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A San Dieguito Component at Buena Vista Lake, California

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IN 1933-34, the Smithsonian Institution supervised extensive archaeological investigations on the southern shore of Buena Vista Lake, located on the west side of the southern San Joaquin Valley near the town of Taft, Kern County, California. A large crew of Smithsonian-directed workers excavated two shell middens situated on the shoreline and two cemeteries located in the low hills above the shore. Additional tests were made at numerous locations in the hills in search of burial areas. An excellent account of the Smithsonian activities was prepared by Dr. Waldo R. Wedel (1941) and issued as *Bulletin* 130 of the Bureau of American Ethnology series. Wedel described two phases of a pre-European late occupation and a sparsely represented early complex.

The early complex described by Wedel (1941) was clearly discontinuous with the later cultural phases. The most distinctive traits for the early complex were handstones (manos) and extended burials, both traits rare or absent in the two later phases. The early complex completely lacked asphaltum, steatite, obsidian, and baked clay, all of which occurred in the later phases. Wedel discussed the possible relationship of the early Buena Vista complex with the Windmiller complex of the Sacramento Valley and with the Oak Grove culture of the Santa Barbara coast and concluded that most specifically the early Buena Vista assemblage resembled the Oak Grove culture.

Various age estimates of the early Buena Vista complex have been made subsequent to Wedel's report. Meighan (1959) suggested a date of 2000 to 4000 years before the present, while Heizer (1964) proposed the period 4000 to 7000 years B.P. and suggested some broad relationships for the complex which had been anticipated by Wallace (1954). Wallace had suggested that the early Buena Vista complex was a part of the early Millingstone culture now well documented in southern California. Baumhoff and Olmsted (1963, 1964; Baumhoff 1957), utilizing archaeological data, radiocarbon dates, and glottochronological evidence, further proposed that the Buena Vista complex, the Windmiller complex, and other early archaeological cultures of northern California represented a population of Hokan speakers and that in central California they were replaced about 4000 years ago by Penutian speakers represented by what is known in central California as the Middle Horizon culture. Gerow (1974; Gerow with Force 1968) rejected the notion of early cultural uniformity between northern and southern California, questioned the proposed linkage of Hokan speakers with the Windmiller complex, and stated that data were insufficient to allow the early component at Buena Vista Lake to be used as a link between northern and southern California.

During the summers of 1964 and 1965, due to the imminent destruction of archaeological sites located along the Buena Vista Lake shoreline as a result of the construction of the California Aqueduct, investigations were conducted by the State of California, Department of Parks and Recreation, under the administrative leadership of F.A. Riddell. Funds were provided by the Department of Water Resources as part of the State of California's program of service archaeology. The senior author directed the 1964 field operations at Buena Vista Lake and advised during the 1965 field season. The junior author was co-director with John Waller of the 1965 field operations.

The 1964 investigations were initiated to obtain additional information concerning the early complex discovered by Smithsonian workers. Unexpectedly, the 1964 study disclosed a cultural deposit that appeared to be significantly earlier than this complex (Fredrickson 1964, 1965). The 1965 investigations focused on the earlier cultural component, which was contained within a buried soil stratum at a depth of approximately 350 to 400 cm. below the surface.

The antiquity of the buried cultural component was confirmed by three radiocarbon dates obtained from freshwater clam shell (*Anodonta nuttalliana*) found in association with artifacts and other cultural debris. These dates were:

(1) 7,600 ± 200 radiocarbon years, 5650 B.C. (I-1928),

(2) 8,200 ± 400 radiocarbon years, 6250 B.C. (LJ-1356),

(3) 8,200 ± 400 radiocarbon years, 6250 B.C. (LJ-1357).

This paper reports the results of the archaeological investigations of the deeply buried cultural stratum at Buena Vista Lake. It is suggested that materials recovered from the component represented a local variant of the San Dieguito complex of southern California (Warren 1967; Warren and True 1961).

THE SITE

The 1964 and 1965 field investigations were conducted at archaeological site CA-Ker-116, actually the northwestern end of an extensive occupation zone situated along the southern shoreline of the now-drained Buena Vista Lake at the base of the Buena Vista Hills. This occupation zone was about 70 m. wide and extended in an approximate northwest-southeast line for a distance of about 4 km. along the lakeshore at the foot of the hills (Fig. 1). Ca-Ker-116 was located at the extreme western end of the occupation zone at the point where the shoreline turned northward away from the base of the hills to become bordered by the Buena Vista Valley rather than by the Buena Vista Hills.

It should be noted that the two shoreline sites excavated by the Smithsonian were only two areas of heavy midden concentration in an occupation zone that stretched with only minor interruptions along the base of the hills fronting the south side of the lake. Every point where water run-off from the hills entered the lake was accompanied by some concentration of midden, and while the midden was shallow and tended to feather out between the run-off areas, it never completely disappeared. The Smithsonian excavations were undoubtedly carried out on the two largest and most important concentrations of surface midden along the base of the hills. One of the two Smithsonian sites (Wedel's Site 2) was located on a sand spit at the extreme eastern end of the occupation zone. The other (Wedel's Site 1) was situated in the approximate center of the zone. Site CA-Ker-116 was located at the extreme western end of the occupation zone.

The boundaries of the area designated CA-Ker-116 were arbitrarily established on the

