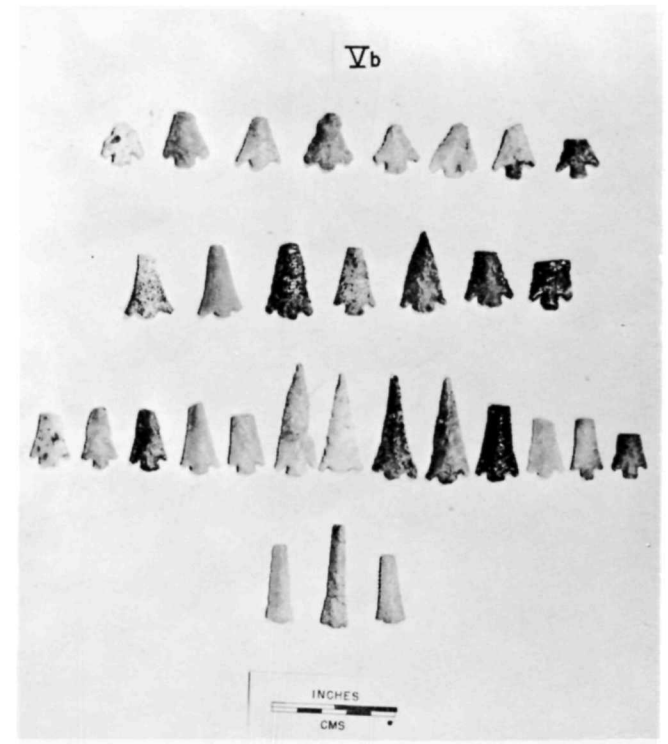


Fig. 34. Pueblo II type points from Lost City

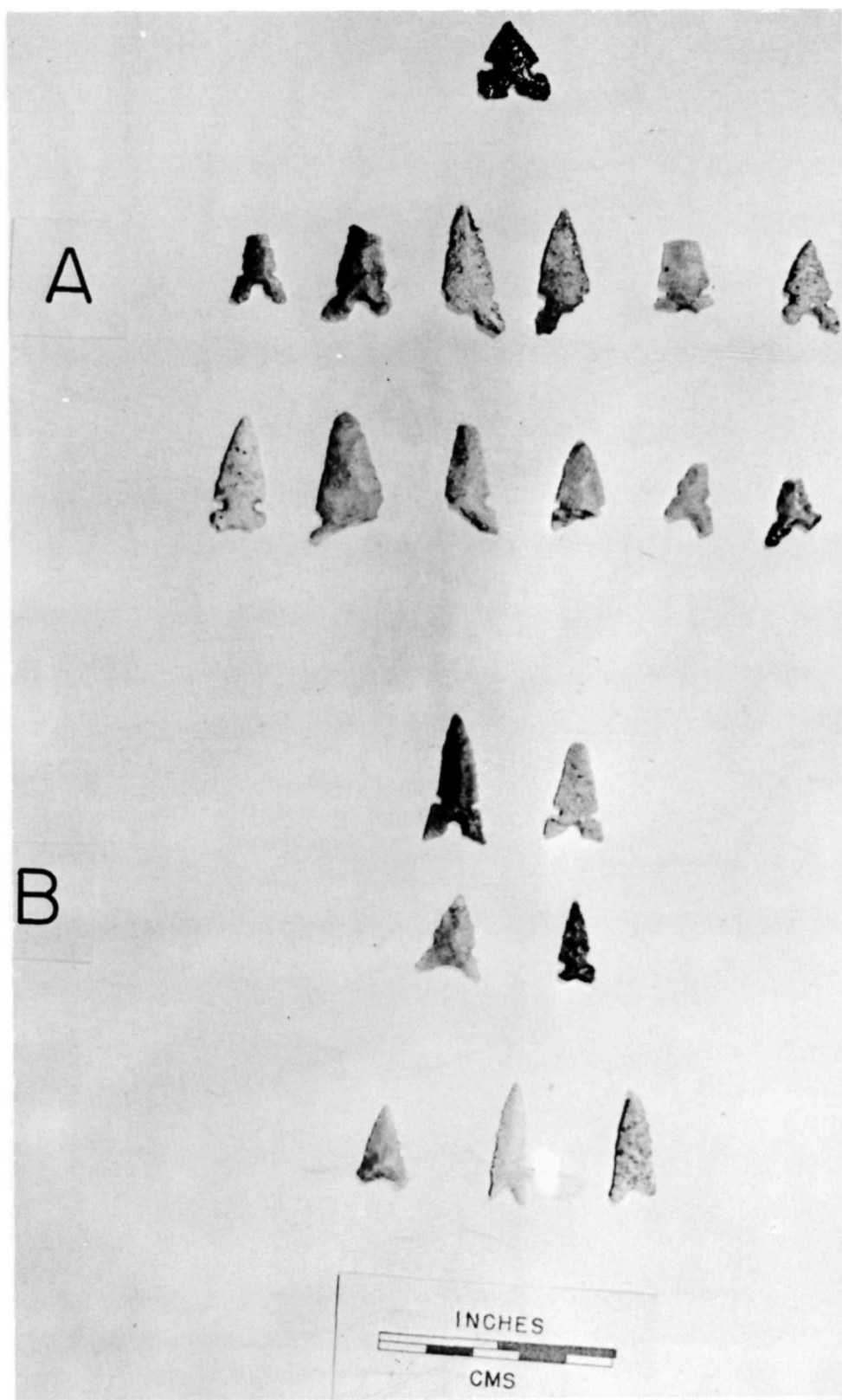


Fig. 35. Paiute type points from Lost City,
A-surface or near Lost City houses,
B-from "camp sites"

