KERN COUNTY

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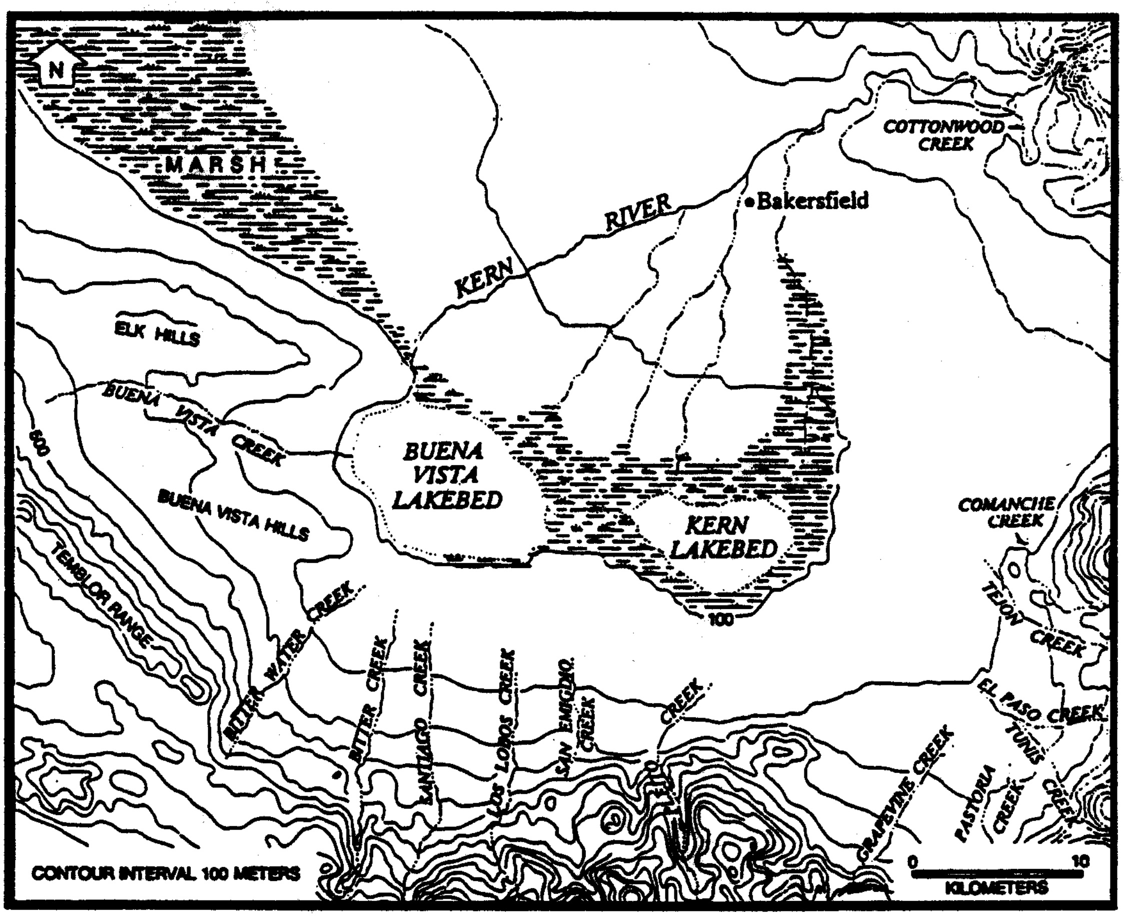

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Cover illustration: Map of the Buena Vista Basin (adapted from Hartzell 1992:50)
(see articles by Siefkin et al. beginning on page 15, and Osborne beginning on page 59)

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MESSAGE FROM THE EDITORS

This is the seventh volume of the *Kern County Archaeological Society Journal* published to date. The editors greatly appreciate the endurance and patience displayed by those who submitted articles in this volume. We feel that the articles represent a good cross-section of the archaeology and ethnography in Kern County and adjacent areas. Most importantly, their contents contribute greatly to a better understanding and appreciation of local prehistory and history.

We encourage all interested persons, professionals, students and avocationalists, to provide material for publication. It will continue to be the practice of the Kern County Archaeological Society (KCAS) to include as many articles as possible in each volume of the *Journal*. For the past several years, the hard work of the editors and authors has made the *Journal* a prominent and viable entity not only in Kern County, but throughout California. We highly encourage KCAS members and others in the community to keep the interest level high and to remember that it is never too early to begin thinking about the next volume.

Finally, KCAS *Journal* (Vol. 6) co-editor Jill Gardner generously provided assistance with the production of this volume. Her help is greatly appreciated.

Nelson Siefkin, Editor
Jeff Bright and Susan Kerr Siefkin, Assistant Editors
Kern County Archaeological Society Journal, Vol. 7 (1996)

AN ARTIFACT COLLECTION FROM THE NETTLE SPRING SITE COMPLEX, SAND CANYON, KERN COUNTY, CALIFORNIA: A LESSON IN DATA LOSS

Jay M. Hinshaw and Susan Rubin, Dept. of Sociology and Anthropology, CSU Bakersfield

INTRODUCTION

Under the direction of R. W. Robinson in March 1971, Antelope Valley College (AVC) obtained a collection of prehistoric artifacts from Locus D of CA-KER-21, as part of its investigations of the Nettle Spring Site Complex (Pruett 1987). The Nettle Spring Site Complex, located in the southern Sierra Nevada, California (Fig. 1), was originally designated CA-KER-21 by the Archaeological Survey Association. CA-KER-21 consisted of Nettle Spring proper and several nearby "loci." Investigators from the University of California, Los Angeles (UCLA), independently designated the Nettle Spring Site Complex as CA-KER-230. In 1988, Catherine Lewis Pruett formally recorded Locus D of CA-KER-21 as CA-KER-2334 (Pruett 1988). This locus/site consists of three bedrock mortar features, two middens, and a surrounding flake scatter. The 1971 AVC collection is the subject of this article.

The precise provenience of the AVC collection is uncertain. Handwritten catalog sheets accompanying the AVC collection indicate that the artifacts were removed from the surface and from a "screen" at Locus D of CA-KER-21 (now designated as CA-KER-2334). This locus is located about 300 m. southeast of Nettle Spring. However, a field sketch map included with the AVC collection depicts the study area as approximately 300 m. *southwest* of Nettle Spring on a hill between two merging dirt roads. Thus, the sketch map does not match the setting or features at CA-KER-2334 as mapped by Pruett (1988) or Hinshaw (1992). After visiting CA-KER-2334 and analyzing the sketch map and notes, the authors concluded that the collection was derived from the surface and subsurface of the Nettle Spring Site Complex, but that more precise provenience has been lost. The AVC sketch map may be erroneous, or the site designation (Locus D of CA-KER-21) assigned to the collection may be in error.

The provenience of materials in the collection in relation to any site features or boundaries was apparently not recorded. The field and laboratory notes do not indicate whether the "screen-collected" materials were derived from surface scrapes or from standard test excavation units. However, there was mention of screening a "10-meter square" at another site; therefore, surface scraping or shallow excavation can be inferred.

The collection was cataloged and curated at AVC, then later transferred to California State University, Bakersfield (CSUB), as part of a large, unorganized assemblage of surface and excavated materials from the Nettle Spring Site Complex. Robert LaDue of CSUB separated the materials labeled "Locus D" (CA-KER-2334) from other Nettle Springs Site Complex materials. The authors analyzed these materials in October and November of 1992 as part of a CSUB archaeological laboratory methods course. At that time, it was determined that approximately 80 percent of the culturally or temporally diagnostic artifacts recorded on the AVC catalog sheets were missing; however, almost all non-diagnostic items in the collection were present.

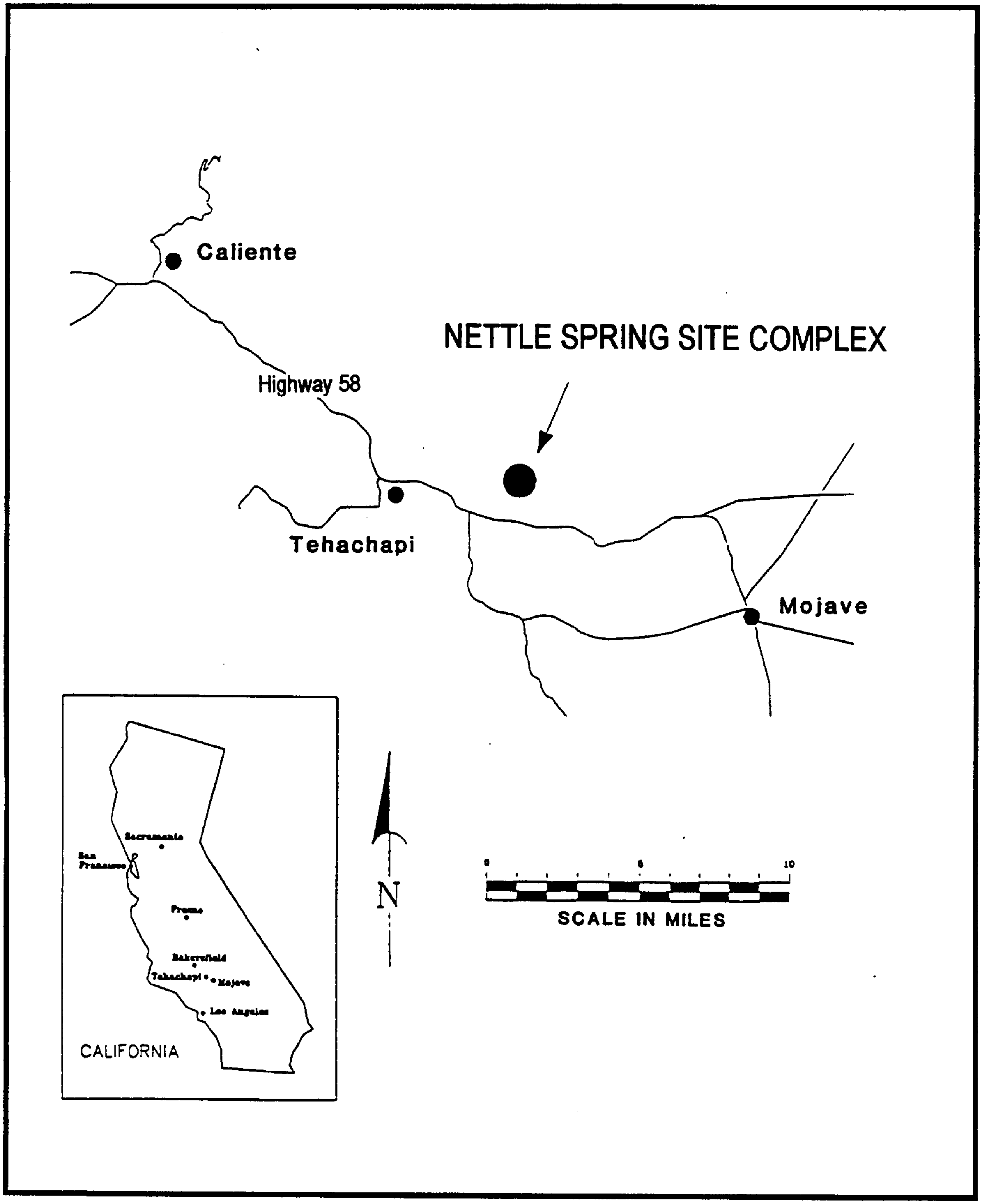

Fig. 1. General location of the Nettle Spring Site Complex, Kern County, California.

This paper describes the natural and cultural setting of the Nettle Spring Site Complex and presents the results of the laboratory analysis of what remains of the AVC collection.

NETTLE SPRING SITE COMPLEX DESCRIPTION

The Nettle Spring Site Complex (hereinafter referred to as the complex) is located northeast of Tehachapi in Sand Canyon, Kern County, California, in the foothills of the southern Sierra Nevada (Fig. 1). The complex consists of approximately 17 overlapping and interrelated aboriginal sites located at and around Nettle Spring, a natural, perennial, freshwater spring. Recorded sites comprising the complex consist of a natural freshwater spring with nearby housepits, temporary camps, bedrock milling features, rockshelters, and rock art sites. Nettle Spring proper, CA-KER-230, is situated on a north-facing slope at about 1,350 m. above sea level. The terrain adjacent to the spring is moderately sloped and rocky. The local geology consists of sedimentary formations of limestone and sandstone with volcanic intrusions. Soils in the surrounding area are primarily entisols resulting from shallow bedrock and a semiarid climate. The area around the complex may have been used for livestock historically, but is currently closed to grazing. It is within the boundaries of the recently created Tomo-Kahni State Park, and access is strictly controlled by the California Department of Parks and Recreation.

Present biota at the complex is characteristic of the Mojavean Juniper Woodland and Scrub ecological community (Holland 1986). Plants common to the area include California juniper (*Juniperus californica*), single-leaf piñon (*Pinus monophylla*), rabbitbrush (*Chrysothamnus* spp.), big sagebrush (*Artemisia tridentata*), annual and perennial grasses, buckwheat (*Eriogonum* spp.), and a number of wildflowers.

Common fauna of the general area include domestic livestock, mule deer (*Odocoileus hemionus*), coyotes (*Canis latrans*), bobcats (*Felis rufus*), mountain lions (*Felis concolor*), gray foxes (*Urocyon cinereoargenteus*), spotted and striped skunks (*Spilogale putorius* and *Mephitis mephitis*), California ground squirrels (*Citellus beecheyi*), packrats (*Neotoma* spp.), mice (*Peromyscus* spp. and *Perognathus californicus*), California quail (*Callipepla californica*), common raven (*Corvus corax*), and a variety of small birds, reptiles, and insects. Considering rock art depictions found at the complex and nearby Teddy Bear Cave (Sutton 1981, 1982), bighorn sheep (*Ovis canadensis*) possibly inhabited the area in aboriginal times.

HISTORICAL CONTEXT

Cultural Setting

The study area is within a region claimed ethnographically by the Kawaiisu. The range of the Kawaiisu included the southern Sierra Nevada south of the Kern River, the northern Tehachapi Mountains, and a portion of the western Mojave Desert (Zigmond 1986). The Tübatulabal lived to the north, the Yokuts to the west, the Kitanemuk to the south, and the Panamint Shoshone to the east.

The Kawaiisu practiced a hunter-gatherer subsistence strategy. Primary plant foods included acorns (*Quercus* spp.), grass seeds, pine nuts (*Pinus* spp.), and a cornucopia of other plant foods (Zigmond 1978, 1981, 1986). The Kawaiisu hunted a variety of large and small animals including bighorn sheep, mule deer, pronghorn (*Antilocapra americana*), black-tailed hares (*Lepus californicus*), and desert cottontails (*Sylvilagus audubonii*).

Previous Archaeological Work

Numerous archaeological sites, both recorded and unrecorded, are present in the Tehachapi and Sand Canyon areas. Site types noted include villages, temporary camps, milling sites, siliceous stone quarries, rock art sites, and other sacred sites. While a number of surface collections and excavations of aboriginal sites in the Sand Canyon area has been conducted, only a few of the assemblages have been properly analyzed and reported (Pruett 1987).

Several studies at the complex have resulted in publications. Siefkin and Sutton (1995) described human and cultural remains from an isolated cremation at CA-KER-4168/H. Osborne (1994) reported the preliminary results of analysis on an archaeological collection from CA-KER-769. Sutton (1981, 1982) reported on bighorn sheep and anthropomorphic petroglyphs at CA-KER-230 (Nettle Spring) and black, red, and white polychrome pictographs at CA-KER-508 (known locally as Teddy Bear Cave or Kawaiisu Creation Cave). Teddy Bear Cave is located approximately 700 m. east of the complex.

Pruett (1987) completed a comprehensive analysis of materials from the ethnohistoric Kawaiisu village of Ma'a'puts (CA-KER-339), located about 2 km. south of the complex. Ma'a'puts was excavated three times; first by UCLA in 1970, and again by CSUB in 1974 and 1985 (Pruett 1987). Rock rings, burials, Late Period projectile points, ceramics, and hundreds of shell, stone, and glass beads were recovered. Apparently, many of the Kawaiisu baskets traded to Euroamericans around the turn of the century were made at Ma'a'puts and other historic habitations around Tehachapi (Zigmond 1978).

Ptomey (1991) reported on materials surface collected and excavated from CA-KER-2357 by Edwin Statter of California State College, Bakersfield (now CSUB). CA-KER-2357 is located on a low hill about 2 km. north of the complex. The site is a habitation area with bedrock mortar features, housepits, and rock rings. Ptomey found that the materials consisted mainly of debitage and flaked stone tools, although groundstone, ceramics, and beads of shell, stone, and glass were also present.

OBJECTIVES

The objectives of this study were to: (1) determine the approximate temporal span represented by the collection; (2) determine what activities are represented by the collection; (3) determine which lithic reduction/production activities are represented and the source of lithic materials; and (4) compare and contrast material in the collection to material from nearby sites. A combination of field and laboratory methods was employed to help achieve these objectives.

RESEARCH METHODS

Field Methods

As previously discussed, AVC obtained the collection from a location within the Nettle Spring Site Complex in March 1971. There is no description of the field methods utilized by AVC to acquire the collection; however, mention is made of both surface collecting and screening of materials from 10-meter squares at a separate location, "Locus B" of CA-KER-21.

In November 1992, the authors visited CA-KER-2334, the originally reported source of the AVC collection. Photographs were taken of the site and its discernible features. The site was mapped, as were its three bedrock milling features. A site record update for CA-KER-2334 was completed and is now on file at the Southern San Joaquin Valley Information Center (Hinshaw 1992). Unfortunately, upon comparing the AVC field map to the physical setting of CA-KER-2334, the authors concluded that the materials must have been collected from a location in the complex other than CA-KER-2334. As mentioned above, the AVC field sketch map placed the collection area 300 m. southwest of Nettle Spring (CA-KER-2334 is actually 300 m. southeast of Nettle Spring). The setting 300 m. southwest of Nettle Spring is also not consistent with the AVC map.

Laboratory Methods

The AVC collection was cataloged and analyzed in an archaeological laboratory methods course taught at CSUB in the Fall of 1992. All artifacts and ecofacts were classified into types, appropriate attributes were obtained, and the collection was recorded on standardized laboratory catalog sheets. Each artifact and most ecofacts received a separate catalog number. Lithic debitage of the same material and calcite crystal rosettes were grouped, counted, weighed, and received one catalog number. Six obsidian flakes were selected from the collection and sent to Dr. Thomas Jackson of Pacific Legacy, Inc. for sourcing, and then to BioSystems Analysis, Inc. for hydration rim measurements. Four rim measurements were recorded for each sample to the nearest 0.1 micron, then averaged. The single clamshell disk bead was classified according to King (1990).

RESULTS

The AVC collection represents a variety of artifacts and ecofacts, including groundstone, flaked stone tools and debitage, brownware ceramic fragments, shell beads, quartz and calcite crystals, and faunal remains. The results of the authors field visit to CA-KER-2334 (i.e., site map, feature descriptions) are not presented here because it is no longer believed that the AVC collection originated from that portion of the Nettle Spring Site Complex.

Material Culture

Between 1971 and 1992, 59 artifacts disappeared from the AVC collection (Table 1). As determined by the authors from illustrations in the AVC catalog, some of the missing artifacts were temporally diagnostic (e.g., projectile points). With the exception of a clamshell disk bead and a quartz crystal, the items remaining in the collection at the time of the authors' analysis were relatively less "flashy" than many of the missing artifacts.

Groundstone. One sandstone and one metamorphic metate fragment, and one diorite and two quartzite mano fragments were cataloged in the AVC collection (Table 2). All groundstone artifacts were reportedly found on the surface. In addition, one groundstone artifact disappeared from the collection between 1971 and the time of this analysis (Table 1).

Table 1
COMPARISON OF ARTIFACTS PRESENT IN NETTLE SPRING SITE COMPLEX COLLECTION, 1971 AND 1992

Artifact/Ecofact	1971	1992	Net Gain/(Loss)
MAMMAL BONE	3	3	0
SHELL	2	2	0
CERAMICS	3	3	0
CRYSTAL			
Quartz	1	1	0
Calcite	7	7	0
GROUNDSTONE FRAGMENTS	6	5	(1)
HAMMERSTONE	1	0	(1)
FLAKED STONE			
Drill	1	0	(1)
Projectile points	13	1	(12)
Bifaces	6	1	(5)
Flake Tools	23	1	(22)
Cores	4	8	4
Debitage	882	861	(21)
TOTALS	952	893	(59)

Flaked Stone. Flaked stone artifacts in the collection include one projectile point fragment, one biface, one flake tool, eight multidirectional cores, and 773 pieces of debitage. Numerous flaked stone artifacts listed in the original catalog are not currently present in the collection, including one drill, 12 projectile points, five bifaces, 22 flake tools, and 21 pieces of debitage (Table 1).

The projectile point fragment is the distal end of an unknown type, is made of obsidian, measures 9.5 x 6.0 x 2.0 mm., and weighs 3.0 g. The biface is made of chalcedony, measures 32.0 x 25.0 x 8.0 mm., and weighs 8.9 g. Finally, the flake tool is also made of chalcedony, measures 38.5 x 23.5 x 9.0 mm., and weighs 7.5 g. All of these artifacts were recovered from the site surface.

Of the missing projectile points, four (one chalcedony, three obsidian) described in the AVC catalog are recognizable as Cottonwood Triangular projectile points, and five (all obsidian) as Rose Spring projectile points. The five missing bifaces were too fragmentary to classify from the illustrations. One of the Rose Spring points was reportedly found while screening and the remaining points were found on the surface.

Of the eight multidirectional cores in the collection, five are made of chalcedony, and one each of chert, basalt, and a green silicate (Table 3). All of the cores were recovered from the surface. The debitage consists primarily of chalcedony and obsidian, with lesser quantities of rhyolite/basalt, chert, and jasper (Table 4). Many chalcedony flakes were classified as cortical, and probably represent early stage reduction via percussion flaking. The average weight of chalcedony debitage is 2.8 g. The obsidian flakes are noticeably smaller (average 0.4 g.) than other flakes present in the collection (see Table 4), and probably resulted from bifacial reduction via pressure flaking or later stage percussion flaking. A single hammerstone was reported to have been collected, but this artifact is now missing from the collection (Table 1).