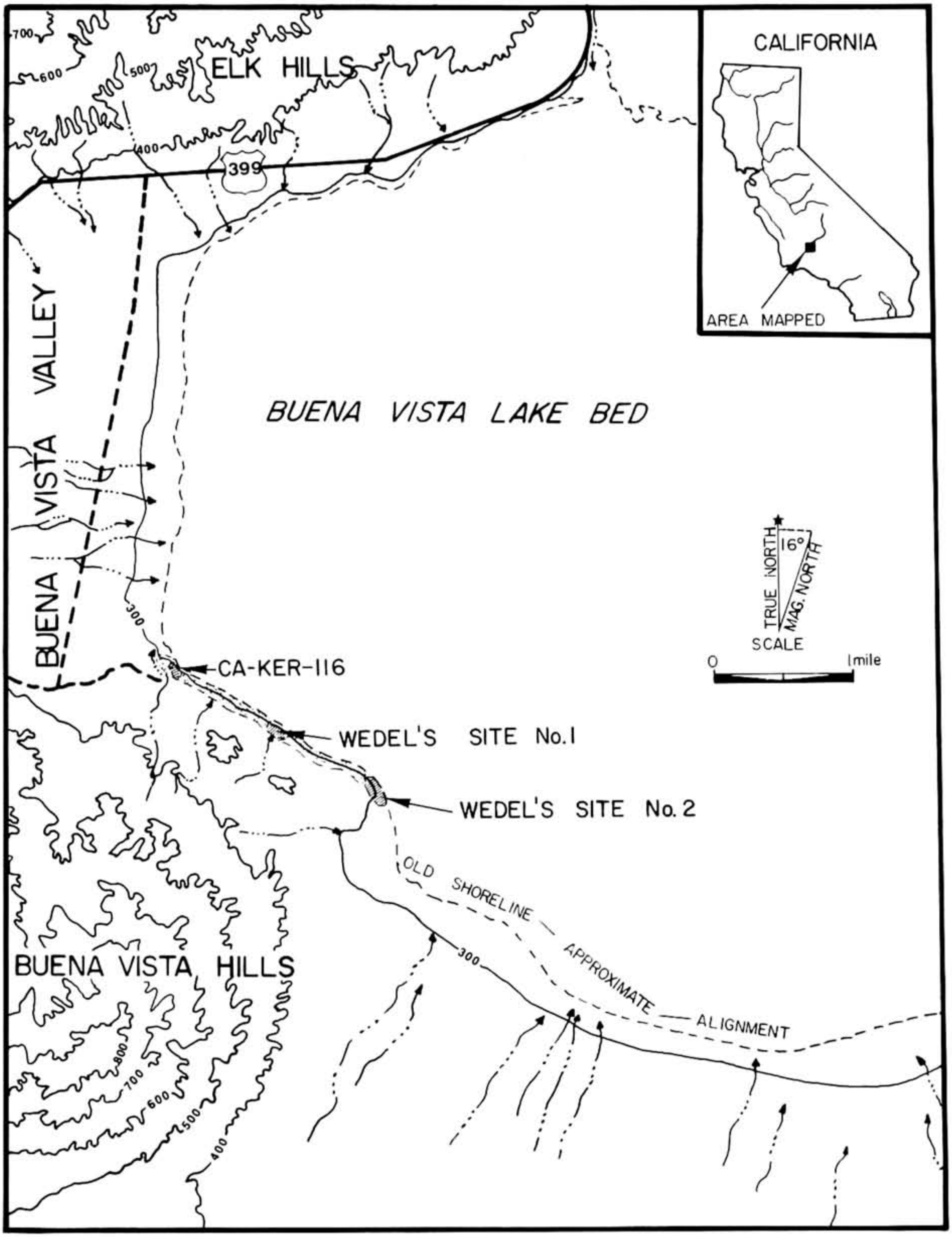

Fig. 1. Map of the southwest portion of the Buena Vista Lake Basin.

basis of recent cultural features. A dirt road and an irrigation canal, which bordered the northern side of the entire occupation zone, were considered to mark the northern limit of the site. A second dirt road, which ran from a bridge that crossed the canal, cut at right angles through the site to form the western limit. The road then turned eastward to form the southern limit. The eastern boundary was established at a large, abandoned oil "sump," located in the occupation zone proper (Fig. 2). Evidence of occupation extended in all directions beyond these limits, although the concentration of cultural debris decreased rapidly.

Site CA-Ker-116 was situated at 35° 10′55″ North Latitude and 119°21′20″ West Longitude. Site datum was at point 614,809 N and 1,595,651 E on the California Coordinate System, Zone V.

THE ENVIRONMENT

Prior to being given over to intensive agriculture, the Buena Vista Basin consisted of a sagebrush desert at the southern end of the San Joaquin Valley. Annual rainfall averages less than six inches. Buena Vista Lake and the adjacent Kern Lake formerly received all of the water from the perennial Kern River, which flowed westward from the Sierra Nevada. While Buena Vista Lake has recently been drained and put under cultivation, it is extremely unlikely that the lake ever dried up completely in the aboriginal period, although the level of the lake was subject to considerable fluctuation annually. Wedel (1941:3-11) summarized the geographical background of the southern San Joaquin Valley with special reference to Buena Vista Lake.

The geological history of the southern San Joaquin Valley was summarized by Wahrhaftig and Birman (1965:313) as follows:

> During the Miocene and early Pliocene an archipelago lay between the San Joaquin Valley and the Pacific Ocean, and the main connection with the sea was at the southwest end of the valley . . . In the Late-Pliocene or early Pleistocene times this connection was broken by the rise of the southern Coast Ranges, [and] . . . the sea was excluded . . . Since this event, a total of 4,500 m of continental strata has accumulated in the south end of the valley. There is generally no break recognizable in surface or subsurface at the Pleistocene boundary.

Wahrhaftig and Birman (1965:315) also reported data concerning rate of alluviation from an area some 100 miles to the north of Buena Vista Lake:

> The present rate of alluviation on the Arroyo Cierro fan, about 20 km south of Panoche Creek on the west side of the San Joaquin Valley . . . is approximately 0.45 m per 1000 years.

Additional comment on soil deposition in the southern San Joaquin Valley appeared in relation to a date of 4,250 ± 200 radiocarbon years, 2300 B.C. (LJ-314), obtained for geologic purposes from charcoal recovered 335 cm. below the surface within the drainage basin of Buena Vista Lake itself, from a location about 7 minutes south and 14 minutes east of CA-Ker-116 (Hubbs et al. 1962:231-32). The date and depth provide a depositional rate of 0.79 m. per 1000 years. W.D. Fuqua, Senior Engineering Geologist for the California Department of Water Resources, commented that the period represented by this date, as indicated by lack of profile development, was probably marked by rapid deposition of soil. Changes in tectonic and probably climatic conditions were believed to have subsequently contributed to a very slow rate of deposition, which allowed some profile development in strata close to the surface. Two profiles identified in the upper 106 cm. were estimated to represent periods of 500 to 1500 years each.