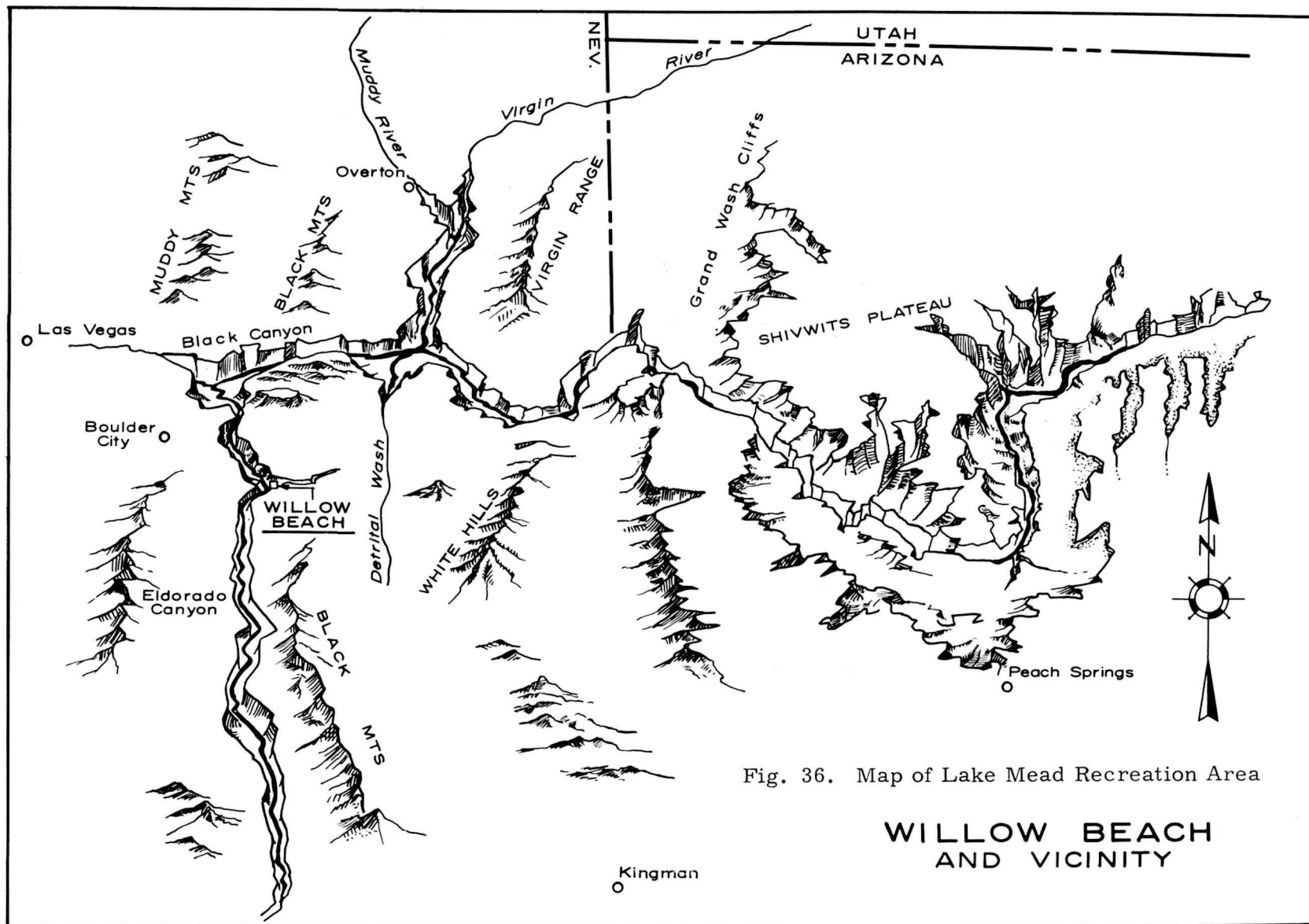


Fig. 36. Map of Lake Mead Recreation Area