Table 2
ATTRIBUTES OF FRAGMENTARY GROUNDSTONE ARTIFACTS, NETTLE SPRING SITE COMPLEX

Catalog No.	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
METATES					
054	metamorphic	164.0	122.5	43.0	1,155.6
053	sandstone	80.0	61.0	36.5	221.3
MANOS					
008	quartzite	93.0	75.0	54.0	488.1
055	quartzite	104.0	71.0	59.5	503.6
052	diorite	89.0	50.0	42.5	248.4

Ceramics. The AVC collection contains three undecorated brownware fragments. All are fairly small (average sherd weight is 6.4 g.). Two of the fragments probably came from the same vessel, which, based on their curvature, was approximately 30 cm. in diameter. The third piece is a rim fragment from a thin, small bowl that was approximately 15 cm. in diameter. This fragment may have been burned. One ceramic fragment was reportedly found on the surface and two were found while screening.

Shell Ornaments. A single clamshell disk bead was cataloged and classified according to descriptions in King (1990) (Fig 2). The bead has an outside diameter of 10.5 mm., a perforation diameter of 3.0 mm., and a thickness of 2.5 mm. King (1990) noted that clamshell disk beads of this type were used in the Late Period (i.e., after A.D. 1000). In addition, one extremely thin fragment of shell, possibly part of an abalone (*Haliotis* spp.) ornament, is present in the collection. The dimensions of this fragment are 10.5 x 7.5 mm.; due to its small size, however, thickness could not be measured. Both of these artifacts were reportedly found on the surface.

Quartz Crystal and Calcite Crystal Rosette Manuports. One clear quartz crystal (Fig. 2) and eight small calcite crystal rosettes were cataloged by AVC. The quartz crystal measures 27.5 x 11.0 x 9.0 mm. and weighs 4.0 g. Calcite crystal rosettes are clusters of crystals originating from a central point to form a more or less spherical mass, and the eight specimens in the collection weigh an average of 6.3 g. No evidence of modification, mastic, or ocher staining was observed on any of the crystals. The crystals are

Table 3
ATTRIBUTES OF CORES, NETTLE SPRING SITE COMPLEX

Catalog No.	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
007	chalcedony	23.0	15.0	13.0	4.6
030	chalcedony	39.0	26.5	18.5	20.7
048	chalcedony	28.5	22.0	21.0	14.8
049	chalcedony	44.0	29.5	18.5	20.8
050	chalcedony	26.0	13.5	14.0	6.2
031	chert	31.5	21.5	27.5	16.1
038	basalt	39.0	32.5	22.0	30.2
011	green silicate	–	21.5	–	1.4

Table 4
SUMMARY OF DEBITAGE, NETTLE SPRING SITE COMPLEX

Material	N	Total Weight (g.)	Average Flake Weight (g.)
chalcedony	559	1,565.2	2.8
obsidian	214	85.6	0.4
rhyolite/basalt	66	363.0	5.5
chert	11	83.6	7.6
jasper	9	36.0	4.0

believed to be manuports because the rocks in the immediate area of the complex are volcanic tuff and sandstone, and are devoid of quartz. Small deposits of quartz crystal are common in the southern Sierra Nevada and eastern Tehachapi Mountains, and calcite has been observed by the senior author in limestone deposits approximately five km. south of the complex. One calcite crystal rosette and the quartz crystal were found while screening, and the remaining crystals were found on the surface.

Faunal Remains

Three fragments of large mammal bone were cataloged by AVC (average weight 1.5 g.). Two of the fragments were not identifiable even to the family level. The remaining bone fragment is likely a bighorn sheep metapodial, which had apparently been burned. The presence of a bighorn sheep skeletal element within the complex would be consistent with the findings of Siefkin and Sutton (1995), who tentatively identified seven or eight bighorn sheep bones found in a human cremation cairn/packrat nest at CA-KER-4168/H.

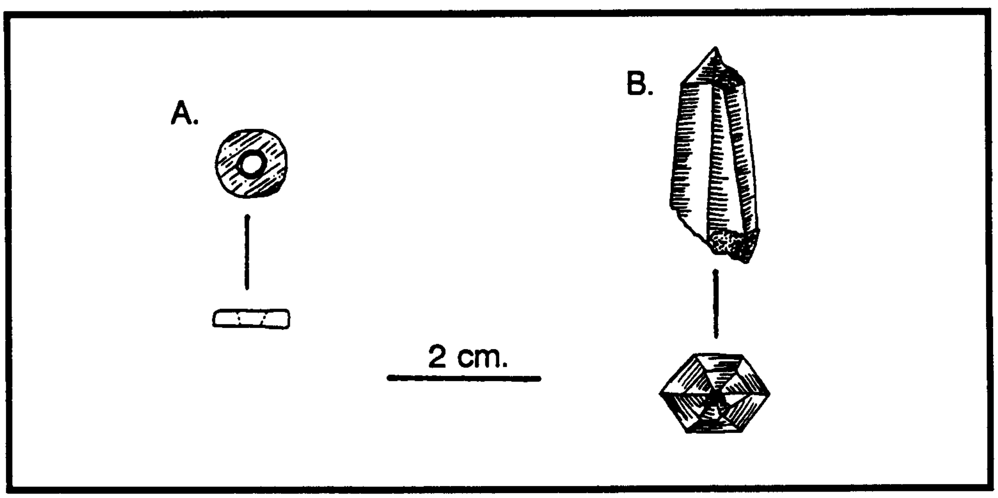

Fig. 2. Artifacts from the Nettle Spring Site Complex collection: (a) clamshell disk bead (Cat. No. 040); (b) quartz crystal (Cat. No. 026).

Obsidian Studies

All six obsidian flakes analyzed were sourced to the Coso Volcanic Field (Table 5). The Coso Volcanic Field is located approximately 120 km. north of the complex. Obsidian hydration rim measurements for these same samples ranged from 3.0 to 4.2 microns. With the exception of one flake (No. 29A), hydration rinds on the flakes fell within a remarkably narrow range, perhaps indicating that the obsidian debitage in the collection was deposited during a brief occupation of the location from which the materials were derived.

Table 5
RESULTS OF OBSIDIAN STUDIES, NETTLE SPRING SITE COMPLEX

Catalog No.	Laboratory No.[a]	Hydration Rind (microns)	Source
29A	BO-95-19-1	3.0±0.1	Coso
29B	BO-95-19-2	4.1±0.1	Coso
43A	BO-95-19-3	4.2±0.1	Coso
43B	BO-95-19-4	3.7±0.1	Coso
43C	BO-95-19-5	4.0±0.0	Coso
43D	BO-95-19-6	4.0±0.1	Coso

[a] Biosystems Laboratory No.

DISCUSSION

Temporally diagnostic artifacts present in the collection and noted (but missing) in the AVC catalog are the only means available to date the collection. Artifacts that are considered temporally sensitive include the clamshell disk bead, several Cottonwood Triangular and Rose Spring projectile points (missing), and the ceramic fragments. The presence of these late prehistoric artifacts provides evidence of a Late Period (post A.D. 500) occupation of the part of the complex from which the collection was obtained. Unlike collections reported by Pruett (1987), Ptomey (1991), and Siefkin and Sutton (1995), articles of European or Euroamerican manufacture are not present in the AVC collection. The authors did not attempt to assign dates to the obsidian hydration rind measurements; however, the narrow range represented by five of the six samples is suggestive of short-term aboriginal use of the location from which the flakes were collected.

Trade with neighboring groups is evinced by the presence of Coso Volcanic Field obsidian and marine shell ornaments. The presence of ceramic fragments indicates the adoption of a technology developed by agriculturalists in the Southwest and Mesoamerica, but not necessarily direct contact with agriculturalists. The inhabitants of the complex probably used ceramics in a manner similar to other groups (e.g., cooking, transport of food and water, storage). Ceramics may also be indicative of a sedentary or semi-sedentary lifeway. The remaining materials in the collection appear to have been locally available.

The presence of portable milling equipment (i.e., metate and mano fragments) is evidence that processing of plant foods, such as acorns and grass seeds, likely occurred at the complex. Further evidence of plant processing is provided by the presence of numerous bedrock mortars at CA-KER-230 and CA-KER-2334.

The predominance of large, cortical chalcedony flakes in the collection suggests that early stage reduction of this material was occurring in this area. Conversely, the high frequency of small, late stage, biface thinning obsidian flakes leads to the conclusion that obsidian flakes or preforms were obtained, then used in the local manufacture of projectile points, such as those recorded by AVC. All obsidian tested is from the Coso Volcanic Field, as was the case at CA-KER-339 (Pruett 1987). Chalcedony and jasper materials probably came from the nearest quarry, CA-KER-1896 (the Horse Canyon Agate Quarry) and/or from other silicate quarries located within a few kilometers of the complex.

As is the case with many modern stone knappers, obsidian appears to have been the preferred material for projectile point manufacture at the complex. This pattern is also found in other sites in the area. For example, at CA-KER 2357, Ptomey (1991) found that 72 percent of the projectile points were obsidian, many of them Cottonwood Triangular and Desert Side-notched types.

CONCLUSIONS

Based upon the authors' analysis of the AVC collection, the following conclusions have been drawn: (1) the collection probably was not obtained from CA-KER-2334, but was taken from within the bounds of the Nettle Spring Site Complex; (2) a Late Period component is present, but the complete temporal span represented in the collection is unknown; (3) food plants such as acorns or grass seeds were likely processed at the location where the collection was made; (4) early stage lithic reduction/production occurred using local siliceous materials; (5) obsidian flakes or preforms were obtained directly, or via trade, from the Coso Volcanic Field for the production of projectile points on site; and (6) the site inhabitants preferred obsidian for projectile point manufacture.

An unknown amount of archaeological data was irretrievably lost during the collection and curation of the AVC collection. Fifty-nine artifacts, several of them temporally sensitive, disappeared from the collection between 1971 and 1992. This phenomenon can best be described as "post-sampling entropy." Having witnessed the results of poor data recordation and "loose" curation practices firsthand, the authors implore readers to take the time necessary to record all pertinent data, and ensure that collections are secured and periodically monitored for evidence of theft.

ACKNOWLEDGEMENTS

We express our appreciation to Dr. Mark Sutton for his support during the analysis and writing phases of this effort. We thank Jill Gardner, Robin Tidmore, and the *Journal* editors for reviewing the manuscript. An earlier version of this paper was presented at the 1993 annual meetings of the Society for California Archaeology, Asilomar.

REFERENCES

Hinshaw, Jay M.

1992 CA-KER-2334 Archaeological Site Record Update. Report on file at the Southern San Joaquin Valley Information Center, California State University, Bakersfield.

Holland, Robert F.

1986 Preliminary Descriptions of the Terrestrial Natural Communities of California. Sacramento: California Department of Fish and Game.

King, Chester D.

1990 The Evolution of Chumash Society: A Comparative Study of Artifacts Used for Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804. New York: Garland Press.

Osborne, Richard

1994 Preliminary Report on the Archaeological Collection from CA-KER-769, Sand Canyon, California. Paper presented at the annual meetings of the Society for California Archaeology, Ventura.

Pruett, Catherine Lewis

1987 Aboriginal Occupation in Sand Canyon. Master's thesis, California State University, Bakersfield.

1988 CA-KER-2334 Archaeological Site Record. Report on file at the Southern San Joaquin Valley Information Center, California State University, Bakersfield.

Ptomey, Kathy

1991 Archaeological Investigations at CA-KER-2357, Sand Canyon, California. Pacific Coast Archaeological Society Quarterly 27(1):39-72.

Siefkin, Susan Kerr and Mark Q. Sutton

1995 An Isolated Cremation from Sand Canyon, Tehachapi, California. Kern County Archaeological Society Journal 6:41-51.

Sutton, Mark Q.

1981 Bighorn Sheep Rock Art from the Southern Sierra Nevada. The Masterkey 55(1):13-17.

1982 Kawaiisu Mythology and Rock Art: One Example. Journal of California and Great Basin Anthropology 4(1):148-154.

Zigmond, Maurice L.

1978 Kawaiisu Basketry. The Journal of California Anthropology 5(2):199-215.

1981 Kawaiisu Ethnobotany. Salt Lake City: University of Utah Press.

1986 Kawaiisu. In: Handbook of North American Indians, Volume 11, Great Basin, Warren L. d'Azevedo, ed., pp. 398-411. Washington, D.C.: Smithsonian Institution.

EARLY SALVAGE ARCHAEOLOGY IN KERN COUNTY: INVESTIGATIONS AT THE BUENA VISTA GOLF COURSE SITE (CA-KER-240), CALIFORNIA

Nelson Siefkin and Gerrit L. Fenenga, Dept. of Sociology and Anthropology, CSU Bakersfield
Jay C. von Werlhof, Imperial Valley College Desert Museum

INTRODUCTION

In October of 1959, Jay C. von Werlhof and students from the College of the Sequoias (COS) in Visalia, California salvaged several burials from an aboriginal cemetery located on the Buena Vista Golf Course property in southwestern Kern County, California. The cemetery had been discovered by golf course employees when human remains were exposed during the construction of a rabbit trap. The site was subsequently recorded as CA-KER-240. While the results of the salvage excavation were never formally published, von Werlhof (1960) did prepare a fairly detailed report on the project.

The purpose of this paper is to make other researchers aware of these data and to summarize the results of the salvage excavation, with particular emphasis on the description of burials and associated funerary objects. Researchers who wish to consult the original manuscript can do so at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.[1] As with most areas of California, the majority of the archaeological data from the southern San Joaquin Valley is in the gray literature, and is not readily accessible to researchers. However, several articles were recently published that presented (or re-presented in modern standards) data collected by earlier archaeologists (e.g., Clift et al. 1992; Estep 1993; Siefkin 1995a, 1995b, 1995c). In the case of this study, von Werlhof obtained detailed information under difficult (at best) conditions and presented those data in a useful format.

SITE DESCRIPTION

CA-KER-240 is located in a small gully in the Elk Hills at an elevation of 105 m. (342 ft.) (Fig. 1). The site is located at the western edge of the Buena Vista Golf Course. Site disturbances include damage by heavy equipment, pothunting, and natural erosion. Before extensive water diversions in the late 1800s, this location was close to the northern shoreline of Buena Vista Lake. As evinced by the distribution of cultural remains, CA-KER-240 measured 15 by 10 m. in diameter. The site soil was a sandy, loose matrix underlain by an "alkali/borax," and the surrounding vegetation was "chaparral" (i.e., *Atriplex*). Evidently, CA-KER-240 represents a discrete cemetery, as typical midden constituents were rare. A large occupation site is located ca. 0.4 km. to the east of CA-KER-240, and CA-KER-240 may have served as a cemetery for inhabitants of that site or others nearby.[2] Discrete burial and habitation areas have been previously recognized by other researchers in the Buena Vista Basin (e.g., Gifford and Schenck 1926; Wedel 1941; Walker 1947). Given the extent of disturbance at CA-KER-240, it is unlikely that undisturbed portions of the site remain. However, due to the focused (i.e., salvage of burial data) and necessarily hurried nature of the project, no attempt was made to determine the full site parameters.

EARLY SALVAGE ARCHAEOLOGY IN KERN COUNTY: INVESTIGATIONS AT THE BUENA VISTA GOLF COURSE SITE (CA-KER-240), CALIFORNIA

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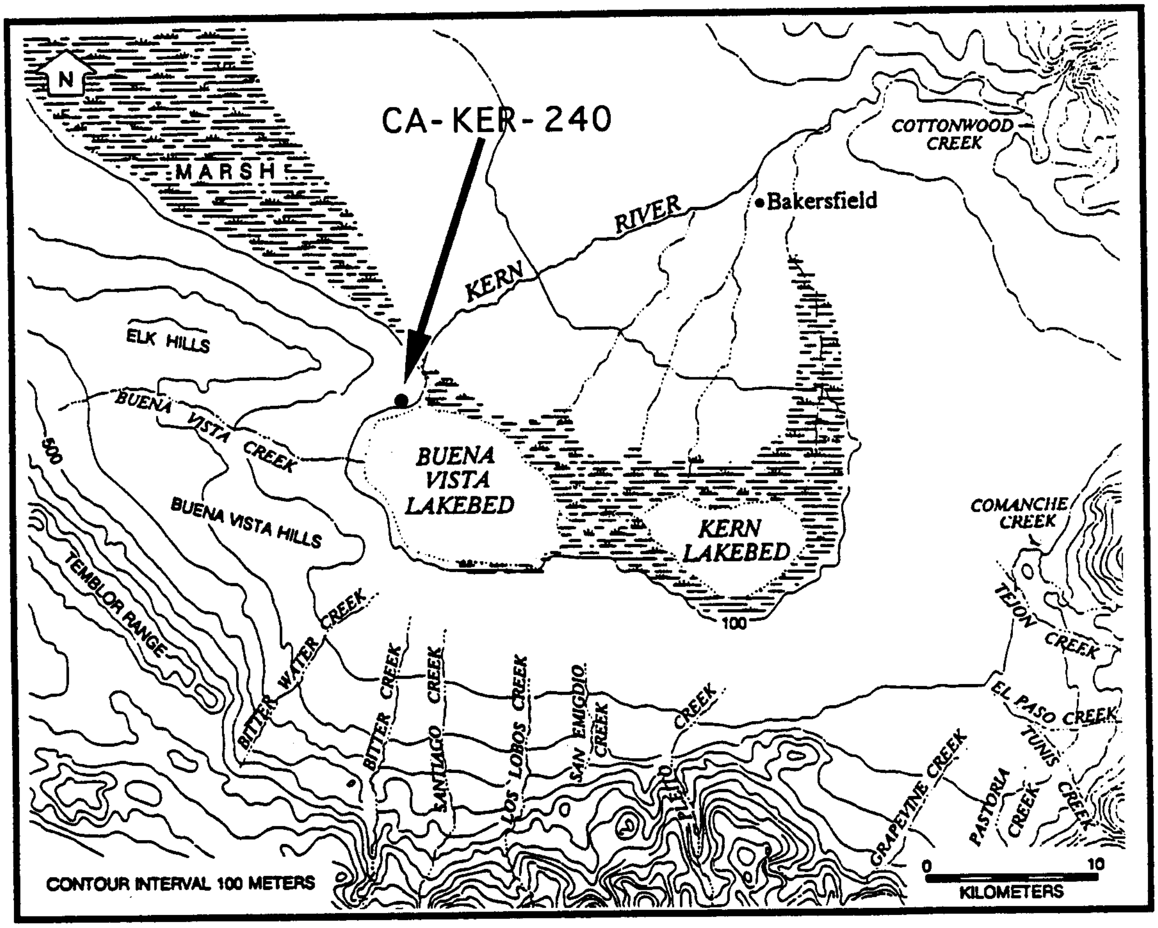

Fig. 1. The Buena Vista Basin and location of CA-KER-240 (adapted from Hartzell 1992:50).

HISTORICAL CONTEXT

As mentioned, CA-KER-240 is located near the former northwestern shoreline of Buena Vista Lake. Buena Vista Lake, along with the adjacent Kern Lake, Kern River, and Buena Vista Slough, comprised a high biomass aquatic ecosystem (Fig. 1). In addition, Buena Vista Lake is in close proximity to a suite of resources available in the plains of the southern San Joaquin Valley and uplands of the Transverse and Coastal Ranges (Hartzell 1992).

Ethnographically, the area surrounding CA-KER-240 was held by the Tulamni tribelet of Southern Valley Yokuts (Kroeber 1925:478; Gayton 1948; Latta 1977:228). The exact configuration of Tulamni territory is not known, but it probably extended west to the Temblor Mountains, south to the Transverse Range, east to Kern Lake, and no further north than Goose Lake. The Tulamni are reported to have held villages throughout the territory, although their main village, Tulamniu, was located on the northern shoreline of Buena Vista Lake at the base of the Elk Hills. Some researchers (e.g., Latta 1977:228) contended that Tulamniu was located at the base of the Buena Vista Hills on the southern shoreline of the lake. However, archaeological and ethnohistorical evidence suggests that Tulamniu was actually located in the Elk Hills during the historic period (Walker 1947; Dieckman 1973, 1977). Almost a century of professional and clandestine excavation and collection at sites along the base of the Elk Hills have produced countless artifacts, shell beads in particular. The sheer quantity of these goods suggests that, at least in late prehistoric times, Tulamniu was important as a trade center.

Compared with the rest of the southern San Joaquin Valley, the archaeological sites in the Buena Vista Lake area have received a fair amount of attention (see Hartzell 1992:121-139). Archaeological evidence suggests that Buena Vista Lake was occupied (with perhaps some interruptions) from the early Holocene through historic times (Hartzell 1992). The CA-KER-240 materials are germane to several research questions/topics that resulted from earlier investigations. First, CA-KER-240 is in a similar locational setting to discrete, late prehistoric/historic cemeteries excavated (or reported) by Wedel (1941 [CA-KER-40, 41, 42]) in the Buena Vista Hills, and Walker (1947 [CA-KER-64]), Nels Nelson (Kroeber 1951; cf. Gifford and Schenck's [1926:41] Site 14 [CA-KER-49]), and Gifford and Schenck (1926:41 [Site 15]) in the Elk Hills. In these cases, cemeteries are located on hills or knolls well above the shoreline of Buena Vista Lake, rather than close to the former shoreline (as habitation sites tend to be). In this respect, CA-KER-240 adds to existing knowledge of late prehistoric land use and burial practices in the Buena Vista Basin.

Second, investigations in the Elk Hills (e.g., Walker 1947; Dieckman 1973, 1977) and Buena Vista Hills (e.g., Wedel 1941; Hartzell 1992) suggest settlement pattern variation in the Buena Vista Basin through time. Sites at the base of the Buena Vista Hills have produced materials that date from the early Holocene through historic times. However, the most intensive settlement at these sites may have occurred during the Middle Period (ca. 2,000 to 1,000 B.P.), with less intensive use in the Late Period (ca. 1,000 B.P. to historic). Sites in the Elk Hills to the east and west of CA-KER-240 have produced abundant evidence of protohistoric and historic aboriginal occupation (e.g., CA-KER-49, -64, -450; see Gifford and Schenck 1926; Walker 1947; Dieckman 1973, 1977), but little earlier material, though this may be a function of sampling error. Interestingly, the Buena Vista Hills habitation sites tend to be restricted along the upper shoreline of Buena Vista Lake (i.e., 86.2 m. to 92.3 m. [280 to 300 ft.]), while those in the Elk Hills extend from the upper shoreline to elevations above 107.7 m. (350 ft.). The reasons for the difference are not yet clear, but may be related to the stability of the water level in Buena Vista Lake (Siefkin 1995d:33-34). CA-KER-240 may contribute additional information towards the apparent late Holocene demographic shifts.