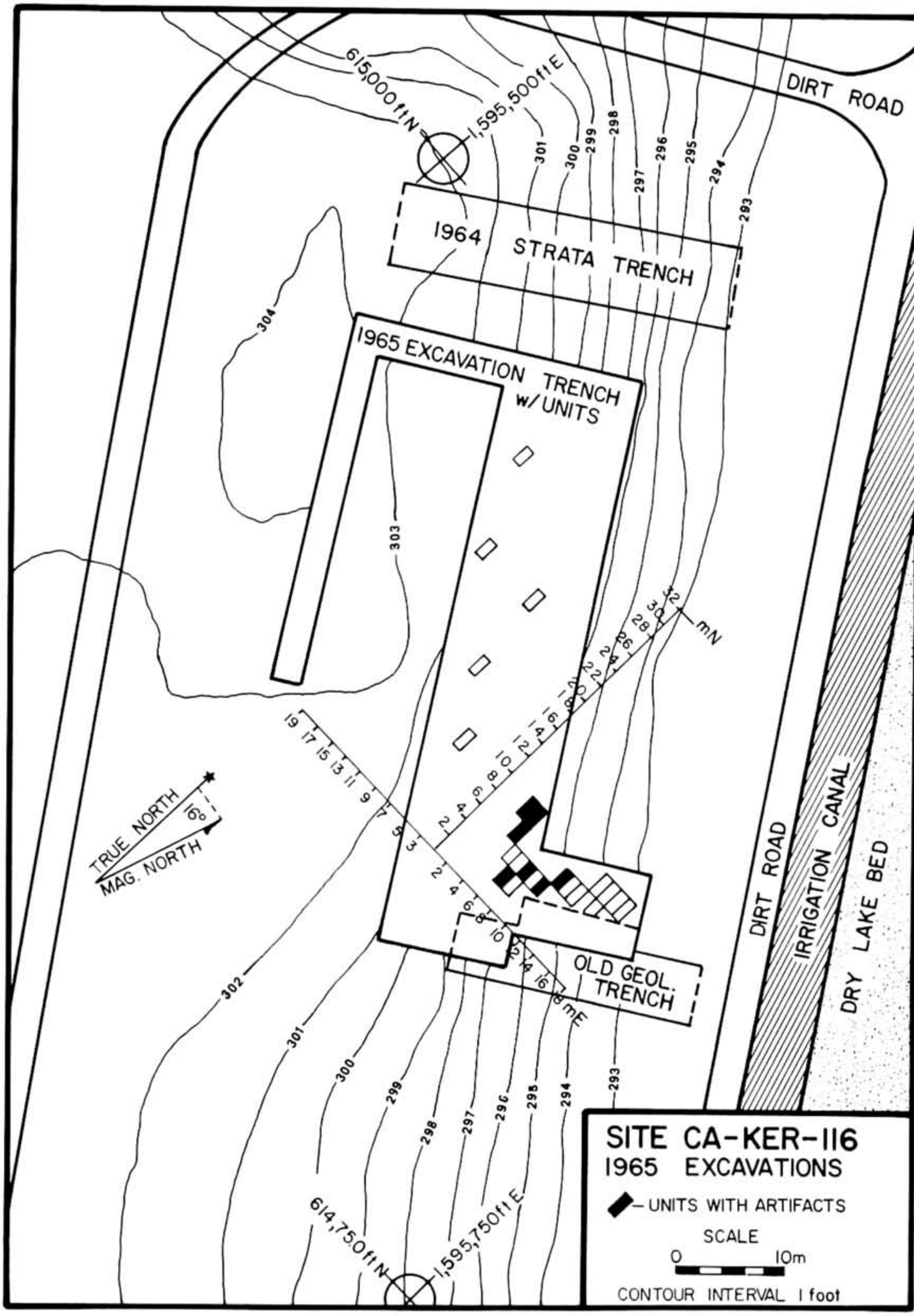

Fig. 2. Map of CA-Ker-116.

THE CA-Ker-116 SITE DEPOSIT

The 1964-65 investigations at CA-Ker-116 were prompted by the occurrence of what appeared to be an important archaeological deposit that was scheduled for complete destruction during the excavation for the California Aqueduct. Exploratory geological trenches excavated in connection with the aqueduct construction revealed the presence of artifacts, features, and human graves at depths of 2 m. or more below ground surface. Surface appearances, however, gave no indication of either significant depth or intensive occupation. Among materials noted in the geological trenches were handstones and extended burials, key attributes of Wedel's (1941) early complex. The Smithsonian investigation had resulted in the discovery of only a small number of cultural items and was not firmly dated. It was therefore hoped that the trait list could be expanded and that sufficient charcoal or other datable material could be obtained from the early complex to allow radiocarbon age dating which might confirm or rule out the culture's expected antiquity.

The archaeological investigation at CA-Ker-116 revealed the presence of two cultural deposits, an upper midden that extended from the surface to a depth of approximately 200 cm., and a deeply buried cultural deposit, the surface of which was 280 to 350 cm. below ground surface. Materials linked to Wedel's (1941) early complex were discovered in the deeper portion of the upper cultural deposit, while materials possibly related to the San Dieguito complex of southern California (Warren 1967; Warren and True 1961) were unearthed from the deeply buried deposit.

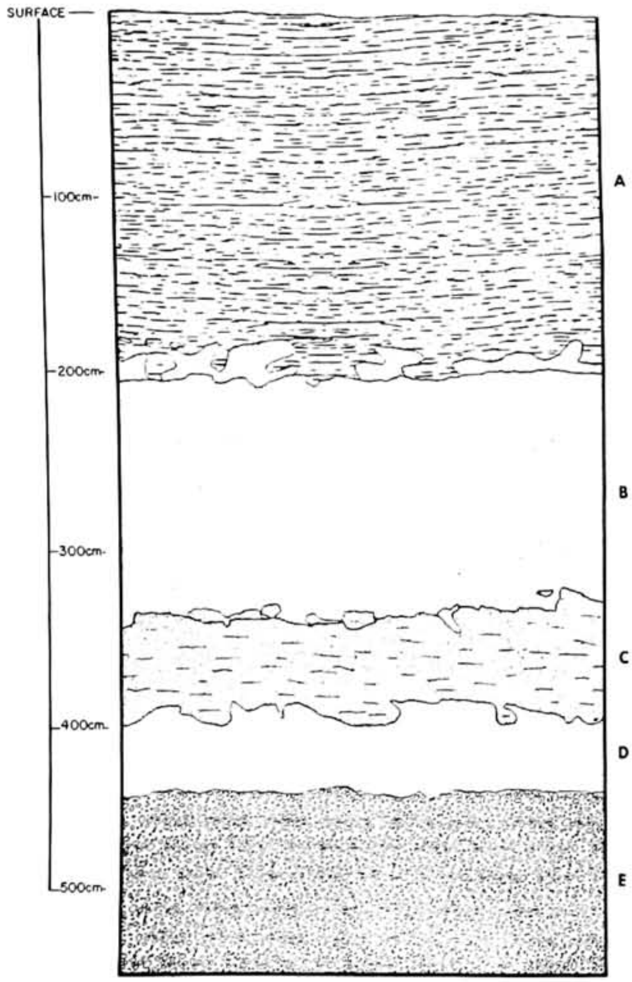

Fig. 3. Stratigraphy of site CA-Ker-116 from 1965 excavation. Stratum C contains early artifacts. A, recent midden; B, D, E, sterile.