**WILLOW BEACH
AND VICINITY**

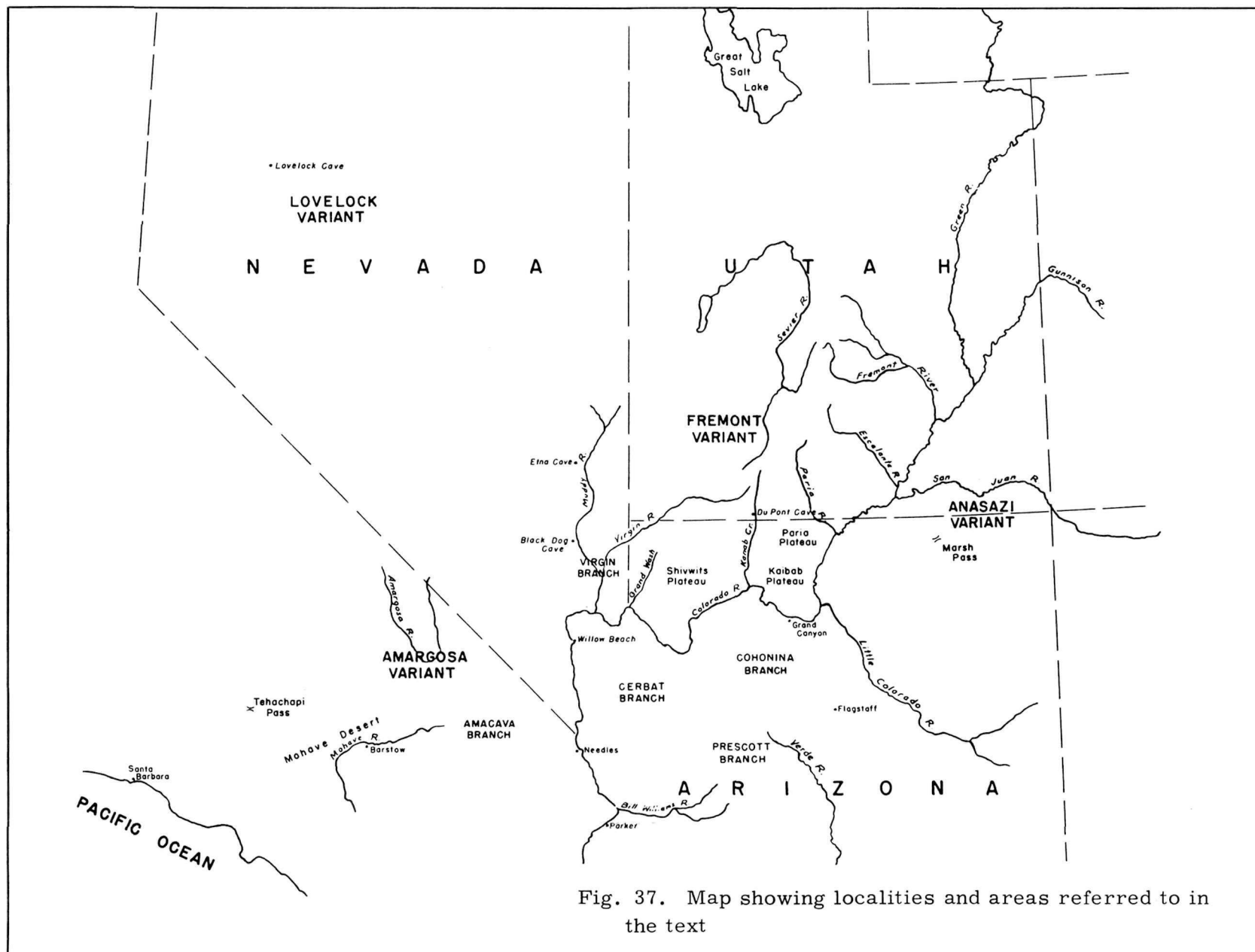


Fig. 37. Map showing localities