Third, numerous burials exhumed from the Buena Vista Basin (including several from CA-KER-240) were interred with perishable goods such as textiles, tule matting, and wooden implements (e.g., Gifford and Schenck 1926:66, 99; Wedel 1941:109, 116-120, 126-127; Walker 1947:5-6; Kroeber 1951). At Site 3 (CA-KER-40) in the Buena Vista Hills, 76 percent (n=271) of the excavated burials were accompanied by woven textiles, tule matting, or both (Wedel 1941:109). No other type of burial good comes close to this abundance; only 16 percent (n=58) of the burials were found with shell beads or ornaments. The presence of perishable material is likely suggestive of very recent occupation, perhaps during the historic period. For instance, a cotton cloth garment recovered from burial context in the Elk Hills was believed to have come from the American Southwest (Gifford and Schenck 1926:104). This specimen may have arrived in the San Joaquin Valley as a result of the horse trade carried on between natives of the San Joaquin Valley and Southwest in the early 1800s; horses stolen from the coastal missions and ranchos were exchanged for textiles (see Phillips 1993).

The presence of abundant perishable materials in these graves and others in the Buena Vista Basin have important implications for the study of mortuary patterns. In California, the types and quantities of grave goods interred with an individual are taken to be reflective of that person's position within society (e.g., L. King 1969; T. King 1970; C. King 1990). While this may work well for durable grave goods, the loss of perishable items such as feathers and baskets remains a major impediment to a more complete understanding of aboriginal burial practices (e.g., Milliken and Bennyhoff 1993:386). CA-KER-240 provides additional data on the use of perishable goods as mortuary offerings in the Buena Vista Basin, and serves (along with other similar cemeteries in the Buena Vista Basin) as a cautionary lesson about the reliability of imperishable grave lots for inferring economic or social status in prehistoric populations.

FIELD AND LABORATORY METHODS

Unfortunately, the urgent nature of this salvage project dictated that most attention be paid to those areas where burials had been previously exposed (and often removed) and the surrounding, heavily disturbed matrix. Thus, the amount and types of data obtained were necessarily limited.

On October 22, 1959, a crew (under the direction of greenskeeper Harry Hughes) working with a tractor on the western edge of the Buena Vista Golf Course exposed a human skeleton. Excavation was resumed with shovels, and two more burials were exposed. The California Highway Patrol was summoned and the skeletons were collected for analysis. When it was determined that the skeletons were aboriginal, Hughes was informed that excavation could continue, and he requested the assistance of Richard Bailey, curator at the Kern County Museum. Upon Bailey's arrival at the site, Hughes had exposed another burial (Burial 5, Pit 4), which Bailey photographed. Over the next several days, seven or eight burials were removed by collectors from the site and two others were exposed and reburied several times (Burials 6 and 7, Pit 8).

The volunteer crew from COS excavated at the site on October 31, 1959. A baseline (marked in five-foot intervals) was created down the center of the gully, with the most easterly point serving as datum (Fig. 2).[3] Five 5 x 5 ft. units were excavated (Pit Nos. 0, 1, 2, 4, and 8; see Fig. 2). Units were placed in areas where burials had been previously discovered and disturbed, although heavy ground disturbance made determination of the original burial locations difficult. Only in the case of Test Unit 1 was the precise burial orientation (i.e., the direction in which the burial's head pointed) known. Furthermore, previously undisturbed burials were encountered only in Test Unit 0 (Burials 1 and 2). Shovel test pits were employed in the disturbed areas between the test units, but no additional burials were encountered.

For each unit, the highest corner served as level control datum, while lateral control was determined from the northeast corner. Four crew members worked each unit; two excavated with trowels, one removed detritus with a flat shovel and screened, and a fourth screened and bagged recovered materials. Excavation proceeded in 6-in. (15-cm.) levels. All matrix was passed through 1/4-in. mesh, and retained cultural materials were bagged and labeled. In general, the upper soil layers were very loose and passed easily through the screens. Two units were excavated simultaneously, and the project director (von Werlhof) kept notes on the excavation of each. Where such data could be obtained, drawings of burials and associated goods were made, although only a portion of these illustrations are reproduced in this article.[3]

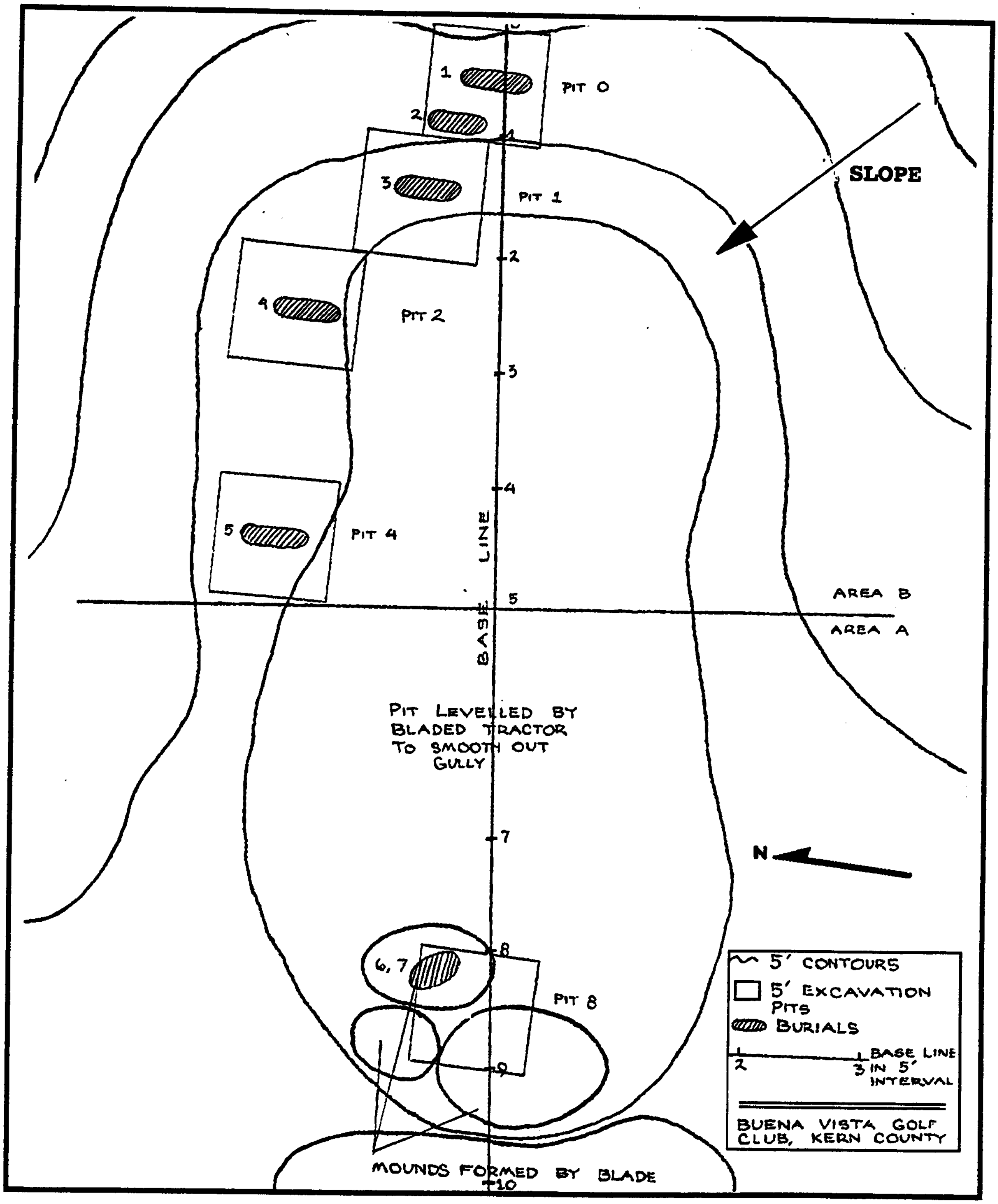

Fig. 2. Site map of CA-KER-240 showing the location of burials and test units.

After removal of the disturbed burials, Test Units 1, 2, 4, and 8 were excavated to the alkali/borax layer in an effort to locate undiscovered burials. Collectors had previously removed seven or eight burials in the general area of these units. However, controlled excavation failed to produce any further human remains.

Laboratory methods used at CA-KER-240 were quite simple; most artifacts recovered received field numbers, were described, and illustrations made. After description, some materials were discarded in the field, while other artifacts and ecofacts were brought to COS and curated. Beyond simple description, none of the artifacts or ecofacts was subjected to special analyses, and the human skeletal materials were not analyzed in detail. Later, the collection was deposited at the Robert H. Lowie Museum (now Phoebe A. Hearst) at the University of California, Berkeley. The current status of the CA-KER-240 collection at the Hearst Museum is unknown.

In addition, von Werlhof was able to describe some artifacts which had been removed from CA-KER-240 by private collectors. Unfortunately, many other artifacts disappeared from the site as a result of vandalism, and were not available for analysis.

RESULTS OF THE SALVAGE EXCAVATION

Description of Burials

Sufficient information was obtained to report on seven burials from CA-KER-240, although at least twice that number were evidently removed from the site. As mentioned, the mechanical and human disturbances inflicted on the area prior to the COS salvage work greatly affected the amount and quality of data which could be gained for each burial. Burials described below retain designations applied by von Werlhof (1960) (see Fig. 2 for reference locations).

A variety of artifacts and ecofacts was recovered during excavation. Because most excavation was carried out in areas where burials had been previously discovered, all of the recovered items were assumed to have been burial associated. In the original report, von Werlhof (1960) depicted numerous items recovered during the burial excavations; however, only illustrations of those artifacts with demonstrated temporal or cultural significance are reproduced below.

Pit 0, Burial 1. Burial 1 was one of two burials that had not been previously disturbed. The burial was interred at a depth of 66 cm. (26 in.) in a semi-extended position. It lay on its back, with knees flexed upward and head oriented to the north (Figs. 3, 4). The upper portion (at least) of the skeleton was covered by a fragile mat of tule (*Typha* or *Scirpus*). The burial was also covered entirely with ocher, though in varying concentrations. The occurrence of ocher stratigraphically *beneath* the tule matting suggested that the ocher was applied prior to the matting.

Burial 1 was accompanied by several other artifact types. Included were nine *Haliotis* pendants which fall into two morphological types (Fig. 5). All appear to be made from a portion of the rim of *Haliotis* shells. One group of four specimens (von Werlhof 1960:Plates 3-4, field nos. 1, 5, 6, 9) have a single perforation at one end and resemble Gifford's (1947) type AP2aII. Ornaments of this type have been found in other late prehistoric/historic contexts in the central and southern San Joaquin Valley (e.g., Riddell 1951:17; Pritchard 1970:Fig. 23). A second type includes four specimens (von Werlhof 1960:Plates 3-4, field nos. 2, 3, 4, 8) which have two perforations at one end. A brief review of the literature revealed no comparable specimens of this type from other collections. The remaining specimen (von Werlhof 1960:Plate 4, field no. 7) is fragmentary, and cannot be readily assigned to either of these types. In addition, 17 *Olivella* beads accompanied Burial 1. These cannot be accurately typed from the original illustration (von Werlhof 1960:Plate 5, field nos. 14, 17), but are made from the shell wall and appear to be small saucers or disks.

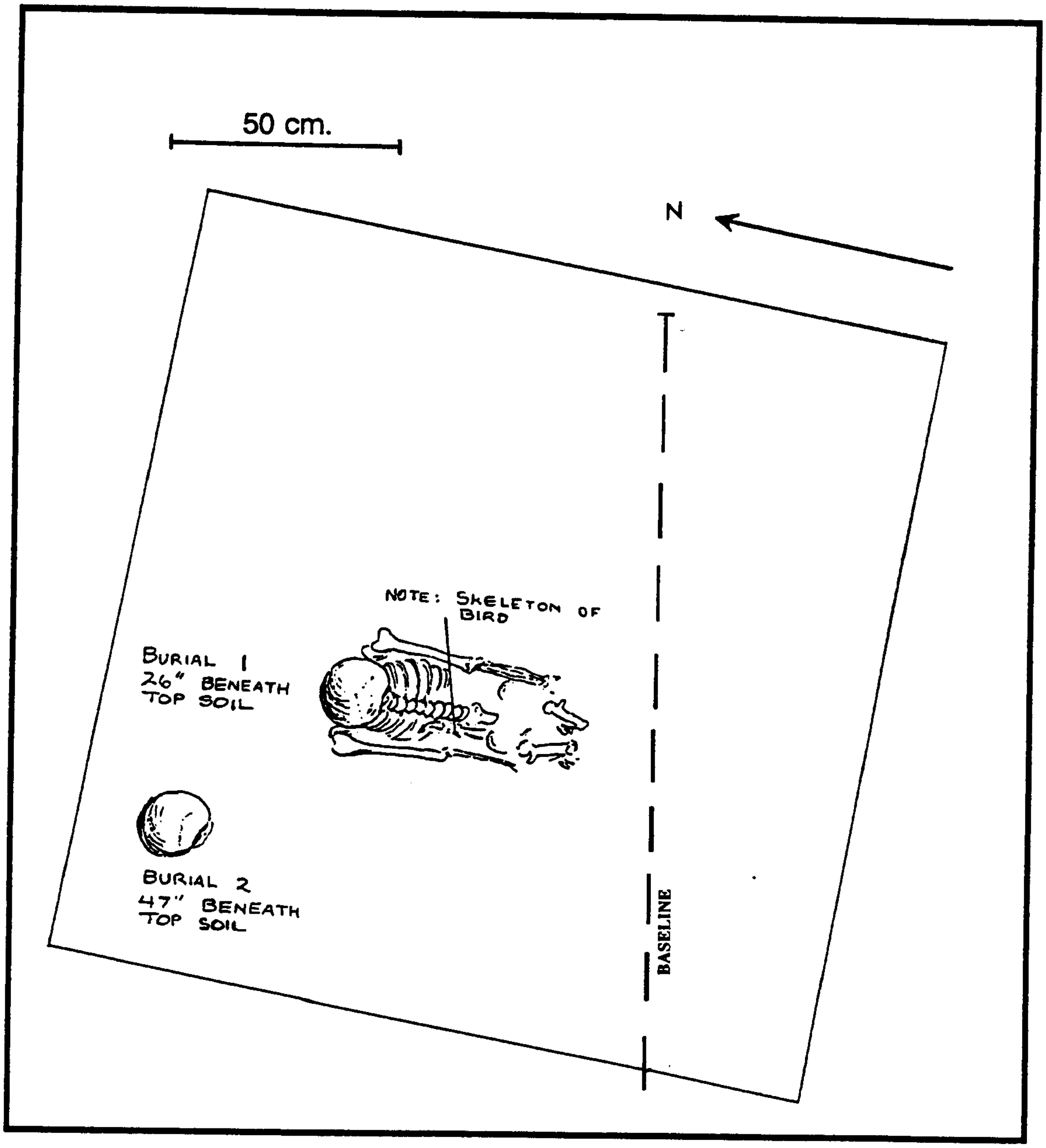

Fig. 3. Plan view of Burials 1 and 2, Test Unit 0, CA-KER-240.

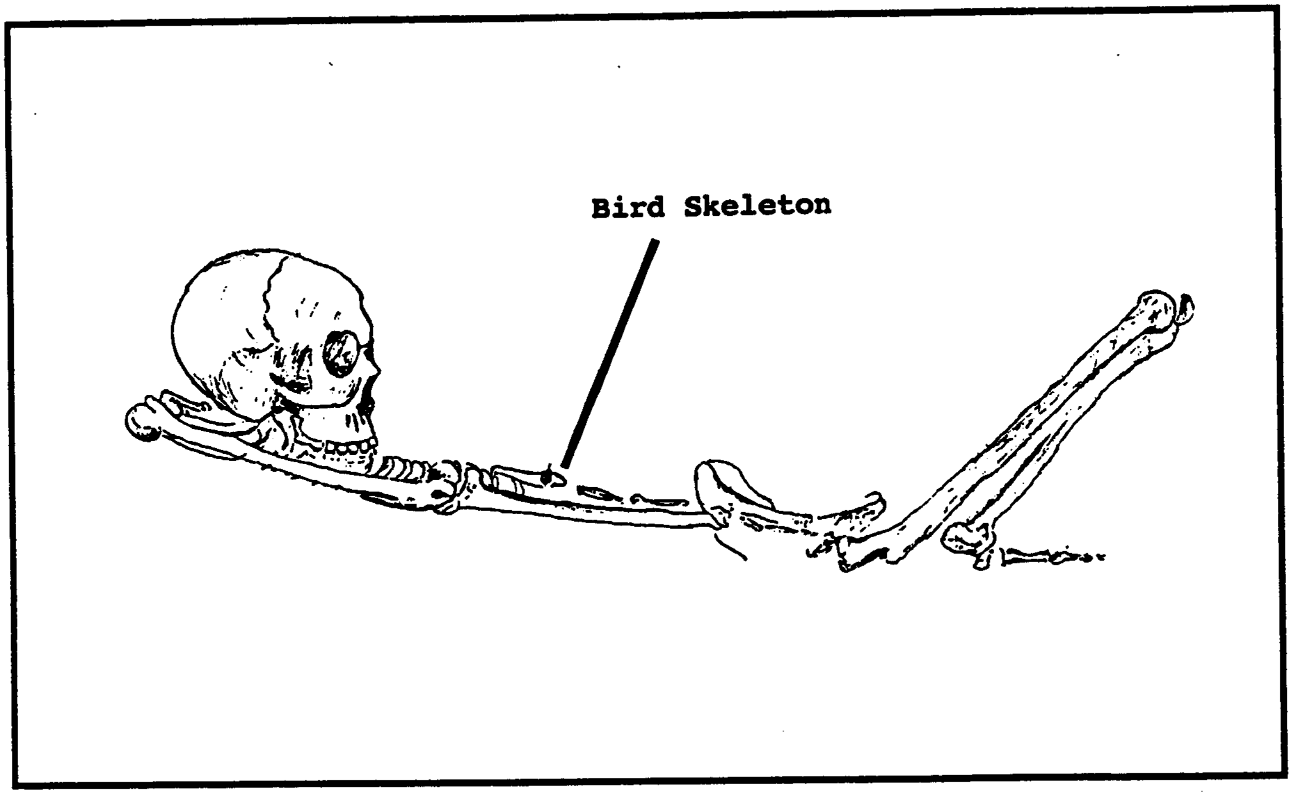

Fig. 4. Cross section of Burial 1 and associated bird skeleton, CA-KER-240 (no scale).

Also associated with Burial 1 was the partial skeleton of a bird (see Fig. 4). Based on comparison with the illustration in the original report (von Werlhof 1960:Plate 6, field no. 18), the authors tentatively identified the species as a double-crested cormorant (*Phalacrocorax auritus*) (Fig. 6). Cormorant remains have been recovered in low numbers from Buena Vista Basin middens (e.g., Hartzell 1992:188), and cormorants are known to have nested historically in the southern San Joaquin Valley (e.g., Goldman 1908:201; Linton 1908:196). Other burials from the southern San Joaquin Valley have been recovered with the skeletons or elements of fauna (e.g., Kroeber 1951:8-9; Riddell 1951:11). These may reflect the totemic affiliation of the deceased (e.g., eagle remains interred with those of a chiefly lineage), be related to a special position held by the deceased (e.g., weasel with shaman), or simply have been pets. Cormorants are not mentioned as having special significance to the Yokuts or adjacent groups in the published ethnographic literature.

Also present was a single agate (i.e., chalcedony/chert) flake that appeared to have been utilized, two pieces of asphaltum, two flattened stones, a whole freshwater mussel shell (*Anodonta* or *Gonidea*), and a small, and very thin shell "flake."

Pit 0, Burial 2. Burial 2 was found adjacent to Burial 1, but at a greater depth (Fig. 3). This burial was exposed to the base of the skull, but further removal was halted due to darkness. The skeleton was eventually removed by Hughes, but no additional notes or maps were produced. The cranium was encountered at a depth of 117 cm. (46 in.) below surface.

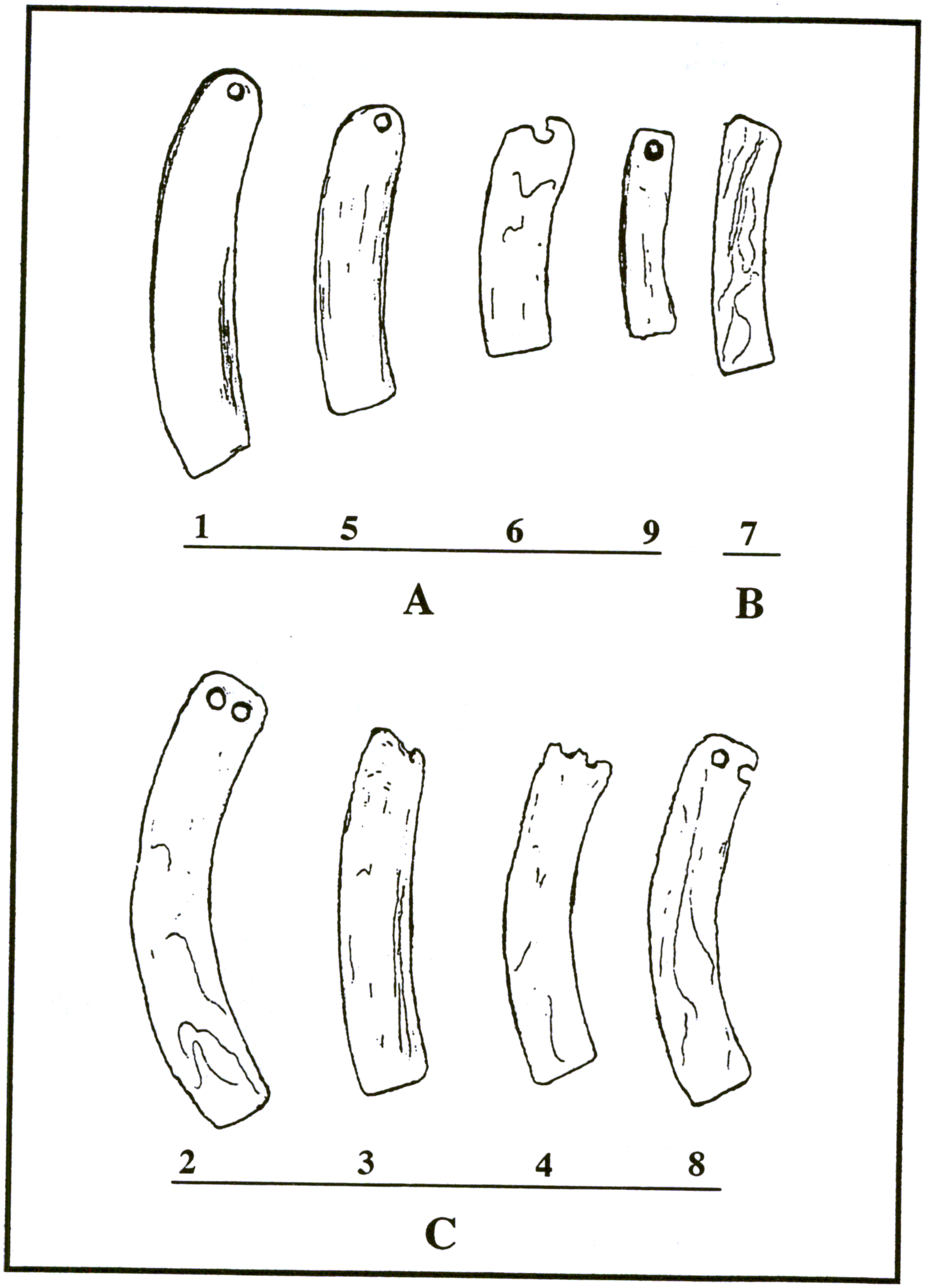

Fig. 5. *Haliotis* ornaments associated with Burial 1, CA-KER-240: (a) rim ornaments, single perforation (field nos. 1, 5, 6, 9); (b) fragmentary specimen (field no. 7); (c) rim ornaments, double perforation (field nos. 2, 3, 4, 8).