The Upper Cultural Deposit

A major cultural stratum marked by the occurrence of many roasting pits, small hearths, and small shell lenses extended from the surface to depths ranging from 40 to 70 cm. Immediately below this stratum was a second cultural stratum that extended to a maximum depth of about 120 cm. These two strata contained evidence of both late period phases described by Wedel (1941), although the protohistoric phase was sparsely represented. Very little asphaltum was recovered and only a small number of steatite objects. Well-made triangular projectile points were rare. No baked clay objects were found and *Haliotis* beads and ornaments were also rare. The bulk of the late deposit appeared to represent the earlier phase of Wedel's late period, with some evidence that this phase could be divided into two subphases. The earlier subphase was distinguished by split-punched and whole spire-lopped *Olivella* beads and crudely flaked, leaf-shaped projectile points. The late subphase was distinguished by proportionately greater quantities of finished and rough disk *Olivella* beads and by a local bead manufacturing industry which may have utilized the rare whole shell *Olivella*. Projectile points were more finely flaked, but not as finely worked as during the protohistoric period, nor were the same types represented. Asphaltum occurred in small quantities and steatite was quite rare. Clay-lined pits occurred as did numerous roasting ovens filled with fresh water clam shell.

Between depths averaging 120 and 160 cm., cultural material was rare and most of what was found had been carried down from the upper layers by rodent burrowing. Between depths of about 160 and 200 cm., material was encountered which is believed to represent Wedel's (1941) early complex. Handstones, millingstones, flake scrapers, and extended burials were associated with this component. Calcium carbonate precipitate in the form of small concretions that ranged from 2 to 5 mm. in diameter occurred in quantity at a depth of about 160 cm. and extended downward to the deepest levels excavated. This material occured in greatest concentration between depths of 250 and 350 cm.

The Deeply Buried Cultural Deposit

A deeply buried cultural stratum, with its upper surface covered with 280 to 350 cm. of more recent soils, ranged in thickness from 30 to 50 cm. in the area of artifact recovery but feathered out to 10 cm. and less in outlying areas. Soil was a light green, indurated sandy loam, permeated with small fragments of fresh water clam shell (*Anodonta nuttalliana*), minute flecks of charcoal or carbonaceous material, and concentrations of calcium carbonate precipitate. Although investigation of the deeply buried stratum yielded only a small number of artifacts, three chipped stone crescentic fragments and a polished stone atlatl engaging spur were recovered. Shell features that yielded three radiocarbon dates centering about 8000 years before the present were also recorded.

Immediately overlying the deeply buried cultural stratum was a culturally sterile stratum consisting of light tan, indurated sand and small gravels, heavily pervaded with caliche. This stratum, apparently representing a hiatus in human utilization of the immediate area, began at a depth of about 200 cm. below the modern surface and extended to the deeply buried layer.

Immediately below the deeply buried cultural component was a light tan, culturally sterile stratum, similar in color and compaction to the overlying culturally sterile layer. Loosely packed alluvial deposits of coarse sand and gravel began at a depth of about 450 cm. below the modern surface and extended to a depth of at least 15 m. Each of these soil strata probably originated through the interdigitation of alluvium deposited through water runoff from the hills and sediments deposited by the lake (see Fig. 3.).

INVESTIGATION OF THE DEEPLY BURIED DEPOSIT

During the 1964 season, an exploratory trench was excavated by bulldozer to aid in clarifying the physical stratigraphy of CA-Ker-116. The trench was located at the northwest end of the site area, opposite from where the earlier geological trench was located (Fig. 2). Excavated to a depth of 4 m., the trench unexpectedly revealed a thin layer of occupational debris at a depth of about 380 cm. The cultural layer contained freshwater clam shell, chert chipping waste, tiny flecks of charcoal, and bone refuse. Bone refuse included remains of bird, turtle, fish, and deer. A concave flake scraper manufactured from locally available chert was recovered and a small hearth was recorded. Unsuccessful attempts were made employing hand separation, flotation, and centrifuge to recover sufficient charcoal for radiocarbon dating. Samples of shell from the occupation layer were submitted for dating and eventually yielded two of the three radiocarbon dates for the deeply buried cultural component.

In 1965, excavation was resumed at CA-Ker-116 with the aim of more thoroughly investigating the deeply buried cultural stratum. A bulldozer was used to remove the overburden from above the buried cultural component. This main bulldozer trench was parallel to the lake shore, measured approximately 12 x 55 m., and was excavated to a depth of about 275 cm., with a buffer zone of culturally sterile soil left above the deeply buried cultural layer (Fig. 2). A second, smaller trench was excavated parallel to and east of the main trench and a third trench was excavated at the east end of, and at right angles to, the main trench. The eastern edge of the latter trench revealed evidence of the previously excavated and backfilled geological test trench (Fig. 2).

Hand excavation was carried out in a series of 1 x 2 m. excavation units, each with its long axis oriented in a north-south line. Excavation proceeded by 10 cm. arbitrary levels at the beginning of the season, but 20 cm. levels were soon adopted due to (1) lack of internal differentiation within the buried cultural component; (2) scarcity of artifacts and other cultural debris; and (3) extreme compaction of the matrix. Because the soil was heavily indurated, excavation by trowel was impossible. Each arbitrary level was worked with a large pick to loosen soil which was then passed through 6 mm. mesh. Material from each level that remained in the screen was later washed through 3 mm. mesh. All chipping detritus and bone was retained.

A comparison of profiles from the 1964 stratatrench and the earlier geological trench revealed that the buried component was thickest and most visible toward the south end of the main excavation trench. Therefore, excavation units were localized in this area. Out of a total of 24 units excavated through the deep stratum, only seven yielded artifacts. All seven were located in the south end of the main trench (Fig. 2).

In order to obtain a profile of the deeper soil and to test for the possibility of even deeper cultural strata, a drilling rig was employed to excavate a one meter diameter shaft to a depth of 15 meters. The shaft was located north of and immediately adjacent to the main trench. No deeper cultural strata were evident below the 350 cm. component. The drilling revealed only loosely compacted large sand and gravel, beginning about 5 m. below modern ground surface.

In an effort to more precisely define the relationship between the light-colored buried cultural stratum and the strata immediately above and below it, pH tests were run on two separate column samples collected from wall profiles near the area of artifact recovery. In both columns, samples were collected at 20 cm. intervals from surface to a depth of about 4 m. One series was tested by David Weide of the Geology Department, University of California, Los Angeles, and the other was run by the junior author at the Standard Oil Company of California laboratories in Taft. Detailed results for each series are listed in Table 1. Although alkalinity decreased at depths below the upper midden, neither series showed any large differences in pH for the deeply buried cultural stratum in comparison with overlying and underlying strata.