and areas referred to in the text

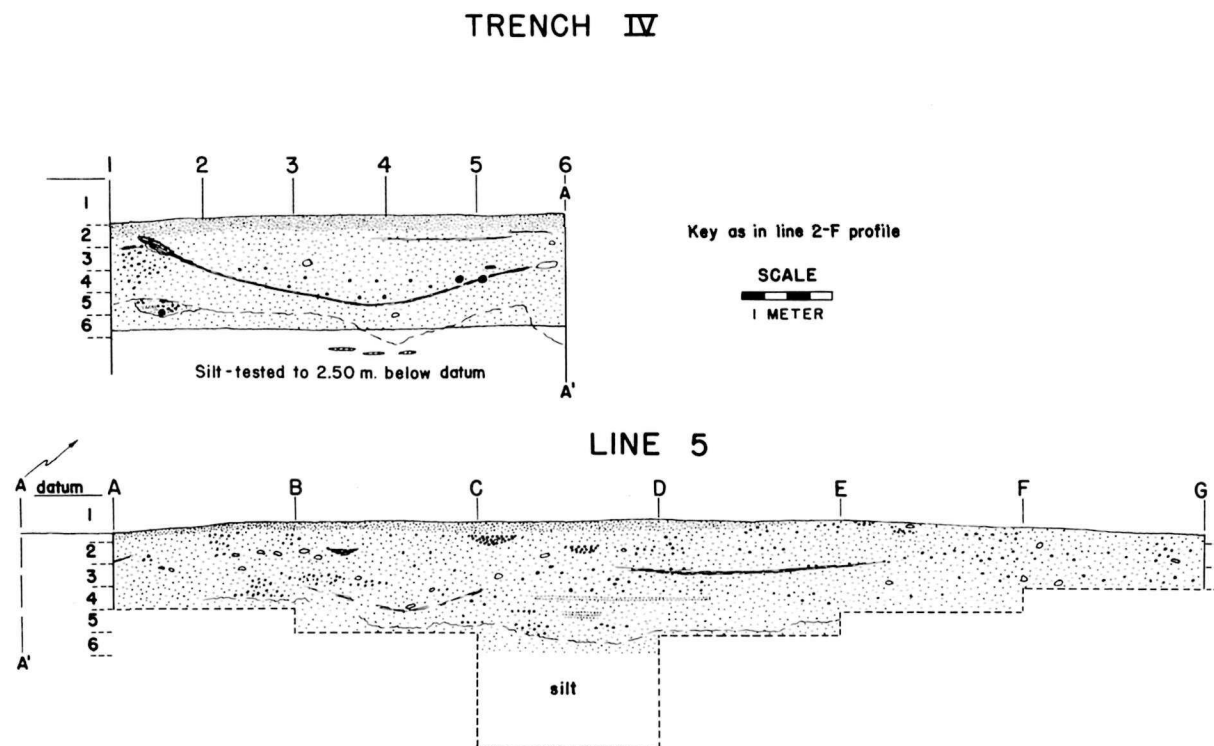


Fig. 38. Profile, trench IV