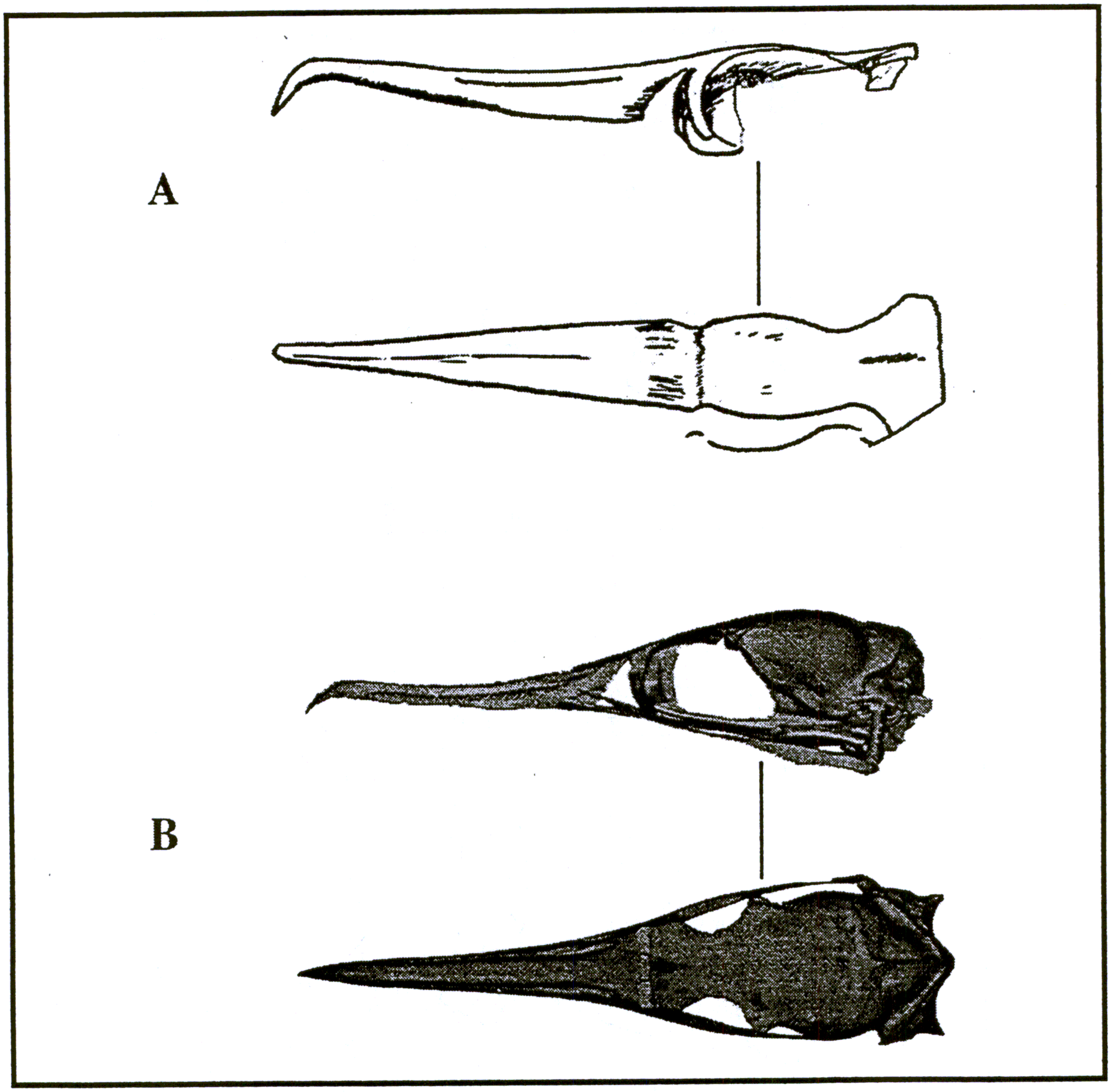

Fig. 6. (a) Cranium of bird associated with Burial 1, CA-KER-240; (b) Cranium of double-crested cormorant (Olsen 1979:64, Fig. 5) (no scale).

During the initial exposure of this burial, slight traces of badly decomposed tule matting were noted at the base of the cranium, as was staining of ocher or some other red pigment. Further, the cranium appeared to have been placed within a "tule reed basket" at the time of interment, although severe decomposition of the vessel had occurred. Hughes reported that several chunks of asphaltum were found associated with the base of the cranium.

Pit 1, Burial 3. Burial 3 had been disturbed by vandals the week prior to the salvage excavations. A 5 x 5 ft. unit was staked out in the location from which the burial had been removed and the disturbed matrix was excavated in arbitrary 6-in. (15-cm.) levels. In the upper 12 in. (30 cm.), several pieces of tule matting and "bound tule reed" were recovered, along with the remnants of a cedar (Juniper [*Juniperus*]) post. Screening of matrix within the burial area yielded a variety of cultural materials, including several pieces of human (some with attached soft tissue) and non-human bone, two projectile points, and numerous unmodified stones.

One of the projectile points recovered (von Werlhof 1960:Plate 13, field no. 43) is the distal end of a chert Cottonwood Triangular arrowpoint (Fig. 7; cf. Tulamniu Cottonwood Series [Hartzell 1992:236]). Cottonwood Triangular points are extremely common from late Holocene sites in the Buena Vista Basin (e.g., Gifford and Schenck 1926:84, 85; Wedel 1941:160, Table 8; Hartzell 1992:236). Though generally believed to have been used only since ca. 500 B.P., two Cottonwood Triangular points were found in association with a radiocarbon date of 1,200 ± 160 B.P. at CA-KER-39 on the southwestern shoreline of Buena Vista Lake (Hartzell 1992:173). The other projectile point (von Werlhof 1960:Plate 16, field no. 74) is a nearly complete obsidian Desert Side-notched arrowpoint (Fig. 7). Desert Side-notched points are probably contemporaneous with Cottonwood Triangular points, although they are much rarer in the Buena Vista Basin than adjacent areas such as the southern Sierra Nevada (e.g., Moratto 1972:249). The fact that this specimen is manufactured from obsidian implies that this point was probably made elsewhere; the vast majority of Cottonwood Triangular projectile points from the Buena Vista Basin are made from locally available "Temblor" chert (see Scott 1994).

Juniper grave markers or posts are common constituents in late prehistoric/historic cemeteries in the Buena Vista Basin (e.g., Wedel 1941; Walker 1947). Juniper could have been obtained in the nearby Transverse and Temblor Ranges.

Pit 2, Burial 4. Burial 4 was removed by vandals and little information on its original context could be extracted. von Werlhof was informed that the skeleton had been covered with a tule matting, and that an unknown number of beads and projectile points were interred as grave goods. Excavation in the general vicinity of the burial yielded only small pieces of tule matting, juniper fragments, several unmodified stones, and three unidentified bones.

Pit 4, Burial 5. Information on Burial 5 was obtained from photographs taken by Richard Bailey after the burial had been completely exposed.[4] Burial 5 was interred resting on its back, with partial flexure, and head oriented to the north. A tule "basket" was reportedly placed over the head of the burial, and the body was wrapped in an unspecified organic matting. Figure 8 is an illustration produced by von Werlhof from a photograph taken by Bailey after removal of the "basket."

Interestingly, Hughes noted nine projectile points embedded within the skeleton of Burial 5. The embedded points were restricted to the upper body and cranium; one in the left side of the mandible, one in the second thoracic vertebra, one in each innominate, one in the distal portion of the left ulna, and two in each scapula. Additional trauma included a large (ca. 5 cm. long), vertically oriented "crease" behind the right ear.

Other associated artifacts recovered by Hughes included a wooden, barbed "harpoon" point (or fish hook), a possible broken bone "whistle," 11 additional projectile points, 6 small shell beads (species and

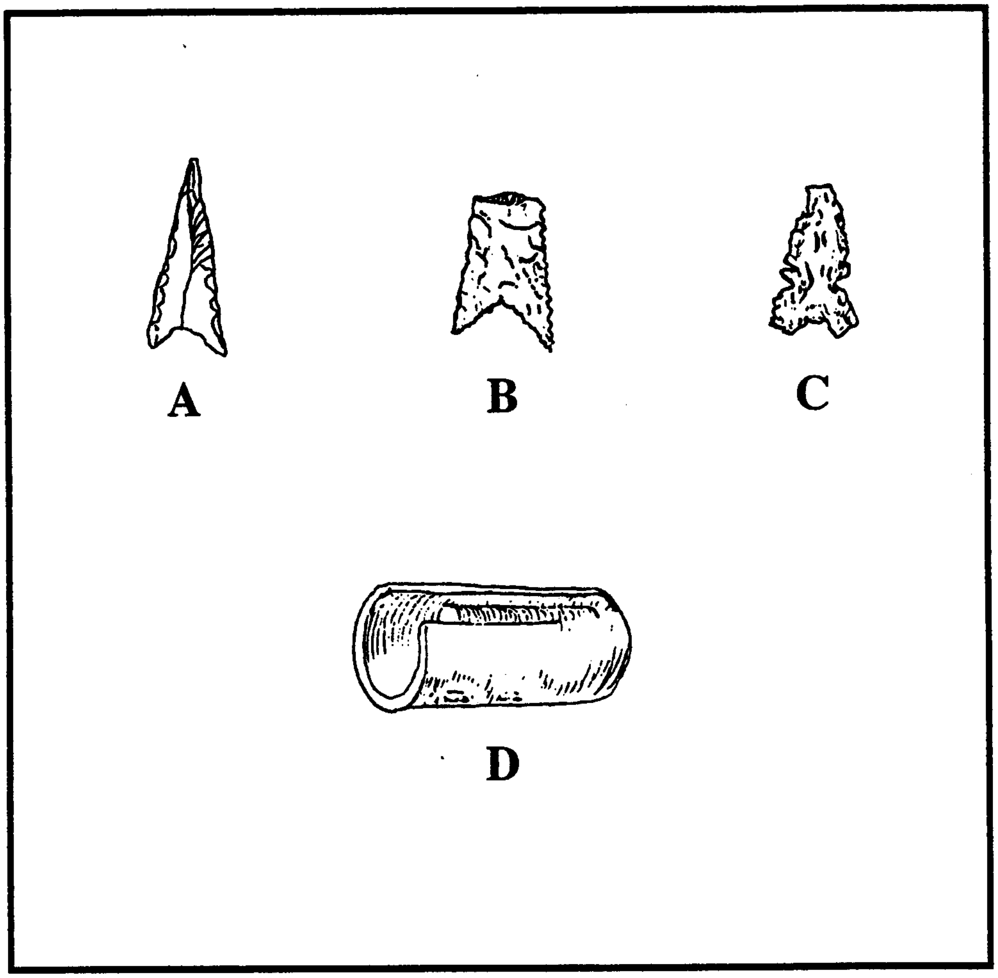

Fig. 7. Miscellaneous artifacts associated with Burials 3, 5, 7 and 8, CA-KER-240: (a) Cottonwood Triangular projectile point (field no. 171), Burials 7 and 8; (b) Cottonwood Triangular projectile point (field no. 43), Burial 3; (c) Desert Side-notched projectile point (field no. 74), Burial 3; (d) bone "whistle," (field no. 105), Burial 5 (no scale).

type unreported), and a lump of unidentified brown material (located in the "crook" of the left arm). The specimen originally identified as a wooden harpoon point is of interest because it is a unique specimen (Fig. 9). Manufactured of wood, it again serves to remind us of the perishable nature of much of the material culture of Native Californians. The authors know of no counterpart in the local archaeological record. However, Heizer and Krieger (1956:143, Plate 11, Specimen C; see also Bennyhoff 1950:337, Fig. 7, Specimen O) illustrated a composite, barbed fishhook from Humboldt Cave, Nevada (Fig. 9). Although made of bone, this artifact closely resembles the wooden specimen from CA-KER-240. The possible bone "whistle" is a mid-section of the ulna of a very large bird (as determined by the wide breadth of the ulnar shaft and large size of the quill knobs) (Fig. 7). The artifact has at least one drilled or punched circular perforation on the middle portion of the shaft, and it somewhat resembles ethnographic examples of bird bone whistles (e.g., Barrett and Gifford 1933:337). However, identification of this artifact as a whistle should be considered tentative at this time.

All of the 11 projectile points available for description (i.e., those not embedded in the skeleton; von Werlhof 1960:Plates 22-23, field nos. 106-116) appear to be Cottonwood Triangular arrowpoints, or fragments thereof (Fig. 10). Material was not unequivocally identified for any of the points (most were likely chert). One projectile point (field no. 109) had a residue of asphaltum, or other hafting aid, on its distal end.

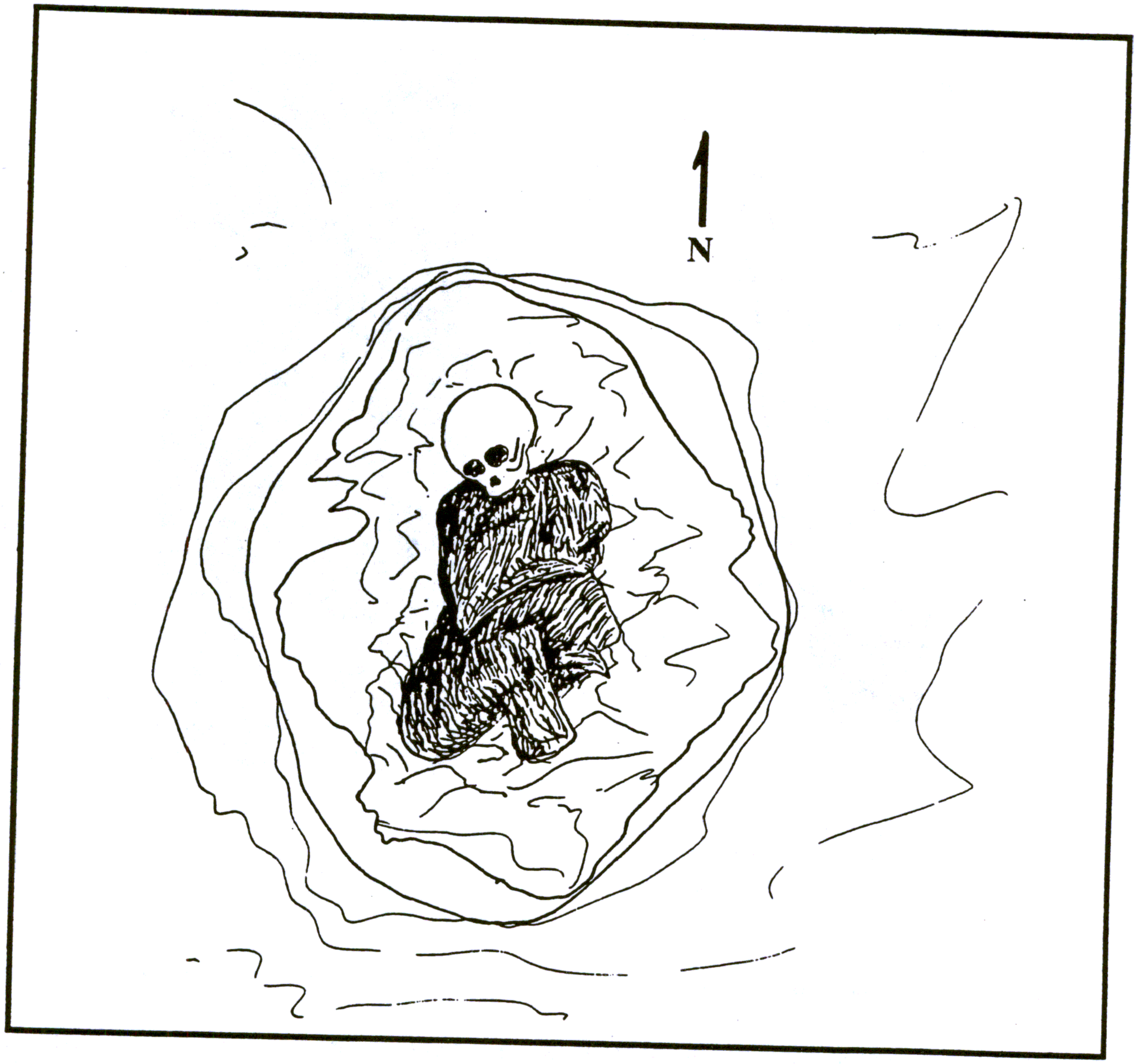

Fig. 8. Plan view of Burial 5, CA-KER-240, as drawn from a photograph (no scale).

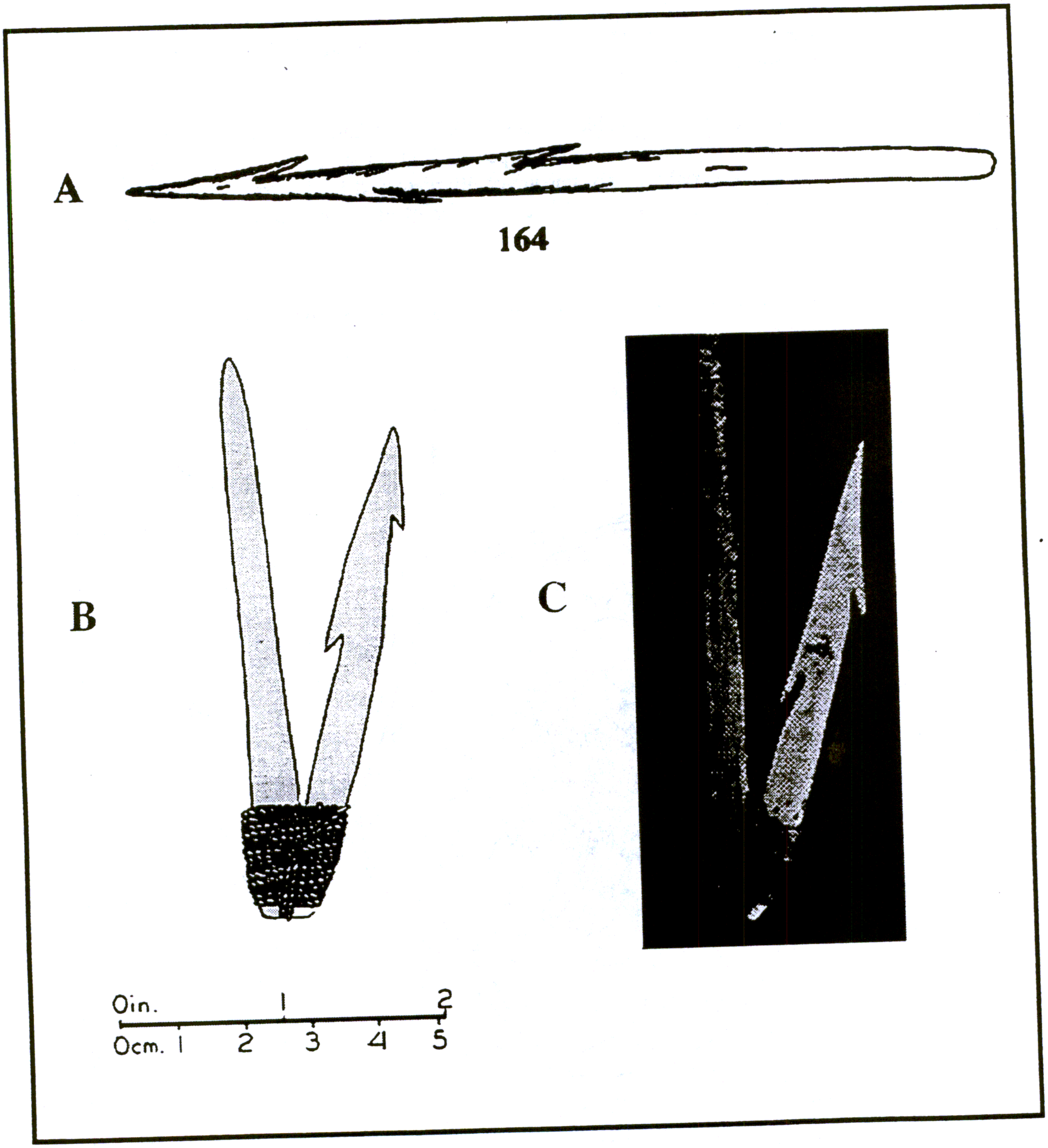

Fig. 9. (a) Wooden fishing implement (field no. 164) associated with Burial 5, CA-KER-240 (artifact is ca. 145 mm. long); (b) Composite bone fishhook from Humboldt Cave, Nevada (adapted from Bennyhoff 1950); (c) Photograph of bone fishhook from Humboldt Cave, Nevada (Heizer and Krieger 1956:143, Pl. 11c). Bar scale for use with Fig. 9b and 9c only.