DESCRIPTION OF CULTURAL MATERIAL

A total of only 14 recognizable artifacts and one human cranial fragment was recovered from the deeply buried component.

Table 1
pH TESTS FROM TWO COLUMN SAMPLES AT CA-Ker-116

Depth in cm.	pH - A (Weide)	pH - B (Grossman)
0	7.86	8.45
20	8.00	9.45
40	7.90	9.45
60	8.17	9.40
80	8.08	9.50
100	8.00	9.20
120	7.80	9.20
140	7.70	9.30
160	8.10	9.30
180	8.40	9.20
200	8.30	9.00
220	8.40	9.30
240	8.30	9.20
260	7.60	9.15
280	7.30	8.20
300	7.30	7.80
320	7.10	7.55
340	7.00	7.45
360		7.60
380		7.50

Note: Both columns were tested with Beckman pH meters. Column A samples were mixed at a ratio of 40 g. of soil to 20 g. of distilled water; Column B samples were mixed at a ratio of 10 g. of soil to 100 g. of distilled water.

Artifacts included two projectile point fragments, three crescent fragments, one end scraper, one micro-core, two knife fragments, one utilized flake, two worked stone fragments, one polished stone atlatl engaging spur, and one piece of worked bone. The human cranial fragment was a portion of a parietal bone. Each item is described in detail in Table 2. The provenience of each specimen is listed in Table 3.

Descriptive terms employed in Table 2 were for the most part taken from Binford (1963). Measurements of all crescent fragments followed the format provided by Tadlock (1966:633). Incomplete dimensions are indicated with an asterisk (*).

The chipped stone pieces showed high variability in manufacturing technique. The two knife fragments (Fig. 4k, l) and the two projectile point fragments (Fig. 4b, c) exhibited only minimal flaking. Made from tabular slabs of chalcedony, they showed only enough flaking to give form and worked edges to the specimens. Scar patterns were irregular and did not extend to the center of either surface.

By contrast, the three crescent fragments (Fig. 4d, e, f) showed delicate bifacial flaking. A series of thin, shallow, lenticular to conchoidal scars covered the entire surface of each face. Because of this fine secondary flaking, it was impossible to determine whether the specimens were manufactured from natural slabs of chalcedony or large primary flakes.

Artifact Elevations

Artifacts from the deeply buried component were found at elevations that ranged from 87.40 to 88.26 m. above sea level, with an average of 87.70 m. According to Gifford and Schenck (1926), the 1910 Buena Vista Lake shoreline followed the 88.7 m. contour. The lowest stage on record, prior to the draining of the lake, was 85.8 m., in 1879. Wedel (1941) reported that during the Smithsonian investigations, six wave-cut terraces marking former beaches were uncovered, the lowest at 88.7 m., the highest at 91.5 m. Wedel also reported that similar wave-cut terraces were located at lower elevations out in the lake bed itself, adding that the terraces evidenced wide fluctuations of water level in Buena Vista Lake during the past. Suffice it to say that the deeply buried stratum reflected human use at a time when the lake level was approximately 87 m. above sea level.

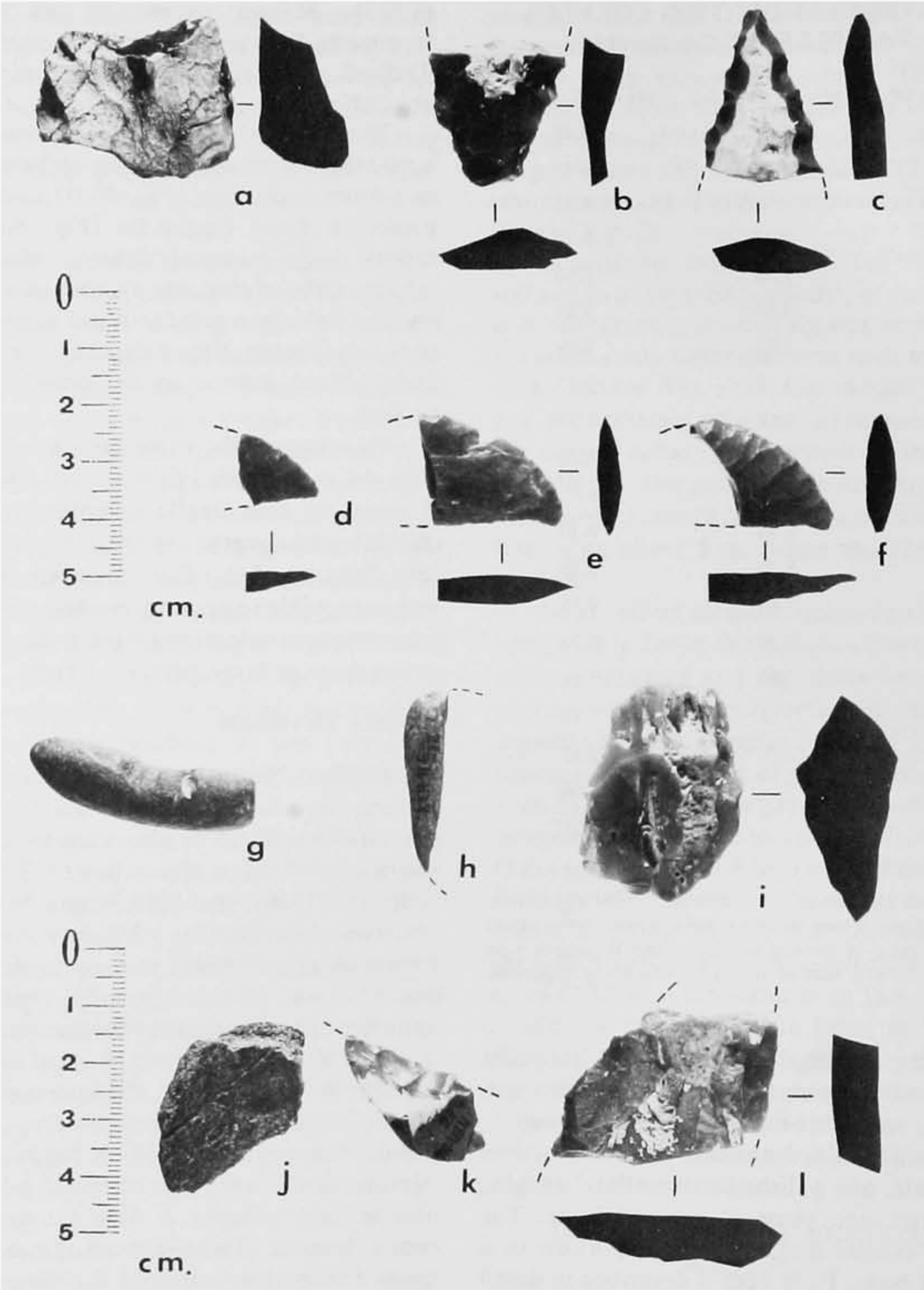

Fig. 4. Buena Vista Lake artifacts from deeply buried stratum. a, scraper; b, projectile point base; c, projectile point fragment; d-f, crescent fragments; g, atlatl engaging spur; h, worked bone fragment; i, micro-core; j, human cranial fragment; k-l, knife fragments.