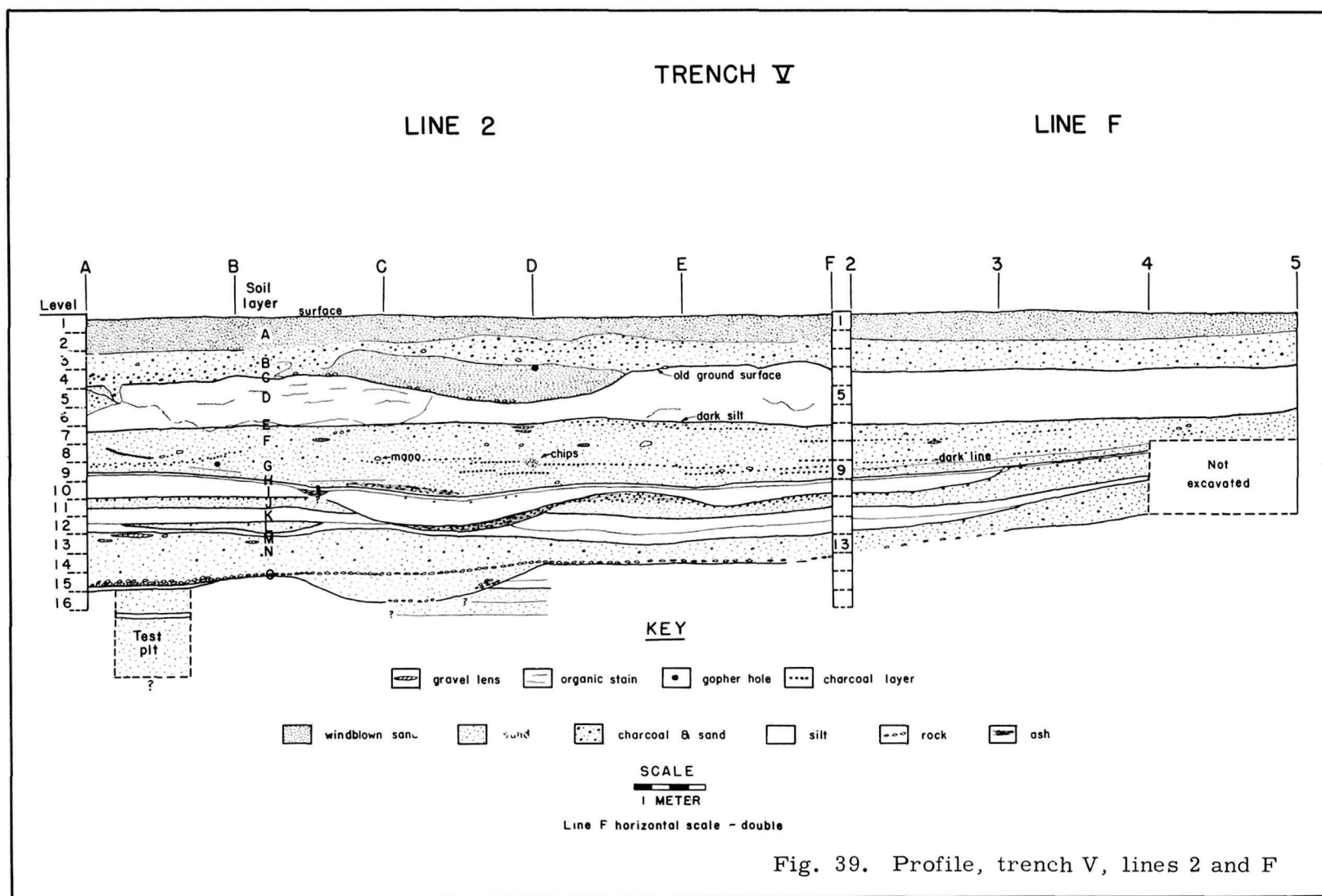
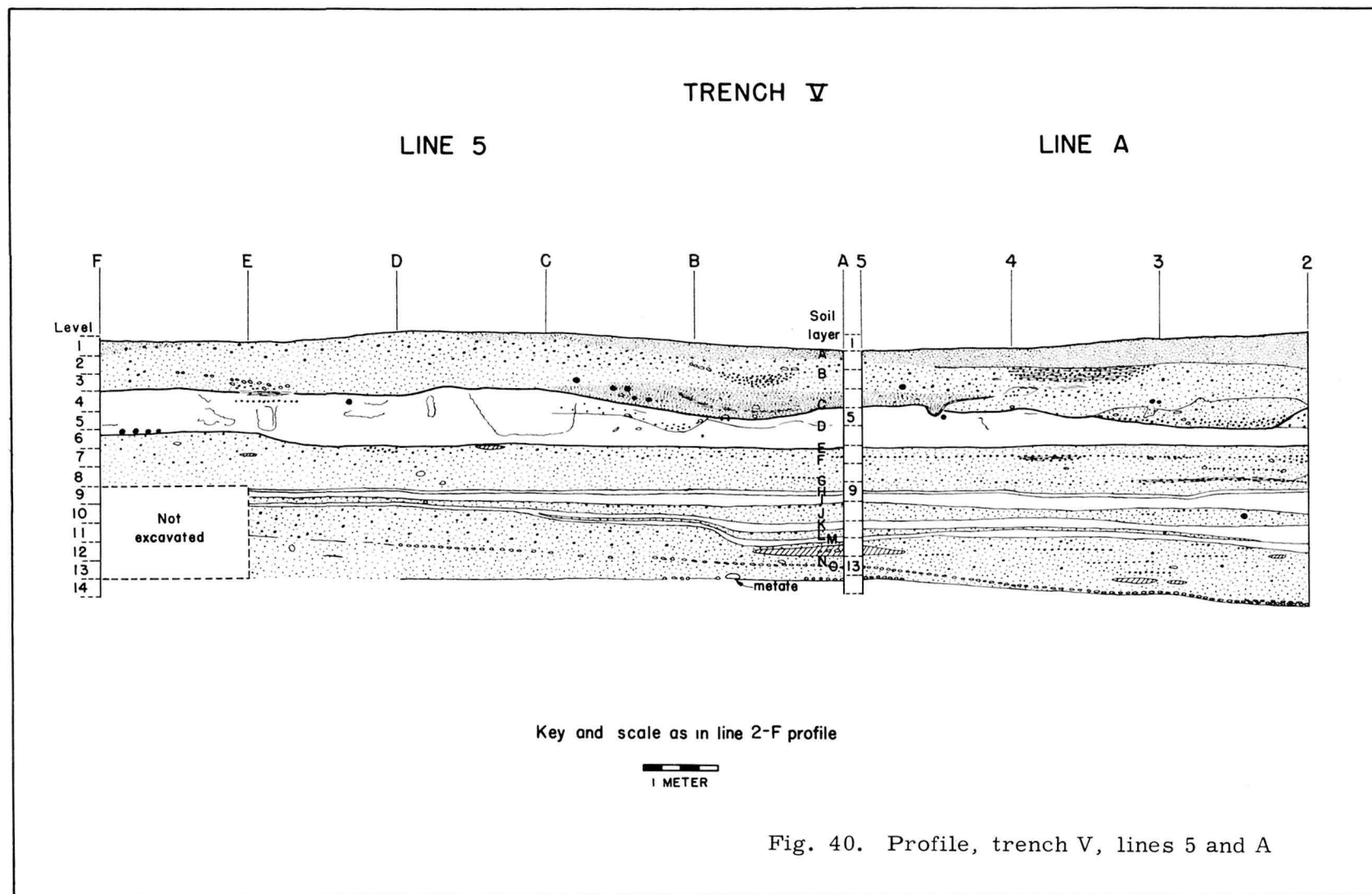


Fig. 39. Profile, trench V, lines 2 and F



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