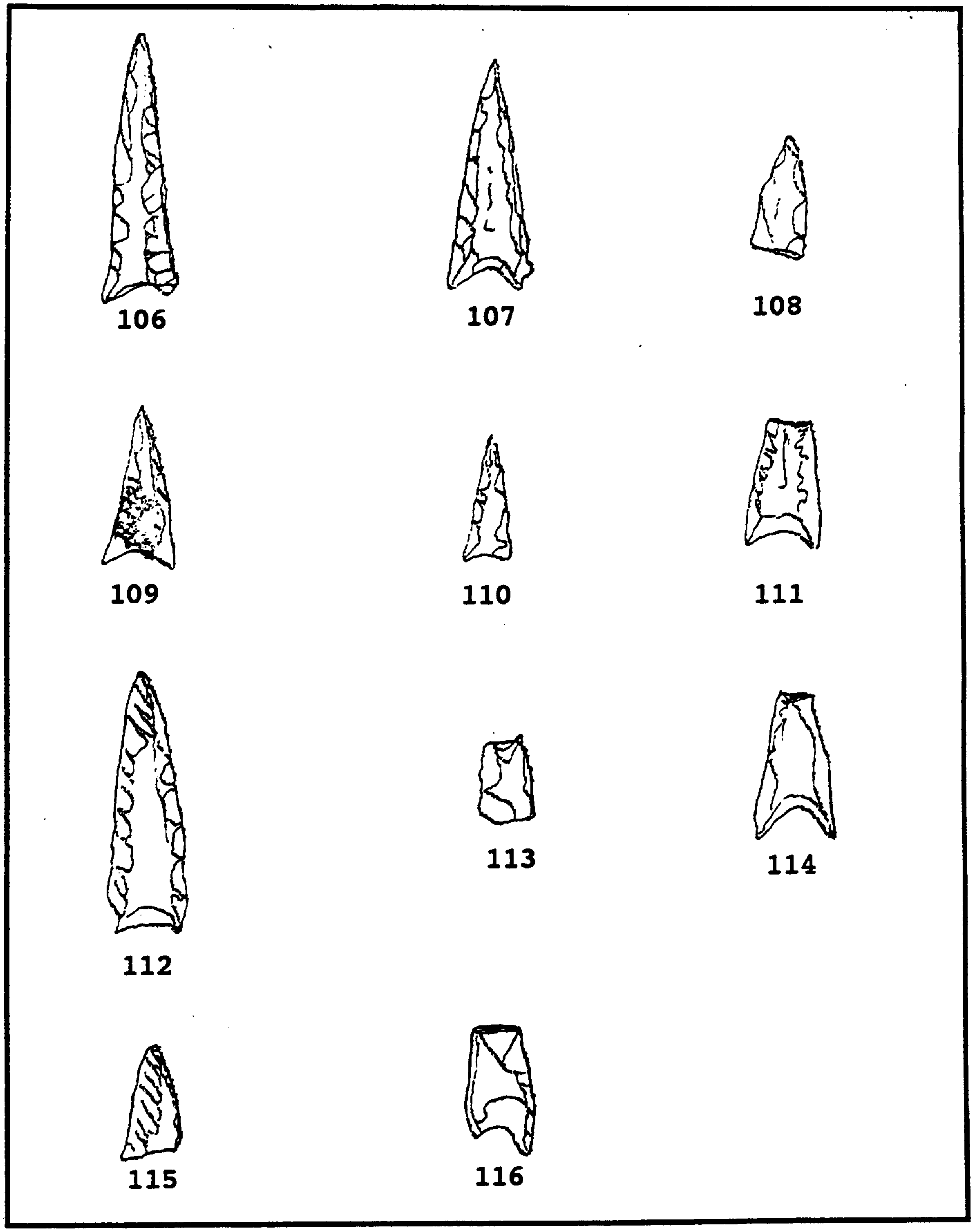

Fig. 10. Projectile points (field nos. 106-116) associated with Burial 5, CA-KER-240 (no scale).

Test Unit 4 was excavated to the alkali/borax layer to check for additional materials. Recovered items included a few bones, tule matting, small stones, and an unidentified resin-like material.

Pit 8, Burials 6 and 7. Extensive disturbance limited the amount and quality of information that could be gathered for Burials 6 and 7. As noted above, these burials were exposed and reinterred twice before final removal by von Werlhof. Both burials were located beneath one of three mounds of loose matrix that were piled near the base of the gully (Fig. 2). Matrix from the area of interment was screened and human remains, one projectile point, and several well-preserved fragments of tule matting were recovered. The projectile point is a Cottonwood Triangular arrowpoint made of "an undetermined form of slate" (Fig. 7; von Werlhof 1960:Plate 26, field no. 171). The bones of the two burials were in a confused entanglement, and the cranium of one burial was missing. Upon removal of the disturbed matrix, excavators were able to ascertain the presence of one of the original burial pits. The long axis of this burial pit was oriented north-south.

DISCUSSION

Again, the purpose of this paper was to alert other researchers to the excavations at CA-KER-240 and the remains that were found there. Rather than perform an exhaustive reiteration of the findings, the authors have extracted those data which can best bear upon problems in the archaeology of the Buena Vista Basin. These materials were recovered under less than ideal conditions and the assemblage may not be representative of the original deposit. Nonetheless, the results from CA-KER-240 add to our understanding of Buena Vista Basin prehistory, and several aspects are especially worthy of further discussion.

First, no unequivocal historic artifacts (e.g., glass or metal objects) were recovered from CA-KER-240. Von Werlhof is certain that these materials would not have been overlooked during the course of excavation. This suggests that, unlike many other sites in the Elk Hills, CA-KER-240 was not used in the historic period. All of the temporally sensitive materials that can be identified in the collection are consistent with assignment to the late prehistoric period. These include Cottonwood Triangular and Desert Side-notched projectile points, *Haliotis* rim ornaments, *Olivella* wall beads, matting and other implements of tule, and juniper posts. Importantly, none of the recorded material contradicts a late prehistoric temporal placement.

Second, numerous projectile points were found embedded in the skeleton of Burial 5. This condition has been recorded in other interments in the Buena Vista Lake area, most notably at CA-KER-64 to the east (Walker 1947). Also, some of evidence of violence was recognized in burials excavated from sites on the southwestern shoreline (Wedel 1941:111, 125), and a formal analysis of skeletal material would undoubtedly have revealed much more. Some of these occurrences have been attributed to the ritual killing of shamans (e.g., Wedel 1941:111; Walker 1947:5), but most were probably the result of intertribelet violence in the late prehistoric period. The ethnohistoric record contains numerous accounts of warfare and intertribelet animosity in the Buena Vista Basin. For example, in 1806, Father Zalvidea was accompanied by several members of the village of Buenavista (i.e., Tulamniu) when he and his party visited a village on the eastern edge of Kern Lake (possibly the village of Pohalin Tinliu of the Hometwoli tribelet), noting that,

> [T]heir warriors caused an uproar by firing a spear at the chief of the Buenavista Indians. The cause of the excitement was the arrival of the Buenavista Indians, who were enemies of the others; of all this we were in ignorance [Cook 1960:246].

Ethnohistorical data, in conjunction with archaeological data from CA-KER-240 and other sites, suggest that violence may have had an important role in structuring cultural developments in the aboriginal Buena Vista Basin.

Third, as mentioned above, the loss of perishable materials may severely limit our ability to understand aboriginal mortuary practices. Most—if not all—of the CA-KER-240 burials for which information could be gathered were interred with perishable items. This pattern has also been noted at other late prehistoric/historic cemeteries in the Buena Vista Basin. Furthermore, more durable items such as shell beads were comparatively rare. This is interesting, given the quantities of shell beads that have been recovered from nonburial, midden contexts in other areas of the Buena Vista Basin. The unique demographic and climatic conditions in the Buena Vista Basin (i.e., large populations and a very arid climate) allowed for the presence of large numbers of burials with preserved perishable goods; in fact, a quantity probably without parallel in California. These data point to the importance, or at least ubiquity, of perishable goods in mortuary contexts, and serve to remind us that we have a biased archaeological record.

Finally, perhaps the most compelling aspect of this analysis is that CA-KER-240 is another example of late prehistoric peoples in the Buena Vista Basin utilizing small, discrete cemeteries away from habitation areas. Numerous hypotheses can be presented to account for this phenomenon, and several are discussed here. First, CA-KER-240 may represent the cemetery of a short duration village or camp. Second, the site might represent a cemetery for non-Yokuts interments. This notion was discounted by Kroeber (1925:934) for nearby CA-KER-49, but the importance of sites in the Elk Hills as trading centers and the locally uncommon grave associations with Burial 2 (i.e., cormorant skeleton, wooden fishing implement) suggest that this hypothesis bears consideration. Third, the cemetery may be the burial plots of an individual family or lineage. Fourth, CA-KER-240 might have been the place of interment for peoples of special status or role. If any of the latter three hypotheses are correct, there are interesting implications for the study of cemetery populations. Generally, it is assumed that cemeteries in the Buena Vista Basin are (at least in the later periods of prehistory) fairly discrete spatial units which contain a cross-section of the society for which they served (e.g., rich, poor, elite, commoners). The presence of multiple, spatially disjunct cemeteries (whose use was determined by affiliation, be it tribal, familial, professional, etc.) used contemporaneously by a single community points to the severe difficulties in attempting to characterize that community from the contents of a single cemetery.

NOTES

1. The report on file at the Southern San Joaquin Valley Information Center is a facsimile reprint of the original. The original manuscript is on file at the Phoebe A. Hearst Museum (Shackley 1992).

2. This site is recorded as CA-KER-118, a large shell midden measuring 150 x 50 m. Von Werlhof excavated a shovel test pit at CA-KER-118 and recovered four shell beads, one smooth, broken stone, and a large piece of unidentified burned bone. The test was conducted near an area previously disturbed by the digging of collectors. A dense lens of freshwater mussel shell was noted between 8 and 15

cm. below the surface, and "ash pits" were profuse across the site. Harry Hughes reported that a young boy had recovered numerous projectile points from the site. Several other shell middens are recorded in the vicinity of CA-KER-118 (e.g., CA-KER-329, -644, -721).

3. Unless stated otherwise, the illustrations presented in this report are reproductions of original drawings by Jay C. von Werlhof. These have been selected from the original manuscript (von Werlhof 1960) and computer enhanced or otherwise manipulated. Artifact illustrations are reproduced at their original size (1:1 scale) or are not to scale as indicated.

4. These photographs are reportedly no longer on file at the Kern County Museum, Bakersfield, CA (C. Enriquez, personal communication 1996).

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REFERENCES

Barrett, S. A., and E. W. Gifford

1933 Miwok Material Culture. Bulletin of Milwaukee Public Museum 2(4):117-377.

Bennyhoff, J. A.

1950 Californian Fish Spears and Harpoons. University of California Anthropological Records 9(4).

Clift, Greg, Mark Q. Sutton, and Emmanuel Gabet

1992 A Second Look at Gifford and Schenck's Site 11 (CA-KER-46), Southern San Joaquin Valley, California. In: Archaeological Studies in the Goose Lake Area, Southern San Joaquin Valley, California, Mark Q. Sutton, ed., pp. 67-89. California State University, Bakersfield, Museum of Anthropology, Occasional Papers in Anthropology No. 2.

Cook, S. F.

1960 Colonial Expeditions to the Interior of California: Central Valley, 1800-1820. University of California Anthropological Records 16(6).

Dieckman, John

1973 The Archaeology of Buena Vista Village, Kern County, California. Report on file at the Kern County Museum, Bakersfield, CA.

1977 Buena Vista Village: Tulamniu? Kern County Archaeological Society Journal 1:49-53.

Estep, Harold A.

1993 The Indians of Pelican Island (CA-KER-33). Kern County Archaeological Society Journal 4:2-30. (Edited and annotated by Mark Q. Sutton.)

Gayton, A. H.
1948 Yokuts and Western Mono Ethnography I: Tulare Lake, Southern Valley, and Central Foothill Yokuts. University of California Anthropological Records 10(1).

Gifford, E. W.
1947 Californian Shell Artifacts. University of California Anthropological Records 9(1).

Gifford, E. W., and W. Egbert Schenck
1926 Archaeology of the Southern San Joaquin Valley, California. University of California Publications in American Archaeology and Ethnology 23(1).

Goldman, R. A.
1908 Summer Birds of the Tulare Lake Region. The Condor 10(5):200-205.

Hartzell, Leslie L.
1992 Hunter-Gatherer Adaptive Strategies and Lacustrine Environments in the Buena Vista Lake Basin, Kern County, California. Ph.D. dissertation, University of California, Davis.

Heizer, Robert F., and Alex D. Krieger
1956 The Archaeology of Humboldt Cave, Churchill County, Nevada. University of California Publications in American Archaeology and Ethnology 47(1).

King, Chester D.
1990 Evolution of Chumash Society: A Comparative Study of Artifacts Used for Social System Maintenance in the Santa Barbara Channel Region Before A.D. 1804. New York: Garland Press.

King, Linda B.
1969 The Medea Creek Cemetery (CA-LAN-243): An Investigation of Social Organization from Mortuary Practices. Los Angeles: University of California Archaeological Survey Annual Report 1969:23-68.

King, Thomas F.
1970 The Dead at Tiburon: Mortuary Customs and Social Organization on Northern San Francisco Bay. Northwestern California Archaeological Society Occasional Papers No. 2.

Kroeber, A. L.
1925 Handbook of the Indians of California. Bureau of American Ethnology Bulletin 78.

1951 At the Bedrock of History: Recent Remarkable Discovery of Human Remains Over Three Hundred Years Old in the San Joaquin Valley of California. Berkeley: University of California Archaeological Survey Reports 11:5-10.

Latta, Frank F.
1977 Handbook of Yokuts Indians (second edition). Santa Cruz: Bear State Books.

Linton, C. B.
1908 Notes from Buena Vista Lake, May 20 to June 16, 1907. The Condor 10(5):196-198.

Milliken, Randall T., and James A. Bennyhoff
1993 Temporal Changes in Beads as Prehistoric California Grave Goods. In: There Grows a Green Tree: Papers in Honor of David A. Fredrickson, Greg White, Pat Mikkelsen, William R. Hildebrandt, and Mark E. Basgall, eds., pp. 381-395. Center for Archaeological Research at Davis Publication No. 11.

Moratto, Michael J.
1972 A Study of Prehistory in the Southern Sierra Nevada Foothills, California. Ph.D. dissertation, University of Oregon.

Olsen, Stanley J.
1979 Osteology for the Archaeologist, North American Birds: Skulls and Mandibles. Papers of the Peabody Museum of Archaeology and Ethnology 56(4).

Phillips, George Harwood
1993 Indians and Intruders in Central California, 1769-1849. Norman: University of Oklahoma Press.

Pritchard, William E.
1970 Archaeology of the Menjoulet Site, Merced County, California. California State Department of Parks and Recreation Archaeological Report No. 13.

Riddell, Francis A.
1951 The Archaeology of Site KER-74. Berkeley: University of California Archaeological Survey Reports 10:1-28.

Scott, David J.
1994 A "Temblor Chert" Location: Preliminary Results of Investigations Near McKittrick. Kern County Archaeological Society Journal 5:15-21.

Shackley, M. Steven (ed.)
1992 Catalog of Unpublished Archaeological Research Facility Manuscripts on file in the Phoebe Hearst Museum of Anthropology. Report on file at the Southern San Joaquin Valley Information Center, California State University, Bakersfield.

Siefkin, Nelson
1995a Putting Together the Pieces: Frank Latta's Little Known Archaeological Investigations in the Tulare Lake Basin. Tulare Lake Archaeological Research Group Report 8(8):2-4.

1995b Frank Latta's Archaeological Investigations at the Sweet Mound. Tulare Lake Archaeological Research Group Report 8(10):2-4.

1995c Frank Latta's Archaeological Investigations at the Alamo Solo Site (CA-KER-152). Tulare Lake Archaeological Research Group Report 8(11):3-6.

1995d A Surface Artifact Collection from the Drunken Navigator Site (CA-KIN-39) and Implications for Late Holocene Adaptations in the Tulare Lake Basin, California. Kern County Archaeological Society Journal 6:22-40.

von Werlhof, J. C.

1960 Notes on Various Tulare and Kern County Sites. Berkeley: University of California Archaeological Survey Manuscript 292.

Walker, Edwin F.

1947 Excavation of a Yokuts Indian Cemetery. Bakersfield: Kern County Historical Society.

Wedel, Waldo R.

1941 Archaeological Investigations at Buena Vista Lake, Kern County, California. Bureau of American Ethnology Bulletin 130.

AN ETHNOGRAPHIC COMPILATION OF THE SOURCES, COMPOSITION, AND USES OF PAINTS BY THE YOKUTS OF THE SOUTHERN SAN JOAQUIN VALLEY AND SIERRA NEVADA, CALIFORNIA

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INTRODUCTION

This article is a summary of the uses, sources, and compositions of paints used by Yokuts groups in the southern San Joaquin Valley and southern Sierra Nevada, California (Fig. 1). The impetus for this paper came from an Experimental Archaeology class taught by Dr. Gerrit Fenenga at California State University, Bakersfield, in the spring of 1993. Several students in the class expressed an interest in aboriginal paints, and Dr. Fenenga requested the author's assistance as a mentor to the student project. The enthusiasm of the students and the encouragement of Dr. Fenenga were catalysts for an intensified and ongoing study of the subject by the author. The original research plan asked the following questions: How and where were pigments procured by the Yokuts? What substances were used as binders? Did the paint contain other additives? Once the paint was made, what were its potential uses and how was it applied? When it became apparent that the project was too broad in scope to be covered during a single academic quarter, it was reduced to two topics: the ethnographic evidence of Yokuts paint use, and experimental replication of Yokuts paints. The first of these topics is the subject of this paper. The paint recipe replication portion of the project is still in progress, and the results will be published upon completion.

The primary Yokuts ethnographic sources are the works of Frank Latta (MS, 1977), Anna Gayton (1948a, 1948b), A. L. Kroeber (1925), and J. P. Harrington (1916-1917). In general, the material on pigments and paints is fragmentary and, at times, contradictory. An ethnographic literature review was conducted to determine what paint constituents were mentioned by Yokuts informants, where pigments were obtained, what uses paints served, and the form pigments took when traded. Ethnographic sources from adjacent areas were examined to fill voids in the Yokuts data. In addition, modern paint practices were reviewed to discover how certain pigments, binders and other ingredients interact. Local mining reports were checked with the intent of locating potential pigment sources.

PAINT TERMINOLOGY AND THEORY

The ultimate goal of this project is to replicate Yokuts paint technology. In order to accomplish this task, the components of paints, their purposes, and their interactions within the mixture must be understood. Therefore, a brief review of paint terminology and theory are presented in this section. While not exhaustive, this discussion will provide the basis for which an understanding of Yokuts paint can be gained.

The three main components of all paints are the pigment, binder, and vehicle. The dry powder, or pigment, acts as the coloring agent. The binder holds the pigment together and fixes it to the surface of the object being painted. Binders may also make the paint more permanent by protecting the pigment particles

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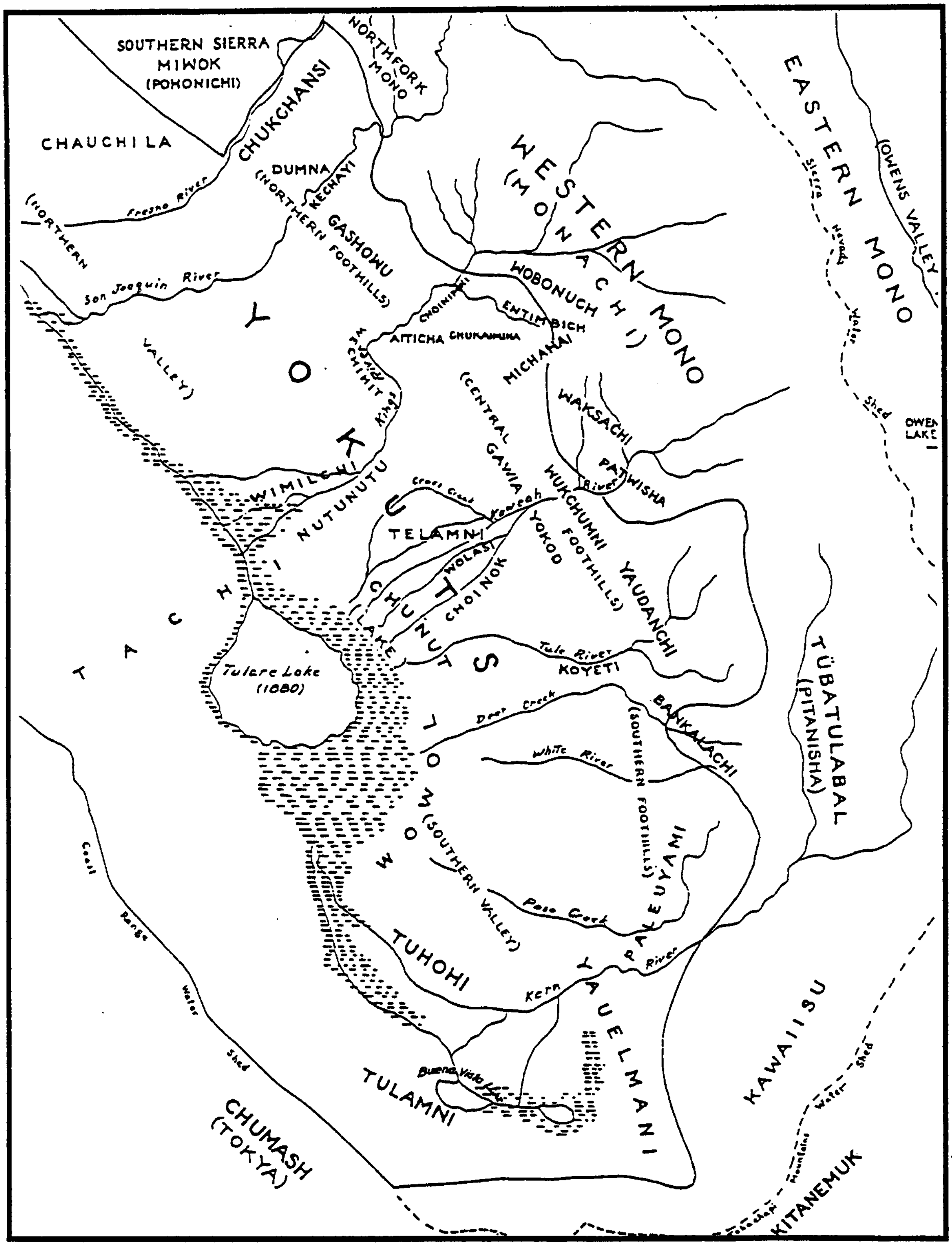

Fig. 1. Map of Yokuts tribelets and adjacent groups (adapted from Gayton 1948a).

against weathering or chemical action (Mayer 1957:131). In many cases, the result of a pigment and binder mixture is the creation of a new substance which, after drying, differs in physical and chemical properties from the original. Therefore, the choice of binder must be made with care and consideration of the desired results. The fluid element of a paint, or the vehicle, enables the paint to be easily applied. Although the binder and the vehicle serve different functions, they can be the same substance. Mayer (1966:6-7) provided an excellent description of the importance and function of vehicles within a paint mixture.