Table 2
ARTIFACTS AND HUMAN BONE FROM DEEPLY BURIED STRATUM, CA-Ker-116
(measurements in mm. and g.)

1. Projectile point fragment (DWR-2931; Fig. 4c)
   Maximum length: 31*
   Maximum width: 21*
   Maximum thickness: 6.5*
   Weight: 4.1*
   Material: Red chalcedony (Munsell: Hue 2.5YR/6-4/8) with white calcite on both surfaces.
   Form: Triangular; the planoconvex longitudinal cross-section reflects the tabular form of the blank from which it was manufactured.
   Chipping: Both lateral edges have relatively wide (6-8 mm.), deep, irregularly placed, expanding primary scars. Maximum scar length is 6 mm.; neither surface has scars which meet in the center.
2. Projectile point stem (DWR-2932; Fig. 4b)
   Maximum length: 27*
   Maximum width: 24*
   Maximum thickness: 7.5
   Weight: 4.5*
   Material: Brown chalcedony (Munsell: Hue 7.5YR:5/6) with traces of white calcite on center of both surfaces.
   Form: Slightly convex edges with a blunt end formed by two apparently intentional transverse scars. The planoconvex transverse cross-section reflects the original tabular form of the parent material.
   Chipping: Both lateral edges have deep, irregular conchoidal scars that do not extend to the center. Both surfaces are thinned at the base with shallow, ill-defined primary scars.
3. Crescent fragment (DWR-2933; Fig. 4d)
   Maximum length: 13*
   Maximum width: 13*
   Maximum thickness: 3.5
   Weight: 0.5*
   Material: Brown chalcedony (Munsell: Hue 7.5YR:5/6).
   Form: This end fragment has one very convex and one slightly concave edge. It is biconvex in both transverse and longitudinal sections.
   Chipping: Shallow, ill-defined scars cover both faces. Scars on one face meet in the center to form a slight ridge. Very small (1-2 mm.) scars are present along both edges, formed by either use or manufacture.
   Comment: Surfaces appear waxy and shiny. Fragment appears less than 30% complete.
4. Crescent Fragment (DWR-2934; Fig. 4e)
   Maximum length: 25*
   Maximum width: 20*
   Maximum thickness: 5.0
   Weight: 2.3*
   Material: Reddish yellow chalcedony (Munsell: Hue 7.5YR:6/6).
   Form: This end fragment has one convex and one straight edge which becomes concave at the tip to form a small round barb at the juncture of the two edges. Specimen is biconvex in longitudinal section.
   Chipping: Both faces are flaked over their entire areas and show thin, shallow scars that extend at least half way across their surfaces. On one face, scar patterns are partially obscured by a weathered veneer. The obverse shows shallow scars, 3-8 mm. in width.
   Comment: Fragment appears at least 50% complete; original specimen was about 40 mm. in length.

(continued)

Table 2, Continued

5. Crescent fragment (DWR-2935; Fig. 4f)
   Maximum length: 28*
   Maximum width: 20*
   Maximum thickness: 5.0
   Weight: 2.2*
   Material: Brown chalcedony (Munsell: Hue 7.5YR:5/6).
   Form: Identical to No. 4 (DWR-2934; Fig. 4e).
   Chipping: Bifacially chipped with scars that extend across both faces. One face shows long, shallow, relatively thin (2-4 mm.) scars which meet in the center to form a slight ridge.
   Comment: Both surfaces are waxy and shiny. The original specimen was about 50 mm. in length.
6. End scraper (DWR-2936; Fig. 4a)
   Maximum length: 25
   Maximum width: 34
   Maximum thickness: 14
   Weight: 14.4
   Material: Brown to dark green chalcedony (Munsell: Hue 7.5YR:5/6 to 7.5Y:3/2).
   Form: This piece is apparently a large primary flake struck from a nodule or an unprepared core. The scraper end was formed by one blow perpendicular to the interior face of the flake. The opposite end was rounded with secondary scars for holding or hafting. The concave end shows use wear.
7. Micro-core (DWR-2937; Fig. 4i)
   Maximum length: 37
   Maximum width: 27
   Maximum thickness: 19
   Weight: 13.2
   Material: Yellowish brown chalcedony (Munsell: Hue 10YR:5/6) with hollow cavities and encrustrations of white calcite.
   Form: Roughly oval in plan and bitriangular in both transverse and longitudinal sections.
   Chipping: The entire surface shows irregular scars varying in width and form. No secondary chipping or edge wear.
8. Knife fragment (DWR-2938; Fig. 4l)
   Maximum length: 25*
   Maximum width: 36*
   Maximum thickness: 7.5
   Weight: 10.9*
   Material: Brown chalcedony (Munsell: Hue 7.5YR:5/6-5/4) with white calcite on both surfaces.
   Form: Tabular fragment shows working on two opposite edges. The fragment has two broken ends perpendicular to the worked edges.
   Chipping: Specimen was formed by the bifacial removal of a small number of primary flakes from the two edges of a tabular slab. Scars are short (7-10 mm.), irregularly placed, and do not extend across either face.
9. Knife fragment (DWR-2939; Fig. 4k)
   Maximum length: 31*
   Maximum width: 14*
   Maximum thickness: 7.5*
   Weight: 2.8*
   Material: Brown chalcedony (Munsell: Hue 7.5YR:5/6) with white calcite on both surfaces.
   Form: One edge is bifacially worked while the other is formed by a convex break.
   Chipping: One face has evenly spaced primary expanding scars, while the other has primary and secondary expanding scars.

(continued)

Table 2, Continued

10. Utilized flake (DWR-2940; not illustrated)
    Maximum length: 30
    Maximum width: 18
    Maximum thickness: 6.0
    Weight: 3.4
    Material: Brown chalcedony (Munsell: Hue 7.5YR:5/6).
    Form: The utilized edge is parallel to the original axis of percussion, which is perpendicular to the longitudinal axis of the flake.

11 and 12. Miscellaneous pieces (DWR-2941, DWR-2942; not illustrated)
    Two small fragments of chipped stone are too worn and polished by natural means to distinguish definite use patterns or secondary chipping.

13. Atlatl engaging spur (DWR-2943; Fig. 4g)
    Maximum length: 39
    Maximum width: 12
    Maximum height: 11.5
    Weight: 9.6
    Material: Greenish gray metamorphic schist, possibly jadeite.
    Form: The pointed end is circular in cross-section with a conical tip. The opposite end was ground flat with rounded edges; the ventral surface of this end was ground slightly flat. A 9 mm. wide groove, possibly for lashing, covers one-quarter of the dorsal surface. Except for the conical tip, the width varies little head to tail.

14. Worked bone fragment (DWR-2944; Fig. 4h)
    Maximum length: 31*
    Maximum width: 7.0*
    Maximum thickness: 7.0*
    Weight: 2.0*
    Material: Heavily mineralized bone, probably from a large mammal.
    Form: Smoothed and polished on one side and end to give a slight curvature to the fragment.

15. Human cranial fragment (DWR-2945; Fig. 4j)
    Maximum length: 35*
    Maximum width: 23*
    Maximum thickness: 6.5
    Weight: 4.8*
    A heavily mineralized cranial fragment, a portion of the parietal.

With respect to Wedel's (1941) early complex, that believed to be represented at CA-Ker-116 by materials found in the 160-200 cm. stratum, it is of interest that the early component at Wedel's Site 1 ranged from about 90.8 to 92.7 m. above sea level (Wedel 1941:24), while at his Site 2 it ranged from about 91.7 to 92.7 m. (Wedel 1941:79). The elevation of the 160-200 cm. stratum at CA-Ker-116 was compatible with these ranges. The deeply buried cultural component at CA-Ker-116 was at a significantly lower elevation.

Chipped Stone Crescents

Chipped stone crescents have been found in early and late contexts throughout the western United States. Tadlock (1966) has reported the known occurrences of crescents in North America:

> The range of known crescent distribution is restricted to the states of California, Nevada, Utah, Idaho, Oregon, and Washington. Of the 26 sites, 16 fall within the boundaries of the Great Basin, two within

Table 3
ARTIFACT PROVENIENCE, CA-Ker-116

	Specimen Acc. No.	Description	Illus.	Unit	Elevation Meters	Feet
1.	DWR-2931	Projectile point fragment	Fig. 4c	N8-E4	87.60	287.4
2.	DWR-2932	Projectile point stem	Fig. 4b	N6-E5	88.26	289.6
3.	DWR-2933	Crescent fragment	Fig. 4d	N2-E7	87.64	287.6
4.	DWR-2934	Crescent fragment	Fig. 4e	N8-E4	87.40	286.8
5.	DWR-2935	Crescent fragment	Fig. 4f	N6-E5	88.26	289.6
6.	DWR-2936	End scraper	Fig. 4a	N4-E10	87.55	287.3
7.	DWR-2937	Micro-core	Fig. 4i	N8-E5	87.90	288.4
8.	DWR-2938	Knife fragment	Fig. 4l	N4-E8	87.68	287.7
9.	DWR-2939	Knife fragment	Fig. 4k	N4-E10	87.55	287.3
10.	DWR-2940	Utilized flake	none	N8-E4	87.50	287.1
11.	DWR-2941	Misc. chipped stone	none	N2-E7	87.74	287.9
12.	DWR-2942	Misc. chipped stone	none	N6-E11	87.57	287.3
13.	DWR-2943	Atlatl engaging spur	Fig. 4g	N2-E7	87.64	287.6
14.	DWR-2944	Worked bone fragment	Fig. 4h	N6-E11	87.57	287.3
15.	DWR-2945	Human parietal fragment	Fig. 4j	N4-E8	87.68	287.7

Note: Since the above excavation units were placed at the bottom of the 1965 excavation trench (Fig. 2), the actual depths from the surface of these artifacts can only be approximated. Field observations indicated that the buried stratum which contained the artifacts was between 280 and 340 cm. from the surface in the region from which they were recovered. As an approximation, surface elevations in the vicinity of the artifact recovery area ranged from about 90.5 to 91.2 m. In terms of relationship to the shoreline, actual elevation with respect to sea level, as given above, is the more significant datum for an artifact location.

> the boundaries of the Columbia Plateau, and eight are located in the remaining portion of California . . . . Known crescent distribution is unique in that it is limited to the proximity of playas, lakes, large rivers, coastal, and island sites [Tadlock 1966: 664].

It is important to note that although Tadlock reported crescents from a total of 26 sites in western North America, they have been found in a stratigraphic context only at Lind Coulee, Paisley Cave #1, the Dean site, the Karlo site, the Borax Lake site, and the upper Buena Vista midden excavated by Wedel. Their occurrence in the deeply buried cultural stratum at Buena Vista Lake can now be added to this list of sites with known stratigraphic occurrences.

Gifford and Schenck (1926:85-6, Pl. 19; see also Riddell and Olsen 1969) described a total of 32 crescents from the Buena Vista and Tulare Lake basins. All of these specimens were surface discoveries with exact proveniences unknown. In 1933, Wedel (1941:168) excavated five crescent fragments from the 3-4 ft. level of his Site 2. He also recovered one specimen from a backdirt pile. From the evidence, Tadlock (1966:672) suggested that in the southern San Joaquin Valley the crescent

> is associated with an unidentified leaf-shaped or stemmed projectile point culture, with a possible date ranging from 7000 B.C. to 5000 B.C. . . .

In a paper presented in 1966, Fredrickson and Grossman commented on the context of Wedel's crescents found in the excavated refuse at Buena Vista Lake during the Smithsonian investigations:

> Although these occurrences may represent a cultural continuity with the 400 cm. finds, the possibility exists that the

crescents found by the Smithsonian workers were already ancient at the time they became a part of the refuse deposit. As a parallel example, manos were recovered during the 1964 excavation [at CA-Ker-116] in the uppermost, late cultural deposit, but only in the form of hearth stones, generally fractured but always burned. The boulder hopper mortar was the food grinding implement of the late period. The possibility that the Smithsonian crescents and the no-provenience surface finds also derived from an earlier context, as the burned, broken manos apparently did, should be accepted as a valid alternative [Fredrickson and Grossman 1966].

Atlatl Engaging Spur

Riddell and McGeein (1969) proposed three provisional types of atlatl engaging spurs on the basis of California examples. The CA-Ker-116 specimen falls within their Type 1, or "snake-head," category and is specifically mentioned in their paper (Riddell and McGeein 1969:477-478). Type I atlatl spurs were manufactured mostly from stone and have central California Early Horizon, Martis Complex, and Early-Transitional Lovelock affinities. They are believed to predate the other two types.