Pigments, binders, and vehicles each have chemical and physical properties that are advantageous or disadvantageous depending on the combination of the materials used to produce the paint. For instance, an alkali or base can be considered the direct opposite of an acid; when the two are mixed, they react and neutralize each other. Typical alkalis, like acids, behave with destructive violence on many substances, notably upon the fats and oils that might be used as binders. Too much acid or alkali will interfere with the paint product. Similarly, the success of some processes depends upon either a very mild action, or the action of very minute amounts of reactive materials. The carbonates and sulfides of metals are all extremely sensitive to action by mineral acids. However, inert pigments can be used to balance this reaction in a paint mixture (Mayer 1957:433-435).

Broadly speaking, there are three types of paint mixtures: tempera, oil, and water color. In the first two, finely ground dry pigments are mixed into the liquid vehicle and applied in semi-liquid form. The result is a more or less glossy, opaque coat of paint, depending on the presence or absence of various other ingredients.

Water color is usually a mixture of water and coloring agent (transparent dye). Dry pigments, mixed with gum or resin and water, make poster paints, a variety of water color (Mayer 1966:6-7). While water colors and poster paints may have been used on other media by the Yokuts, they probably would not be used for painting on rock because water colors are too thin and watery to stain a rock, and poster paints are not permanent.

Each of the components and their interactions within a paint are important in any study of paint technology. A paint replication project such as this one relies on the development of a "paint recipe." Paint recipes are formed by varying the proportions of the three constituents of paint: the pigment, the binder, and the vehicle. Each of these three elements will be discussed in turn, along with the advantages and disadvantages that each material would contribute to a paint recipe.

ETHNOGRAPHIC REFERENCES TO YOKUTS PAINT USE

Although painted artifacts and rock paintings of the Yokuts have been discussed at length in the literature, there has been little emphasis on paint analysis (Yokuts names and meanings for paints are summarized in Table 1; pigments and their properties are summarized in Table 2). Until recently, little effort has been placed into determining the properties of aboriginal pigments, despite a great deal of information available from modern artists on the technical details of paints.

Paints had a multitude of decorative, as well as special, uses among the Yokuts. Breech clouts, medicine boxes, bows, and arrows are examples of utilitarian items which were painted. Less frequent uses

Table 1
YOKUTS PAINT AND PIGMENT VOCABULARY

Yokuts Term	Type or Use	Pigment Color	Tribal Affiliation	Ethnographic Source
(no word given)	cinnabar	red	(none given)	Latta 1977:599
(no word given)	powdery effervescence	white	Tachi/Chunut	JPH[a]: Josefa Damien
(no word given)	diatomaceous earth, chalk	white	Coast Range tribelets	Latta 1977:301
'ajap'	alum	white	Tachi/Chunut	JPH: Margarita Manuel
cau'ded	pulverized shells	white	Gawia/Wikchamni	Gayton 1948a:69
copch-ke	paintings	(not given)	Wikchamni	Latta 1977:600
hapa'ka o'cek	body paint	red	Michahay	Gayton 1948b:218
haw-you	paint ball	red	(none given)	Latta 1977:333
hawwe	red earth pigment	red	Palewyami	Latta 1977:203
hoi'iyu	traded from Mono	red	Tachi/Chunut	Gayton 1948a:21
ho'jiw	burned white rock made bright red paint	white and red	Yawdanchi/Wikchamni/ Koyeti/Yawelmani	JPH: Juana Dionicio/ Juan Valdez/Maria Wheaton
ho'jiw'w	body paint	red	Tachi/Chunut	JPH: Josefa Damien
hoo-chaing-ooc	mixed color painting	mixed	Wikchamni	Latta 1977:600
horowistit	body paint	(not given)	Yawdanchi/Wikchamni	JPH: Juana Dionicio
hoso'sa, hoso'het	pulverized shells	white	Gawia/Wikchamni	Gayton 1948a:69
ho'set, hoo'het	pulverized shells	white	Gawia/Wikchamni	Gayton 1948a:69
ho'sot	burned shell, clay	white	Tachi/Chunut	Gayton 1948a:21
ho'suc	clay, body paint	white	Kechayi	Gayton 1948b:162
ho'yen	body paint	red	Wikchamni/Gawia	Gayton 1948a:69
hoy'yen	body paint	red	Yawelmani/Koyeti	JPH: Maria Wheaton
huh-so-sid	body paint	white	(not given)	Latta 1977:333
hu'iyu	doctors bought from the Mono	red	Choynimni/Kechayi	Gayton 1948b:147,162
kadi'an	body paint	black	Wikchamni/Gawia	Gayton 1948a:69
k'aljan	medicine, body paint	black	Tachi/Chunut	JPH: Josefa Damien

Table 1 (continued)
YOKUTS PAINT AND PIGMENT VOCABULARY

Yokuts Term	Type or Use	Pigment Color	Tribal Affiliation	Ethnographic Source
ka'lyan	body paint	black	Tachi/Chunut	Gayton 1948a:21
k'ardjan	medicine, face paint	navy blue	Yawelmani/Koyeti/Wowol	JPH: Juana Dionicio
keli	paint, smear	any color	Gashowu	Newman 1944:117
k'iwen	Equivalent to Tachi *qofrots'*	white	Yawdanchi	JPH: Josefa Damien or Maria Wheaton
kodeen	graphite	blue-black	Wikchamni	Latta 1977:333
kodi'an	medicine	black	Gawia/Wikchamni	Gayton 1948a:69
kolis	soapstone	gray-white	Yawelmani/Koyeti	JPH: Lorenza Lola
kadis	soapstone	gray-white	Wikchamni	Latta 1977:309
mutskei'wek ocek	face and body paint	charcoal	Michahay	Gayton 1948b:218
naviaht	same as *k'aljan*	black	Yawdanchi	JPH: Maria Wheaton
'otsihi'j	painted up, body paint	any color	Chunut/Tachi	JPH: Josefa Damien
'otsi'ji	to paint, any pigment	any color	(not given)	Harrington 1933: 173-174
otsoi'amin	general word for paint	any color	Tachi	Gayton 1948a:21
paci'kan	red color	red	Gawia/Wikchamni	Gayton 1948a:69
qofrots'	found at <u>*Qutru'm*</u>, body paint	white	Tachi/Chunut/Koyeti/ Yawelmani	JPH: Josefa Damien/ Maria Wheaton
sa'lu	charcoal	black	Kechayi	Gayton 1948b:162
sih-mik	graphite face paint doctor's dance paint	black	Chunut	Latta 1977:706
toiye'i ocek	face and body paint	white	Michahay	Gayton 1948b:218
wa'wen	body paint	black	Choynimni	Gayton 1948b:147
wa'wun	face paint	blue/green	Wobonuch/Kechayi	Gayton 1948b:162
wa'wina	a paint like soft rock	dark blue	Wobonuch/Entimbich	Gayton 1948b:265
won-won	body paint	black	(not given)	Latta 1977:333
ya'dub	charcoal	black	Wobonuch/Entimbich	Gayton 1948b:265

[a]JPH refers to Harrington (1916-1917).

included painting on rocks, as medicine, and as a part of ceremonial rites (both for body painting and for painting special equipment such as wood clappers used in Yokuts' songs and dances) (Latta 1977:593-595). A good summary of face and body painting practices by California Indians has been done by Sherwin (1963:83-124).

The cosmetic use of paints is described in detail by Gayton (1948a:21, 1948b:264) for the Tulare Lake tribes. *Qofrots'* was the Chunut and Tachi Yokuts word for the white pigment used for body painting, while *k'iwen* was its equivalent in Yawdanchi Yokuts (Harrington 1916-1917). Asphaltum was used as face paint during the mourning period by the tribes around Buena Vista Lake, Kern Lake, and the west side of Tulare Lake, while other groups applied a mixture of powdered charcoal and pine pitch over their cheeks at the beginning of this period (Latta 1977:332). Yoimut, a Chunut Yokuts, related that graphite or *sih-mik*, was used both to paint faces during the mourning period, and by Indian doctors as body paint for dances (Latta 1977:706). Yokuts women used red face paint to signal the end of the meat taboo after pregnancy or bereavement (Gayton 1948a:69). *K'aljan*, a blue-black earth paint, was used by Yokuts women to color their cheeks (Harrington 1916-1917).

In addition to its use as face paint, k'aljan was taken mixed with water to create a medicine. Maria Wheaton reported that a very small amount of k'aljan mixed in hot water was given to a sick baby, and once she drank a little of it stirred in cold water to cure an upset stomach (Harrington 1916-1917). Also, a menstruating girl would smear k'aljan in her hair to prevent it from falling out. Black paint, made from a gray earth that turned black when burned, was used by some Yokuts tribelets as a salve for sore eyes and rectum (Gayton 1948a:69).

Paint also had supernatural power for the Yokuts. In a Yawelmani myth, Coyote doctors used blue rock paint to revive Falcon after he died (Gayton and Newman 1940:81). *'Ajap'* was used by the Yokuts as body painting for dances. It was *tripni'*, or had magical properties, and could be fixed as "good" or "bad" medicine (Harrington 1916-1917).

The frequent use of paints, combined with the fact that the sources were widely distributed, made paint pigments logical trade items. The Yokuts made uniformly sized balls (between a tennis ball and baseball in size) of asphaltum and paint. The pigments were ground in small mortars, mixed with a binder, and shaped into balls (Gayton 1948a:21, 1948b:147; Latta 1977:599). These were traded and sold throughout Yokuts territory (Latta 1977:305-307, 333). Gayton (1948b:265) reported that the Eastern Mono traded red pigment to the Yokuts in this ball form as well. At a Tulamni Yokuts village in southwestern Kern County, archaeologists recovered a number of asphaltum balls, some of which appeared to have been wrapped in tules or in strips of rabbit skin. Pigment balls of various colors were also recovered from the Menjoulet Rancheria on Los Banos Creek in western Merced County, Grizzly Gulch and Broder Mound in Tulare County, and at Alamo Solo in northwestern Kern County. At Los Banos Creek, a white pigment ball was recovered that retained human finger prints. Paint balls recovered archaeologically in the southern San Joaquin Valley and Sierra Nevada show a remarkable degree of standardization in size. This adds support to the notion that paint balls served as units of trade among the Yokuts and their neighbors (Latta 1977:307, 333).

Table 2
CHARACTERISTICS OF MINERAL PAINT PIGMENTS

Pigment	Color	Chemical	Formula
aragonite	white	calcium carbonate	$CaCO_3$
alum—iron	white	halotrichite	Fe_2+Al_2 $(SO_4)24H_2O$
alum—magnesia	white	pickeringite	$MgAl_2$ $(SO_4)_4 22H_2O$
chalk	white	calcium carbonate	$CaCO_3$
charcoal—white ash	white	carbon	C
charcoal—bone	black	amorphous carbon	$Ca(H_2PO_4)(2)(SO_4)(C)$
charcoal—wood	black	carbon	C
cinnabar	red	mercuric sulfide	HgS
diatomaceous earth	white	silica, cristobalite, quartz	$SiO_2 nH_2O$
graphite	black	carbon	C
gypsum	white	calcium sulfate	$CaSO_4.2H_2O$
hematite, red ocher	light to deep red	iron oxide	Fe_2O_3
kaolinite	soft white	hydrous aluminum silicate	$Al_2Si_2O_3$ $(OH)_4$
lampblack	black	carbon	C
lead oxide	bright red-orange	lead oxide	PbO
limestone	white	calcium carbonate, silicas	$CaCO_3$ plus
limonite (geothete)	yellow (gold)	iron oxide	$Fe_2O_3 nH_2O$
magnesite	light beige	magnesium carbonate	$MgCO_3$
magnetite	black	iron oxide	Fe_3O_4
scheelite	white	calcium tungstate	$CaWO_4$
siliceous clay	white to all hues	impure hydrated aluminum silicate	$HAl_2O_3Fe_2O_3$
steatite, talc	beige	magnesium silicate	$Mg_3Si_4O_{10}(OH_2)$
manganese oxide	black	manganese oxide	Mn_3O_4
zincite	white	zinc oxide	ZnO

Table adapted from Latimer and Hildebrand (1951)

ETHNOGRAPHIC REFERENCES AND SOURCES OF YOKUTS PIGMENTS

Blue, red, white, black, yellow, and green earth colors comprised the Yokuts' color palette (Latta 1977:595). However, blue and green paints are rarely encountered in extant Yokuts art. In addition to mineral pigments, stains were made from organics such as berry and plant juices (Latta 1977:594; Voegelin 1938:24). This paper will confine itself to the mineral pigments mentioned in the ethnographic record. The four most common paint colors (red, white, black, and yellow) are found in a wide range of hues. This range could be caused by the use of different pigment types, processing the materials differently, weathering, or varying the proportions of ingredients in the paint recipes. Hudson (1982:13) believed that the paint variation from an orange-red to a dark red at Painted Cave in Santa Barbara County was "due to dilution of the paint, exposure to light, absorption into the rock," and to color choice on the part of the artist.

While the pigments preferred by the Yokuts are often included in ethnographic accounts, the identification of Yokuts pigment sources from the ethnographic record is not so simple. Informant accounts are often contradictory or lack important details. However, California geology has been mapped in some detail, and mining reports and the like can be used to supplement the ethnographic record. In several cases, cross checking with mining reports and geological information has confirmed ethnographic accounts of the location of specific pigment sources.

Several locales in Tulare and Kern counties were given names by the Yokuts that refer to the pigment source present there. *Wa'wun* was the place name for the area between Badger and Aukland, where an earth that turned red when burned was obtained (Gayton 1948a:69). Badger Hill, located east of Exeter, was known as *Hawshau Shido* (or Paint Place), for the white paint which the Yokod Yokuts mined there (Latta 1977:185, 188). The white earth around a spring in southern Tulare county, *Chawlul Ilkaw* (or White Water Place), gave its name to the White River (Latta 1977:202). *Hawawel*, a small hill west of the village of Altau near Poso Creek, is where the Palewyami Yokuts mined a red earth pigment called *hawwe* (Latta 1977:203).

The following section summarizes the ethnographic references to pigments used by the Yokuts. For each material, the author has also included a listing of the sources that were, or could have been, used by the Yokuts.

White Pigments

According to ethnographic sources, white pigments were derived from clay, magnesite, soapstone (or steatite), talc, calcium carbonates and chalks, shell, alum, and diatomaceous earth. These pigments, constituting a group of powders which in a dry state are white or nearly white, are useful materials and can function as valuable modifying ingredients in a paint recipe.

Kaolinite forms the base of most clays, and is almost universal in occurrence (Murdock and Webb 1966:234). One source of white pigment was a kaolin clay found along the White River that was mined commercially in historic times (Cloudman et al. 1917:131; Latta 1977:202). Another source of white clay was found in the swamps along the Kings River near Centerville in Fresno County (Gayton 1948b:147).

J. Crain (personal communication, 1993) identified the mineral that was mined and traded by the Yokod Yokuts as magnesite (Latta 1977:185, 188). While magnesite is widespread in California, the main deposits are in the foothills of the Sierra Nevada and the Coast Range. Kern, Fresno, and Tulare counties all have historic magnesite mines of commercial value (Cloudman et al. 1917:130; Murdock and Webb 1966:247-250). For instance, a Yokod Yokuts magnesite mine on Badger Hill in Tulare County was later the site of a historic magnesite mine (Cloudman et al. 1917:130, 148-149, 166).

Soapstone (or steatite) was used by Yokuts groups to produce white paints (Heizer and Treganza 1944:294). The Yokod Yokuts mined and traded soapstone from a quarry east of Lindsay (Heizer and Treganza 1944:302, 308; Latta 1977:428). Other quarries were located on Santiago Creek west of San Emigdio in Kern County, Table Mountain in Madera County, and on Fish Creek Mountain in Fresno County (Heizer and Treganza 1944:308; Murdock and Webb 1966:358). Talc, closely related to soapstone or steatite, is common in metamorphic rocks and is often associated with serpentine. Found in many localities throughout the state, other California groups are reported to have used talc as a paint pigment (Waterman 1910:297, 304-305; Heizer and Treganza 1944:306; Murdock and Webb 1966:358).

Calcium carbonates, chalk, and limestone are widespread throughout the state. Veins of fluorescent calcite with cinnabar are located on Avenal Creek in Fresno County. Blue crystalline calcite, associated with scheelite, occurs in Drum Valley in Tulare County (Murdock and Webb 1966:116-118). Crude chalk made by burning diatomaceous earth provided a pure white paint pigment, and was traded by Yokuts living in the Coast Range. Large chalk deposits are located near Lompoc in Santa Barbara County and on Crow Creek in Stanislaus County. Chunks and prepared balls of this soft chalk have been found in San Joaquin Valley archaeological sites (Latta 1977:301). Lucia Francisco, a Chunut Yokuts, claimed that a white pigment could be created when a white rock containing tiny shells and bones was burned for two hours or more. When red hot, the rock was placed on a flat stone and water was sprinkled over it, which caused the rock to "boil." The boiling action turned the white rock into a flour-like material (Harrington 1916-1917).

White paint was also made from lime, which was produced by burning and pulverizing the shells of freshwater mussels (Gayton 1948a:21, 69; Kroeber 1925:538). Gayton (1948b:265) speculated that lime was the material described by informants as the white paint which looked like flour, and was carried in a little skin sack. This material came from the Wowol Yokuts, whose territory lay south of Tulare Lake, and who had access to an abundant supply of freshwater mussels. However, this material could also be the flour-like substance described by Harrington's (1916-1917) informant above.

Alum, another flour-like pigment, occurs in two forms. Halotrichite, an Iron alum, can be found as encrustations around springs and in thin seams. Pickeringite, a Magnesia alum, can occur as an efflorescence, as a coating on quartzite, or as encrustations around hot springs (Murdock and Webb 1966:213, 288). Voegelin (1938:65) theorized that alum was the white flour or baking powder-like substance used by Chumash bear shamans to power their "bear machine." Alum, when combined with lime or chalk, is a good absorbent, and in some situations can set the color to form a permanent pigment (Doerner 1934:47).

On a trip to the rancheria near the headwaters of the Tule River, Carobeth Laird (1975:54-55) provided the following description of alum:

> Along the rocky banks enclosing those rushing, relentless waters there was said to be a deposit of a poisonous substance that had been used by the ancients . . . I inched my way across the face of a boulder that bellied out over the stream. There was a precarious trail on the surface of the rock, chipped out and enlarged from natural footholds. I found and tasted the "poison," which proved to be alum, broke off a bit to take to Harrington so he could secure the Indian name and the proper terms for its taste, texture, etc.

From Foothill Yokuts Josefa Damien and Margarita Manuel, Harrington (1916-1917) obtained the following description of alum (i.e., 'Ajap'):

> 'Ajap' is found on the Tule Reservation near Jose Casada's place. It occurs on a particular rock that sits in the water. 'Ajap' comes out on the rock just like alkali or a transparent alum. It is similar to a white effervescence that occurs on top of certain rocks there. 'Ajap' was tripni', or in other words it had supernatural power. The white, powdery substance was fixed in various ways so that sometimes it is a good medicine, or sometimes a bad one. Margarita related that cooking made it stronger, and it was dangerous stuff to handle. Josefa agreed that 'ajap' was cooked sometimes. She added that to make 'ajap' a poison, it had to be mixed with other materials. Bob Bautista, a Tachi doctor combined burned Jimson seeds with a very small amount of 'ajap' mixed with water to make his body paint for dances. Once when Josefa saw some of Bob's 'ajap', his wife told her that she was mistaken and that the "white meal" was only qofrots' or white paint. Qofrots', a white earth, was mined by Americans at a place north of Tulares with another deposit above Bakersfield and also at a place on the east side of Cantua Mountain.

At another time, Josefa Damien said that the Tachi word qofrots' was the same as the Yawdanchi word, k'iwen, both meaning white paint used for body painting (Harrington 1916-1917). The white earth, qofrots', cannot be specifically identified. However, two types of alum can be recognized from the descriptions given by Laird and Harrington. While qofrots' and 'ajap' both served as a body paint; 'ajap' was also used for different purposes and could have supernatural power.

Some of the materials used as white pigments can also be used to enhance the performance of a paint. The addition of inert substances such as silica and gypsum to other pigments does not affect the color of the paint. They not only act as fillers or extenders, but can also improve the paint's smoothness and brushability (Mayer 1957:107, 1966:56-57). Although silica and gypsum are not specifically mentioned in Yokuts ethnographies, they are likely to occur along with other pigments in Yokuts territory. Gypsum is a very common mineral, easily formed by the action of sulfate waters on limestone. There are extensive gypsum deposits on the west side of the San Joaquin Valley in Lost Hills, Telephone Hills, the Temblor Range, and at Kern Lake. Additionally, beds occur at Cane Springs, San Emigdio mine, Bitterwater Creek, and Cuddy Canyon. In Fresno County, there are deposits at Coalinga, Tumey Gulch, and Escapardo Canyon. Northwest of Dudley in Kings County, mineral paint pigments are associated with the gypsum deposit (Wilson 1933:79; Troxel and Morton 1962:197-198; Murdock and Webb 1966:209-211).