Published accounts of atlatl engaging spurs are rare. Gifford and Schenck (1926:98) illustrated 19 specimens, which they identified as "snake-heads," without temporal or cultural provenience, from the Tulare Lake region, some 40 miles to the north of Buena Vista Lake. With some slight degree of variation, 18 of these illustrated pieces are almost identical in form to the CA-Ker-116 specimen, with cylindrical bodies, conical points, and slight body thinning toward the flattened end.

With the new evidence from the deeply buried cultural component at CA-Ker-116, it is now apparent that both the ground stone atlatl engaging spur, Riddell and McGeein's (1969) Type 1, and the chipped stone crescent, Tadlock's (1966) Type 1, have a time depth of approximately 8000 years in the southern San Joaquin Valley.

Projectile Points

Although evidence for the form of projectile points from the deeply buried cultural component at CA-Ker-116 consisted only of two fragmentary specimens, a tentative reconstruction can be made. A comparison of the two pieces indicated that the likely projectile point form was laurel leaf with bifacial edge flaking, and a length of at least 5.5 cm.

DATING THE DEEPLY BURIED BUENA VISTA LAKE ASSEMBLAGE

Three radiocarbon dates obtained from three samples of *Anodonta nuttalliana* collected from the deeply buried cultural component at CA-Ker-116 yielded consistent results. Two samples were collected in 1964 by the senior author and were submitted to the Scripps Institution of Oceanography at La Jolla. The third sample was collected in 1965 by the junior author and was submitted to Isotopes, Inc., Westwood, New Jersey. The data for each sample are presented below.

The first date, received in January, 1966, was determined from the sample submitted to Isotopes in 1965.

(1) Sample No.: I-1928
  Material: Shell (*Anodonta nuttalliana*)
  Age: 7,600 ± 200 radiocarbon years, 5650 B.C.
  Provenience: The sample consisted of small fragments of freshwater clam shell which were collected from a 50 cm. wide shell concentration located in the deeply buried cultural deposit which at the point of collection ranged from 280 to 340 cm. below the modern ground surface. The horizontal location of the sample included point N8-E18 on the 1965 site grid (Fig. 2).

The second and third dates, received in October, 1966, were determined from the samples submitted to the La Jolla laboratory in 1964. Both samples had the same provenience and are discussed together.

(2) Sample No.: LJ-1356
Material: Unburned shell (*Anodonta nuttalliana*)
Age: 8,200 ± 400 radiocarbon years, 6250 B.C.

(3) Sample No.: LJ-1357
Material: Burned shell (*Anodonta nuttalliana*)
Age: 8,200 ± 400 radiocarbon years, 6250 B.C.
Provenience: Samples (2) and (3) were sorted from a soil sample collected from the west wall profile of the 1964 stratatrench (Fig. 2) between 425 and 455 cm. below modern ground surface. (Surface elevation: 92.4 m.; sample elevation: 87.95-88.15 m.; location: 614,988N, 1,595,516E, California Coordinate System Zone V.) The soil sample was obtained from an area 20 cm. thick and 600 cm. wide, immediately adjacent to a hearth. Charcoal collected from the badly preserved hearth proved insufficient to yield a radiocarbon date.

These three radiocarbon dates suggest that the deeply buried cultural component at CA-Ker-116 was deposited approximately 8000 years before the present. Other lines of evidence also support the suggested time depth. First, the stratigraphic context of the deeply buried stratum is consistent with the radiocarbon age. The buried component was located beneath approximately 150 cm. of culturally sterile soil, which in turn was located beneath a stratum (160-200 cm. beneath modern ground surface) that contained handstones and extended burials heretofore judged as relatively ancient (Baumhoff and Olmsted 1963, 1964; Heizer 1964; Meighan 1959; Wallace 1954; Wedel 1941).

Second, the deeply buried cultural component contained a distinctive artifact, the chipped stone crescent, which is known to occur elsewhere in contexts at least as early as 7000 years ago (Tadlock 1966).

At present, the third line of evidence is only suggestive. Data suggest that the rate of alluviation was 0.45 m. per 1000 years for an alluvial fan on the west side of the San Joaquin Valley approximately 100 miles north of Buena Vista Lake (Wahrhaftig and Birman 1965:315). A sedimentation rate of 0.79 m. per 1000 years can be calculated for the bed of Buena Vista Lake itself, just a few miles from the CA-Ker-116 location (Hubbs et al. 1962: 231-2), while a rate of 0.4 to 0.5 m. per 1000 years can be calculated for the deposition of soils overlying the deeply buried cultural component at CA-Ker-116. These figures are in general accord with one another and the lake bed depositional rate expectedly exceeds the two non-lake rates, which are themselves comparable.

Although radiocarbon dates obtained from shell carbonate are potentially subject to contamination by carbonate ions of unknown age from the soil, the sum of the evidence leads the authors to believe that the three radiocarbon dates reported here are valid and reflect the true order of magnitude for the age of the deeply buried cultural component at CA-Ker-116 at Buena Vista Lake.

CULTURAL AFFILIATION

The time depth established for the deeply buried cultural component, the artifactual assemblage, and the environmental context are compatible with attributes of the San Dieguito complex as discussed by Warren (1967; see also Warren and True 1961). Warren hypothesized that the San Dieguito complex was distinct from the Desert Culture (Jennings 1964) and that it represented a generalized hunting tradition which moved into the western Great Basin and southern California, along a north-south belt. Warren emphasized that the handstone and millingstone, characteristic implements of the Desert Culture, were not present in the inventory of the San Dieguito complex.

The deeply buried cultural component at CA-Ker-116 was stratigraphically deeper and temporally older than the early complex from the same locality described by Wedel (1941), which was characterized by extended burials and handstones. Although the artifactual inventory from the deeply buried Buena Vista Lake assemblage is small, handstones and millingstones were absent, while crescents and large bifacially flaked projectile points and knives, implements characteristic of the San Dieguito complex, did occur. The CA-Ker-116 artifact assemblage falls within the definition of the San Dieguito complex as provided by Warren (1967:177).

Finally, the lake shore context of CA-Ker-116 is compatible with that expected for San Dieguito sites. Although Warren (1967:183) stated that few data were available for reconstruction of the environment of San Dieguito sites, he also noted that the desert expression of San Dieguito was associated with high stands of Pleistocene lakes. In sum, the authors believe it is reasonable to suggest that the deeply buried cultural component at CA-Ker-116 is a local, southern San Joaquin Valley representative of Warren's (1967; Warren and True 1961) hypothesized San Dieguito complex.

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