Gypsum could provide other advantages or disadvantages to a paint recipe. As an advantage, gypsum is a very white, inert pigment that imparts a brittle hardness to oil-based paints (Mayer 1957:55). When water is added to gypsum, the material solidifies into what is known as "plaster of Paris." The process of slaking involves soaking gypsum in large quantities of water in order to hinder its solidification. Thus treated, plaster of Paris does not form, and the mixture remains relatively liquid. The slaked gypsum is identical to the original gypsum except in its crystalline structure. There are unconfirmed reports that Native Americans were aware of and used the slaking procedure (Voegelin 1938:2). A major disadvantage of gypsum is that it has no covering power when mixed with oil and it dissolves in acid.

Silica is silicon dioxide, or powdered quartz. Naturally occurring within many native ores, silica is an inert pigment with no coloring power. It adds a coarse texture to paint that helps bond the mixture to the painted surface when it dries (Mayer 1957:69, 1966:57, 104-105). The base of most clays is kaolinite, formed when rocks containing aluminum silicates are altered (Murdock and Webb 1966:234). Diatomaceous earth is a form of silica or clay which is light, fluffy, and absorbent (Mayer 1957:51). Hydrated talc is insensitive to both lyes or acids, an advantage when no chemical reaction is wanted or needed in a paint recipe (Doerner 1934:61). Used as a filler to add bulk or volume to paint, talc, diatomaceous earth, and kaolin keep heavy pigments in suspension (Mayer 1957:42, 51, 69, 71, 1966:56-57).

Magnesite (or magnesium carbonate) is a permanent color that can also be used as an inert pigment (Mayer 1957:80). The calcium carbonates, chalk and limestone, have the same chemical composition, and differ only in crystalline structure, density, or degree of purity (Mayer 1957:107). Magnesium carbonate, as well as the calcium sulfates and carbonates, such as chalk, gypsum, or shell, form a yellowish-brown paste known as putty when ground with oil, and cannot be used as a white pigment. However, when calcium carbonates are used in glue and other mediums, they retain their white color. Besides the formation of putty, the other disadvantages of using the calcium sulfates and carbonates are that they have little covering power and they dissolve in acid (Mayer 1966:56-57, 60, 77).

Lime, limestone, chalk, shells, and slaked lime were used as plaster and mortar by other cultures. The lime in solution with water combines with undissolved particles in the manner of a binder, effecting a rock-like cohesion (Mayer 1957:350-355). Natural limestone, a calcium carbonate, gives off carbonic acid gas when burned. The burned lime, if combined with water, turns into slaked lime or calcium hydroxide (Doerner 1934:267). Gypsum added to the lime prevents the setting of the plaster and causes efflorescence (Doerner 1934:268).

Red Pigments

The Yokuts used a variety of pigments to obtain red paint, including hematite, iron-rich clays, and cinnabar. In addition, several red pigments mentioned in the ethnographic record have yet to be identified.

Forms of iron oxide were commonly used as pigments by the Yokuts. In California, many low-grade red ocher deposits of hematite have been mined historically for pigment (Murdock and Webb 1966:144). Hematite is found in quantity in the Minarets Mountains in Fresno and Madera counties. Mount Breckenridge, Cane Springs, and Ricardo are the locations of spectacular hematite deposits in Kern County (Wilson 1933:83; Murdock and Webb 1966:144-150).

South of Little Poso Creek in Kern County, the Palewyami mined an unidentified red earth pigment (Latta 1977:203). In Tulare County, extensive deposits of red clay lie near Exeter, Visalia, and Porterville (Cloudman et al. 1917:131). Another clay deposit is located at Dunlap in Fresno County (Heizer and

Treganza 1944:333). These red ochers are stable materials that are resistant to acids and lyes. They are excellent pigments in paint recipes, except when they contain chalk or gypsum which can cause unwanted chemical reactions. The presence of these adulterants is not uncommon in natural deposits (Doerner 1934:70).

Gayton (1948a:21, 69) speculated that the earth mined between Badger and Auckland (Tulare County) that turned red when burned was either yellow ocher or cinnabar. Cinnabar, the ore from which quicksilver is refined, varies in color from maroon to the light red of common brick. Latta (1977:599) found several unmodified chunks and one molded ball of cinnabar in an archaeological site on Los Banos Creek in western Merced County. There are numerous outcrops of cinnabar in the Sierra Nevada and in the Coast Range from Poza Chana near Coalinga in Fresno County, to Del Puerto Creek opposite Crows Landing in Stanislaus County. In Kings County, cinnabar occurs in serpentine. In Kern County, it is found near Cuddeback, Woodford, and in Jawbone Canyon (Murdock and Webb 1966:144-150). Also, L. Vredenberg (personal communication, 1993) has identified a cinnabar outcrop along Highway 58 in the Tehachapi Mountains. A major cinnabar source, the New Almadin mine in Santa Clara County was mined prehistorically (Heizer and Treganza 1944:311-312).

Juan Valdez and Tomas and Maria Wheaton described *ho'jiw*, a bright red paint obtained from a white rock (Harrington 1916-1917). The pigment was found in rocks strewn over the surface of a hill two or three miles north of Hokiw, a Yokuts village near Poso Creek in Kern County. After being burned and water added, the pigment produced a red paint. Harrington commented that informants thought it strange and incomprehensible for a white rock to have the ability to produce a red paint. The identity of this pigment is not known.

Gayton (1948b:147, 162, 265) related that Yokuts doctors bought red paint, *hu'iyu*, from the Western Mono; however, the Eastern Mono were the ultimate source of a red pigment which was obtained from water, and traded as a hard, round ball (see Harrington 1933:142). This red pigment may be the same red earth obtained from the Coso Hot Springs area, east of Little Lake, that the Koso Shoshone traded to the Tübatulabal (Voegelin 1938:23; Heizer and Treganza 1944:309). The identity of this pigment is also uncertain.

Yellow Pigments

Yellow pigment was derived from an ocher obtained throughout the volcanic regions of the Sierra Nevada (Latta 1977:179). Limonite, or yellow ocher, is a form of goethite, a natural hydrous iron oxide that is otherwise unidentified. The appearance of limonite varies from a soft powder to a clay-like solid, but always has a yellow-brown streak, and a slightly metallic to dull luster. Limonite is common in every county of California (Wilson 1933:11, 83; Murdock and Webb 1966:243). A lump of yellow pigment was found in a site on the shoreline of Kern Lake (Gifford and Schenck 1926:57), and a yellow pigment ball was recovered at Grizzly Gulch in eastern Tulare County (Latta 1977: 307).

Yellow ochers will turn red when burned. As mentioned, Gayton (1948a:69) speculated that the earth obtained at Wa'wum (between Badger and Auckland) which turned red when burned was either limonite or cinnabar. Since cinnabar is found as a red pigment, it is most likely that the substance Gayton's informants described was limonite.

Black Pigments

Earthen minerals, such as magnetite, magnesium oxide, and graphite, as well as other forms of carbon (such as charcoal, black bone, and soot), were used as a black pigment. When reduced to a powder, these are very light, absorb oil poorly, and are water repellent (Mayer 1957:100). A cake of black pigment found in Chumash territory was analyzed and identified as magnesium oxide (Grant 1965:85). While this substance is mined in Kern County (Cloudman et al. 1917:166-167), it is not mentioned by Yokuts informants.

Graphite from Stokes Mountain in Tulare County was traded to the Chunut Yokuts. It was burned and ground in a small mortar to make a black, shiny paint (Latta 1977:706). Gayton (1948a:21, 69) related that charcoal and a "gray earth" that turned black when burned were used for black paint. Graphite is blue-gray to black in color, and may be the "gray earth" mineral to which Gayton's informant referred (Wilson 1933:53). Graphite occurs in a wide range of hues, and the informant descriptions reflect that variation.

Graphite deposits in Kings and Kern counties have been mined historically for the manufacture of paints and lubricants (Wilson 1933:11, 52-53). Most of the graphite in California is found as a silica mix in widely scattered flakes, or in larger foliated masses within crystalline limestone or carbonate rock in the Sierra Nevada and Tehachapi Mountains (Troxel and Morton 1962:197). Graphite is prominent in rocks west of Dunlap, at Borer Hill, and near Trimmer in Fresno County, near Fort Tejon in Kern County, and at Camp Nelson, Drum Valley, near Dunlap, and below old Aukland in Tulare County (Cloudman et al. 1917:143; Murdock and Webb 1966:206-207; Latta 1977:297).

Tomas and Maria Wheaton described k'aljan as a blue-black earth similar to writing ink that women obtained at San Emigdio Potrero Mountain in southern Kern County (Harrington 1916-1917). When Harrington (1916-1917) asked her if k'aljan was the same as *naviaht*, a word given to him by another informant, Maria Wheaton agreed that it was. The k'aljan was placed in water, stirred, and allowed to settle. The fine matter on the surface of the water was the portion which was used. Harrington admitted that he did not clearly understand the process of stirring in water, because his informants had provided contradictory information, one claiming that k'aljan was burned during the preparation process. Josefa Damien related to Harrington that the color of k'aljan compared favorably with a chocolate-colored wrapper on a coffee can sitting on her table (Harrington 1916-1917). Juan Valdez told Harrington (1916-1917) that k'aljan was a purple paint used for face painting in the "old days." Valdez said that k'aljan was not red or chocolate colored, but instead was the color of "pencil lead."

Juan Valdez told Harrington that he believed k'aljan to be the mineral antimony (Harrington 1916-1917). Troxel and Morton (1962:56) and Murdock and Webb (1966:77) reported that antimony deposits in the Tehachapi Mountains, Lake Isabella area, Jawbone Canyon, Calf Creek, Antimony Peak, and Greenhorn Summit, may have been the source of the pigments used in native paintings in the area. In southern Kern County, "stibnite is the principal antimony mineral, but much of it is altered to red, white, and yellow oxides of antimony" (Troxel and Morton 1962:59). In a purer state, antimony is a brittle, lustrous, silver-white crystalline material. Thus, it does not seem very likely that the paint k'aljan is antimony (in any of its forms) because the colors do not match. From the descriptions related above by Harrington's informants, graphite, or even magnetite, would seem to be a more likely material.

While both Gayton (1948a:21, 69) and Harrington (1916-1917) mentioned that the various black pigments were burned as part of their preparation, Latta (1977:297, 299-300) gave a detailed, first-hand account of the procurement and firing of graphite prior to its use as a pigment. Along a road cut below old Aukland, chunks of crude graphite were removed from granite overburden. The graphite, called *kodeen*, was roasted in a bed of coals. This process changed its composition from a "hard, heavy, blue-black metallic appearing material to a fine, sooty black powder, similar in appearance, but heavier than commercial lamp-black" (Latta 1977:297, 299-300).

YOKUTS PAINT BINDERS

As previously mentioned, the main function of a binder is to hold the pigment particles together in a film that, as it dries, acts as an adhesive to attach the colored matter to the painted surface. Binders used, or possibly used, by Yokuts artists include vegetable gums, oils, and resins, as well as animal urine, fats, saliva, eggs, and blood.

Vegetable gums, oils, and resins are common binders. Plant gums or saps dissolve or swell in water to produce solutions adhesive enough to serve as binders (Kay 1972:59). A number of vegetable oils dry to form tough, adhesive films either by themselves, or when assisted by the action of added ingredients. An oil dries quickly, slowly, or not at all depending on the presence of various fatty acids and its drying or non-drying ingredients. These oils do not dry by evaporation, but by oxidation (the absorption of oxygen from the air), and are accompanied by a series of other complex chemical reactions. The disadvantage of using vegetable oils as a binder is the eventual darkening or yellowing of the oil. In addition, the paint film often disintegrates by cracking and flaking off (Mayer 1957:405; Kay 1972:59).

Milkweed sap (*Asclepias* spp.) and chilicothe (i.e., wild cucumber [*Marah* spp.]) seed oil were used by Yokuts groups as binders in paint mixtures (Latta 1977:302, 594). Burned diatomaceous earth and chalk were two pigments specifically mentioned as being mixed with these binders (Voegelin 1938:24; Latta 1977:594). Henry Icho and Jim Tawpnaw, Foothill Yokuts, both stated that their paint recipes contained binders formed from the sap of Indian milkweed (*Asclepias eriocarpa*) mixed with chilicothe oil (Latta MS, 1977:302). Milkweed sap, a natural emulsion containing lecithin, may have worked similarly to the slightly alkaline juice of young fig sprouts mentioned as a paint additive in medieval European recipes (Doerner 1934:211; Mayer 1957:237, 1966:141). Lecithin is a fat-like substance present in all plant and animal tissue. It is used in commercial paint today because it is a very efficient emulsifier or stabilizer. Emulsions are oily, watery solutions that are beneficial in paint recipes. By contrast, straight oil and water mixtures tend to separate (Doerner 1934:104, 211; Mayer 1957:237). Among the Kawaiisu, the juice of the milkweed was collected by cutting the stalk of the plant near its top prior to blossoming, and draining the sap from the split stalks (Zigmond 1981:13).

A Dumna Yokuts informant from Friant, in Fresno County, related that his people used only oil from the seeds of the chilicothe as a binder (Latta 1977:301). Henry Icho agreed that chilicothe oil was used for painting on buckskin or rocks (Latta 1977:301-302). The Kawaiisu prepared chilicothe by removing the seeds from the pod, roasting them until black, then mashing them to produce a greasy salve (Zigmond 1981:40). Indians in southern California are reported to have toasted, but not charred, the chilicothe kernels before grinding the seeds into a fine pulp. This process produced an oil base that was then mixed with iron oxide and pitch obtained from spruce or pine trees (Sparkman 1908:209-210; Harrington 1933:142). Latta (1977:302) commented that all of his attempts to extract chilicothe oil ended in failure. Chilicothe is a member of the family Cucurbitaceae, the same plant family as the squash. The Hopi chewed squash seeds as a fixative (Smith 1952:30-31). While saliva itself could have some effect on the paint mixture, it is possible that the chilicothe seeds might have similar fixative properties.

While pine pitch was used by the Yokuts as a cement or adhesive, and conifer seeds were collected as food, they are not mentioned in connection with paint (Kroeber 1925:214, 527; Gayton 1948b:180). However, resin from conifers could have been employed as a binder (Aginsky 1943:406, 408; Latta 1977:293, 409) because these hardened saps dissolve or swell in water to produce solutions adhesive enough to form good paint binders. The Hopi used pinon pine gum in the preparation of paints (Smith 1952:31). In addition to the use of resins, pine seed oils must also be considered as possible binders. Depending on the species, spruce, fir, and pine seed oils are semi-drying to non-drying (Mayer 1957:405; Kay 1972:59).

Animal materials such as urine, animal fat, egg, saliva, and blood can also serve as binders and, in the case of urine and blood, can double as vehicles (Wellmann 1979:17; Sanger and Meighan 1990:26). Urine is an acid that has been used as a color fixative to set dyes in wood. Urine is composed of inorganic elements (chloride, phosphorus, sulfur, sodium, potassium with traces of calcium, magnesium and iron), and nitrogenous compounds (ammonia, uric acid, and creatinine) (Best and Taylor 1958:274). Urine causes the paint to be more opaque or less lustrous than modern paints. The advantage of urine is that it is easily carried and always available to the artist (Watson 1974:134). As an acid, urine would chemically react with some paint elements (causing color change), a disadvantage that would need to be offset by the inclusion of inert pigments or materials that contain an alkali.

Animal fat has a number of disadvantages that make it unsuitable as a binder in paints intended for application on rocks. First, animal fat needs to be heated to form a liquid paint. Second, fat would produce a greasy smear on the rock, attracting dust which would cover the paint surface and act as an abrasive. Finally, any fatty substance tends to darken and, in time, discolor the pigments (Rudner and Rudner 1970:13). However, animal fat added to body paint would form a smooth paste that could easily glide on the body and remain pliable, preventing the coloring agent from cracking or flaking off the skin with movement. While animal fat was mentioned as a binder by all the Yokuts ethnographers; only one informant, Henry Icho, emphasized that it was used in conjunction with body paint (Latta 1977:302).

Saliva is another possible binder. There are accounts of people chewing paint before application, or placing the paint in their mouth before spraying it on the object to be decorated (Smith 1952:30; Sanger and Meighan 1990:29). Saliva is composed of salts (such as sodium and potassium chloride, sodium bicarbonate, acid and alkaline sodium phosphates, calcium carbonate and calcium phosphates, potassium sulfocyanate), carbon dioxide and oxygen gas, and organic substances (ptyalin, maltase, serum albumin, serum globulin, urea, and mucin) (Best and Taylor 1958:299). Saliva contains many components, such as calcium carbonate, that could contribute positively as a paint binder. As mentioned, the Hopi chewed squash seeds to enhance their fixative character (Smith 1952:30-31). Lorblanchet (1991:26-31) reported using only water and saliva as binders in his excellent recreation of the Spotted Horse pictograph at Peche Merle, France. Lorblanchet ground and chewed some of the pigments, which were applied by spitting them on the wall.

Egg yolk has been used as a binder by many cultures (Doerner 1934:216; Mayer 1957:234, 250, 1966:141; Kay 1972:98). Upon drying, the yolk becomes clear and waterproof, developing great elasticity and toughness. It does not yellow, crack, or darken. Egg contains lecithin and albumen, both good emulsifiers or stabilizers. In contrast to the yolk, egg white is a poor choice as a binder. It is soluble in water, has poor brushing qualities, and it is brittle and easily peels off. However, combined with egg yolk, the additional albumen contributes to the stability of egg and oil emulsions (Mayer 1957:233-234, 469-471). The author has found no ethnographic references to the use of eggs as binders by the Yokuts. Perhaps this is due to limited access (available seasonally) or because eggs functioned primarily as food and were not spared.

Although there is no definitive documentation of its use by the Yokuts, in South Africa there is good evidence that blood was an element in the paint used for rock art (Rudner and Rudner 1970:163). Blood is composed of cells, plasma, solids (protein, serum albumin, serum globulin, and fibrinogen), inorganic elements (sodium, calcium, potassium, magnesium, phosphorus), organic constituents (urea and uric acid), respiratory gases (oxygen and carbon dioxide), and internal secretions, antibodies, and various enzymes (Best and Taylor 1958: 56-57). Of these components, plasma is the most important; when separated from the other constituents of blood it serves as an effective binder. Plasma, a clear serum, is obtained by twirling a stick through the blood. When the liquid settles, the plasma can be drawn off and used. Paint made with fresh blood is a red-brown color that bleaches to a light brown, giving pigments a muddy color (Doerner 1934:217; Rudner and Rudner 1970:163). These are qualities that could be considered a detriment to an aesthetically pleasing color.

Immunological analysis of three samples of red paint from widely separate sites in Tulare County by M. Newman (personal communication 1992, 1994, 1995) showed no evidence of human or animal proteins. Each of the immunological analyses were conducted on antisera for bear, cat, deer, dog, human, mouse, rat, elk, pronghorn, guinea pig and duck eggs. Antisera for guinea pigs was used because it identifies marmots and other small rodents. Perhaps the lack of proteins in the samples is due to poor preservation; that is, only a pigment stain remained, and no detectable proteins were present. It is also possible that the proteins in the paint are from taxa other than those encompassed by the available antisera. For example, there is no antisera available for milkweed and chilicothe, two confirmed Yokuts paint binders. It is encouraging to note that gas chromatography-mass spectrometry was used to determine that an unidentified oil was used as a binder in European cave paintings at ca. 12,000 B.C. (Pepe et al. 1991:929-934). It is hoped that further scientific analysis on binders will be forthcoming.

It should also be noted that binders would have been necessary to form the standard trade balls discussed earlier. However, it probably would not have been desirable for such a binder to chemically react with the pigment and change its color. Thus, the correct choice of binder (and vehicle) was a critical step in the creation of pigment trade balls (Mayer 1957:131; 1966:7, 22).

YOKUTS PAINT VEHICLES

As previously defined, a vehicle is the substance which allows paint to be easily spread over a surface, assists in binding pigment particles together, and adheres the mixture to the surface being painted. Water is commonly suggested to have served as a vehicle among the Yokuts. Water, especially from springs, had spiritual significance to Yokuts groups (Gayton 1948b:260). While rainwater is relatively free from mineral salts, ground and surface water vary greatly in composition. For example, the water at California Hot Springs in Tulare County is a highly mineralized sulfo-saline-alkaline variety, while water from Coburn Soda Springs, also in Tulare County, is carbonated, mineralized, saline, and alkaline

(Cloudman et al. 1917:167-172). A very satisfactory paint could result from the correct combination of mineral pigments and water thoroughly mixed together prior to the addition of a binder.

However, water as the sole vehicle in a paint would be unsatisfactory because of its volatility (resulting in the minerals and pigments quickly returning to their original state and flaking or powdering off the surface). Further, dissolved minerals in the water may react with the different elements in the pigment and binder to form a chemical reaction that has disastrous results. For example, water that contains lime and magnesium salts could prevent a paint from emulsifying (Doerner 1934:227). Water may have been chosen as a vehicle by Yokuts groups because of its sacred qualities, because certain minerals within the water would produce a desired chemical reaction, or simply because of its abundance and availability.

PIGMENTS AND BINDERS USED IN ADJACENT AREAS

Pigments and binders used by the Yokuts were similar to those used by Native American groups elsewhere in what is now the southwestern United States. Recently, several technical analyses and experimental replications of paint pigments were conducted in the Southwest, Great Basin, and Texas. Smith (1952:21-32) and Hibben (1975:36-50) discussed paint recipes used for the Pueblo murals of Arizona and New Mexico. The results of the paint replication experiments are of particular interest, despite the fact that the aboriginal paint recipes were compared with commercially prepared materials (Smith 1952:30-32, 50-52). Based on analytical tests on a large number of samples, Smith (1952) and Hibben (1975) determined that, with the exception of black, the pigment elements are entirely inorganic. Hematite was used to produce red and yellow paints, carbon and gypsum were combined in dark gray-blue paint, black paint was derived from carbon and other ingredients, and white pigments were primarily siliceous clay and kaolin.

Results from electron-microprobe and x-ray diffraction of pigments in prehistoric rock paintings have been presented by Corner (1968), Koski et al. (1973), McKee and Thomas (1973), Turpin (1982), and Whitley and Dorn (1984). Following x-ray diffraction analysis of pigments from pictographs in central Nevada, McKee and Thomas (1973:113) concluded that gypsum was used as a binder in all colors.

A similar study (Koski et al. 1973:8) revealed that a combination of aragonite, gypsum, and halotrichite-pickeringite (alum) formed white paint, and was also the base used to bind red, orange, and yellow paint. The occurrence of aragonite in association with gypsum and alum, rather than the more stable calcium carbonate or calcite, is characteristic of the use of water from hydrothermal deposits (Koski et al. 1973:8). This evidence, plus the knowledge that mineral springs were considered special to some Native American groups, led Koski et al. (1973) to conclude that soda and sulfur water should be mixed with the pigments as part of replication experiments.

Using both x-ray diffraction and electron microprobe analysis on pigments from CA-INY-439, CA-KER-735 and CA-KER-736, Whitley and Dorn (1984:48-51) concluded that various mixtures of iron oxide minerals and a white base were used to produce the yellow, orange, and red pigments. Orange hues were produced by mixing red and yellow minerals in varying proportions.

Turpin's (1982:282-284) x-ray diffraction analysis of 35 paint samples from Seminole Canyon in Texas revealed that gypsum and calcite, used to produce white paint and described as ubiquitous in arid regions, were present in all samples. The black pigments were identified as manganese. The red and yellow pigments consisted of one or more of the following: maghemite, lepidocrosite, hematite, goethite, and akaganeite. While these pigments ranged in color from yellow to red, the pigment color was not indicative of its specific iron content (Turpin 1982:282).

CONCLUDING THOUGHTS ON YOKUTS PAINT RESEARCH

The rock art panels that can be seen in Yokuts territory today are the remnants of a much larger body of paintings. The paintings have weathered through time, and some have been destroyed through construction and development. What remains are those paintings that had successful paint recipes, and were placed in areas that have remained relatively untouched.

A number of studies demonstrate that prehistoric paints were truly complex (Smith 1952:24-26, 30-31; Koski et al. 1973:5-6; Hibben 1975:36-49; Clottes et al. 1990:21). With our present knowledge of the many pigments, vehicles, and binders available prehistorically, we can now move to the next step of this project—to determine what paint recipes may have been used by the Yokuts. In graduating from the production of a comprehensive list of pigments, binders, and vehicles available, to the development of paint recipes, many factors must be considered. First, the paints must function adequately (adhere to surfaces, etc.). Second, the complex interactions of the materials used must be considered. Third, the availability of the products used as pigment, binder, and vehicle must be evaluated. Last, it is important to consider experience gained from first-hand observation of prehistoric or ethnographic painted objects.

One major requirement of paint is that it adhere permanently to the surface to which it is applied. Flaking, peeling, blistering, wrinkling and similar defects are most frequently caused by simple lack of adhesion of the coating itself, although permanent adherence also depends largely on the nature of the surface to which it is applied. A rough, textural surface that has absorbent or porous qualities is needed to hold the dried paint in a mechanical grip or bond (Mayer 1966:104). For rock paintings, that requirement is not a difficult one to meet. As described above, grinding the paint pigment with the vehicle and binder is desirable because it produces a much more stable paint that binds and holds the pigment to the surface better than one left unground (Mayer 1957:143-144).

Another consideration is the complex interaction of the ingredients in a paint. For example, the highly alkaline waters of California Hot Springs would require that inert pigments be used to offset any violent chemical reaction that might occur if a fat or oil were also used. Earth pigments such as various forms of iron oxide and manganese dioxide are mixtures of clay, silica, and coloring matter. While these oxides are inert substances, they more often than not contain impurities, chiefly gypsum and magnesium carbonate. Perhaps one of the reasons that gypsum occurred in all the paint samples that Koski et al. (1973) analyzed is that these substances can act as stabilizers.

There are other advantages in using earth pigments as one of the elements in a paint recipe. These colors have great permanence, and they are very opaque. When ochers are heated, they lose their chemically bound water content, become thicker and denser, and deepen their color (Kay 1972:20). Our replicative experiments have revealed that the heated ochers are more difficult to grind into powder, a difficulty that might possibly be avoided by grinding the pigment before firing. Clay can be an excellent additive because it not only increases a paint's brushability, promotes better suspension in oil, and is excellent in glue, but also acts as a stabilizer when added to the dense, opaque iron oxides.

The availability of paint ingredients must also be considered. Many of the binders and vehicles would be only seasonally available. For example, including an egg in a paint recipe results in the best paint qualities of any of the binders and vehicles discussed in this paper. Eggs, however, would be readily obtainable by the Yokuts only in the early spring. Milkweed sap is available in the late spring to summer up to the 2,000 ft. range in the Sierra Nevada foothills. Chilicothe seeds are available only in late spring, but can be dried or roasted and stored until needed. Similarly spruce, fir, and pine seeds gathered in the fall could be stored and made into oil at a later date. The hardened sap of conifers makes a good binder and is one of the few materials available throughout the year.

The author has personally examined hundreds of rock art panels in Yokuts territory over a number of years. This type of experience with the art can offer important information when attempting to reconstruct the creation of the paints used. For instance, paints often vary in their adherence to the rock surface. Red paint appears to adhere best and may actually join with or penetrate the rock surface. Yellow paint sits slightly more on the surface than the red, and at times has a powdery appearance. White paint does not appear to penetrate the rock, and often looks as if it could flake off very easily. Black paint shows a full continuum, from appearing to bond with the rock to adhering in flakes on its surface.

Further, all of the paint colors exhibit a variety of hues. Red paint varies from a dark maroon to a bright red. At one panel in the Yokohl Valley, the red paint mixture was so fluid that the paint dripped onto the rock face below the paintings. White paints range from a bright white to yellow to grayish white. At times, white paint can resemble a shiny white lacquer. Black paint varies from a deep black to a dull color that may blend in with a granite background. Occasionally, black paint has a metallic appearance, an effect that may be due either to a high proportion of silica, or to graphite used as the pigment. These observations of adherence and color may aid in determining which recipe best correlates with the paints actually used by the Yokuts.

In general, the ethnographic material concerning Yokuts paint constituents corresponds well with that of other groups in California and the Southwest. It was gratifying to be able to locate many of the pigment sources using the information provided by Yokuts informants and mining reports. The primary conclusion is that Yokuts paint production was a complex process. This conclusion will be an important influence on our research design as we continue our quest to replicate Yokuts paint recipes.

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REFERENCES

Aginsky, Burt W.
1943 Culture Element Distributions, XXIV: Central Sierra. University of California Anthropological Records 8(4).

Best, Charles Herbert, and Norman Burke Taylor
1958 The Living Body. New York: Henry Holt and Company.

Clottes, Jean, Michel Menu, and Philippe Walter
1990 A New Light on the Niaux Paintings. Rock Art Research 7(1):21-26.

Cloudman, H. C., Emile Huguenin, F. J. H. Merrille, and W. Burling Tucker
1917 Mines and Mineral Resources of San Bernardino County and Tulare County. San Francisco: California State Mining Bureau.

Corner, John
1968 Pictographs in the Interior of British Columbia. Vernon: Wayside Press, Ltd.

Doerner, Max
1934 The Materials of the Artist. New York: Harcourt Brace.

Gayton, A. H.
1948a Yokuts and Western Mono Ethnography I: Tulare Lake, Southern Valley, and Central Foothill Yokuts. University of California Anthropological Records 10(1).

1948b Yokuts and Western Mono Ethnography II: Northern Foothill Yokuts and Western Mono. University of California Anthropological Records 10(2).

Gayton, A. H., and Stanley S. Newman
1940 Yokuts and Western Mono Myths. University of California Anthropological Records 5(1).

Gifford, E. W., and W. Egbert Schenck
1926 Archaeology of the Southern San Joaquin Valley. University of California Publications in American Archaeology and Ethnology 23(1).

Grant, Campbell
1965 The Rock Paintings of the Chumash. Berkeley: University of California Press.

Harrington, John P.
1916-1917 Yokuts Ethnographic and Linguistic Notes. Notes on file at the National Anthropological Archives, Smithsonian Institution, Washington, D. C.

1933 Annotations in Chinigchinich: A Revised and Annotated Version of A. Robinson's Translation of Father Geronimo Boscana's Historical Account of the Indians of the Mission San Juan Capistrano. Santa Ana: Fine Arts Press.

Heizer, Robert F., and Adan E. Treganza
1944 Mines and Quarries of the Indians of California. California Journal of Mines and Geology 40(3):281-359.

Hibben, Frank C.
1975 Kiva Art of the Anasazi at Pottery Mound, New Mexico. Las Vegas: KC Publications.

Hudson, Travis
1982 Guide to Painted Cave. Santa Barbara: McNally & Loften.

Kay, Reed
1972 Painter's Guide to Studio Methods and Materials. Garden City: Doubleday and Company.

Koski, Randolph A., Edwin H. McKee, and David H. Thomas
1973 Pigment Composition of Prehistoric Pictographs of Gatecliff Shelter, Central Nevada. American Museum Novitates 2521:1-9.

Kroeber, A. L.
1925 Handbook of the Indians of California. Bureau of American Ethnology Bulletin 78.

Laird, Carobeth
1975 Encounter with an Angry God: Recollections of My Life with John Peabody Harrington. Banning: Malki Museum Press.

Latimer, Wendell M., and Joel H. Hildebrand
1951 Reference Book of Inorganic Chemistry. New York: The Macmillan Company.

Latta, Frank F.
MS Ethnographic and Linguistic Notes. Notes on file at the Yosemite Research Library, National Park Service, Yosemite National Park.

1977 Handbook of Yokuts Indians (second edition). Santa Cruz: Bear State Books.

Lorblanchet, Michel
1991 Spitting Images: Replicating the Spotted Horses. Archaeology 11:26-31.

Mayer, Ralph
1957 The Artist's Handbook of Materials and Techniques. New York: The Viking Press.

1966 The Painter's Craft. Princeton: D. Van Nostrand Company, Inc.

McKee, Edwin H., and David H. Thomas
1973 X-ray Diffraction Analysis of Pictograph Pigments from Toquima Cave, Central Nevada. American Antiquity 38(1):112-113.

Murdock, Joseph, and Robert Wallace Webb
1966 Minerals of California: Centennial Volume (1866-1966). California Division of Mines and Geology Bulletin 189.

Newman, Stanley
1944 Yokuts Language of California. Viking Fund Publications in Anthropology 2.

Pepe, Claude, Jean Clottes, Michel Menu, and Philippe Walter
1991 Paleolithic Cave Painting Binders in Ariege (France). Academie of Science 312(II):929-934.

Rudner, Jalmar, and Ione Rudner
1970 The Hunter and His Art. Cape Town: C. Struik, Ltd.

Sanger, Kay Kenady, and Clement W. Meighan
1990 Discovering Prehistoric Rock Art. Calabasas: Wormwood Press.

Sherwin, Janet
1963 Face and Body Painting Practices Among California Indians. Berkeley: University of California Archaeological Survey Report 60:81-147.

Smith, Watson
1952 Kiva Mural Decorations at Awatovi and Kawaika-a, with a Survey of Other Wall Paintings in the Pueblo Southwest. Papers of the Peabody Museum 37:21-32.

Sparkman, Phillip Stedman
1908 The Culture of the Luiseno Indians. University of California Publications in American Archaeology and Ethnology 8(4).

Troxel, Bennie W., and Paul K. Morton
1962 Mines and Mineral Resources of Kern County, California. San Francisco: California Division of Mines and Geology.

Turpin, Solveig A.
1982 Seminole Canyon: The Art and the Archeology. Texas Archeological Survey Research Report 83.

Voegelin, Erminie W.
1938 Tübatulabal Ethnography. University of California Anthropological Records 2(1).

Waterman, T. T.
1910 The Religious Practices of the Diegueno Indians. University of California Publications in American Archaeology and Ethnology 8(6).

Watson, Editha L.
1974 Materials of Ancient Southwestern Art. In: American Indian Rock Art: Papers presented at the 1974 Rock Art Symposium, Shari T. Grove, ed., pp. 131-135. Farmington: American Rock Art Research Association.

Wellmann, Klaus L.
1979 A Survey of North American Rock Art. Graz: Akademische Druck-u. Verlagsanstalt.

Whitley, David S., and Ronald I. Dorn
1984 Chemical and Micromorphological Analysis of Rock Art Pigments from the Western Great Basin. Journal of New World Archaeology 6:48-51.

Wilson, Hewitt
1933 Iron Oxide Mineral Pigments of the United States. Bureau of Mines Bulletin 370.

Zigmond, Maurice L.
1981 Kawaiisu Ethnobotany. Salt Lake City: University of Utah Press.

ABORIGINAL TULE EXPLOITATION IN THE SOUTHERN SAN JOAQUIN VALLEY: SOME DEFINITIONS AND EXAMPLES

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INTRODUCTION

The Yokuts, with between 50 and 60 distinct tribelets, constituted the largest Native American population group in California (Latta 1977:2). They inhabited the entire San Joaquin Valley from the San Joaquin-Sacramento Delta south to the Tehachapi Mountains, as well as the eastern slope of the Coast Range and foothills of the Sierra Nevada south of the Fresno River. The southernmost portion of this territory was occupied by a number of tribelets that have been categorized as the Southern Valley Yokuts (Wallace 1978). Until the latter part of the nineteenth century, when agricultural development began to divert the courses of the numerous rivers and streams in the Tulare and Buena Vista basins, the primary physiographic feature of this region was a system of lakes and sloughs and associated freshwater marshes (Fig. 1; also see Preston [1981] for data on the Tulare Basin). Many of the resources exploited by the Southern Valley Yokuts were associated with these wetlands. Principal among these resources was the tule, also commonly referred to as reeds, bulrushes, rushes, and cattails.

Virtually every researcher who has studied the prehistory and history of the southern San Joaquin Valley noted the extensive exploitation of tule by the aboriginal populations (e.g., Kroeber 1925; Gifford and Schenck 1926; Gayton 1948; Latta 1977). The Native Americans who made their homes near the shallow lakes and sloughs that constituted the core of the southern valley utilized tule for a number of purposes. While describing one particular Yokuts tribelet, the Tuhoumne (cf. Tuhohi or Chuxoxi), Latta (1977:205) summarized their optimization of the tule resource in a humorous, yet accurate, manner:

> Except for an occasional antelope surround, or a squirrel smoke-out on the west side, theirs was strictly a goose, duck, mudhen, swan, blue heron, egret, pelican, lake, slough, swamp-and-overflow culture; water and mosquitos, willows and mosquitos, tules and mosquitos everywhere; tule boats, tule bags, tule skip-rings, and other tule equipment—and mosquitos; tule houses, tule sunshades, tule windbreaks, piled-up tules for sails on tule boats; tule clothing—caps, capes, hoods, parkas, and skirts; tule mattresses, tule mats, tule blankets, pounded tule-fiber disposable diapers for babies, tule baby cradles, tule fuel, tule blinds for hunting, tule seed mush, tule-root bread, tule baskets, tule shrouds, tule rope, tule string, tule elk, beaver, sea and fresh-water otter, tules, tules, and tules—and mosquitos; seal, raccoon; waterfowl and fish in myriads; more tules, tules, tules—and mosquitos.

Yokuts who lived in the eastern or western sectors of the valley were less dependent on the reeds but still utilized them extensively, and artifacts fashioned from tule (particularly mats for sleeping or house construction) were commonly traded to groups outside of the valley (Beals 1974:57).

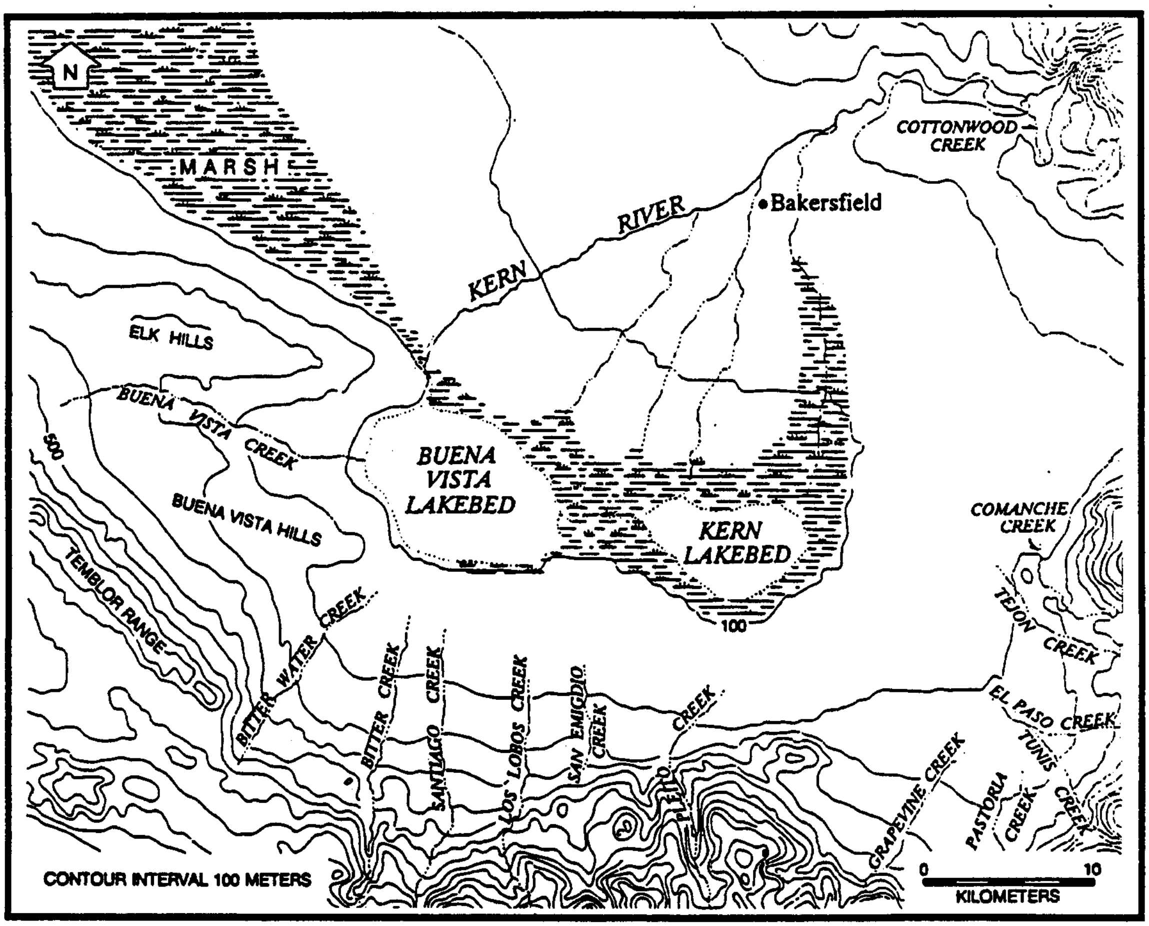

Fig. 1. Historic distribution of marshes in the Buena Vista Basin (adapted from Hartzell 1992:50).

RESEARCH OBJECTIVES AND METHODS

Despite its prevalence in the southern San Joaquin Valley and importance to Native Americans there, little effort has been made by researchers to determine what the term tule actually refers to. For instance, is it a specific plant that grows in marsh environments, or is it an umbrella term under which many plants are included? When using the word tule, most authors either take for granted that the reader has an understanding of the marsh plant community, or perhaps, they themselves are not completely familiar with the term. While performing research on the Yokuts of the southern San Joaquin Valley, this author noted that there are numerous interpretations and uses of the term tule. Most researchers know that it is a marsh plant or community of marsh plants, but little beyond that.

The purpose of this paper is twofold. First, specific definitions for the term tule will be provided using a combination of biological and ethnographic sources. Second is a review of some of the ways in which tules have been, and can be, exploited. In order to satisfy the first objective, this subject will be approached from a more biological perspective than is generally found in the ethnographic or archaeological literature from the southern

San Joaquin Valley. Hopefully, this paper will aid future researchers by crystallizing the sometimes ambiguous nomenclature regarding tule.

BIOLOGY OF THE TULE

Origin of the Word Tule

Tule is a term commonly used to refer to the aquatic plants that grow on the margins of shallow lakes, streams, and sloughs in the San Joaquin Valley of California. The name is derived from the Aztec word *tullin* (or *tollin*) that designates the cattail or similar plants with sword-like leaves (Gudde 1969:346). Early Spanish explorers in the southern San Joaquin Valley used the term similarly when referring to such marsh plants, and the places where these plants grew were called *tulars*. The Spanish also alluded to the marsh areas of the valley as *los tulares*. An example of this comes from the diary of Captain Don Pedro Fages, who led the first expedition into the southern San Joaquin Valley in 1772. Fages described the valley floor, and more specifically, the area around Buena Vista Lake as a "labyrinth of lakes and tulares" (Bolton 1935:7). In Spanish, tulare means "a swamp with flags" (Caughey 1952:5), and the Yokuts who resided in the San Joaquin Valley were referred to as *Tularenos* by the Spaniards (Kroeber 1925:476).

Tule as a Species

Modern biologists have applied the name tule to some members of the genus *Scirpus* (the bulrushes); for example the common tule (*Scirpus acutus*). As is often the case with plant identification, there is some degree of overlap and inconsistency between the common names and the biological names applied to plants of marshes. For instance, in the case of the term bulrush, Preston (1981:246) was very specific in reference to *S. acutus* as tule, and *S. californicus* as bulrush, while Medsger (1972:196) terms *S. validus* "the great American bulrush." However, most authors (e.g., Brown 1957:25; Mason 1957:303; Kirk 1975:175; Gibbons and Tucker 1979:29; Zigmond 1981:63) simply applied the term bulrush to anything in the genus *Scirpus*. Despite some isolated confusion, it seems that the general consensus among researchers is that the term bulrush is a generic label that may be applied to all members of the genus *Scirpus* (which includes the common tule). Therefore, tules are considered bulrushes, but not all bulrushes, *technically speaking*, are tules.

Tule as a Plant Community

The term tule might also refer to a marsh plant community comprised of several different species of plants. Early explorers did not know, and often did not care, about possible differences between plant species, and would simply lump similar plant types under a single rubric. For the purpose of this paper, marshes refer to geographic areas in the southern San Joaquin Valley which were sufficiently inundated by water (permanently, annually, or seasonally) to support hydrophytic plants. A number of factors (including water depth, fluctuation in water level, rate of water flow, water and air temperature, pH, salinity, and the nature of bottom sediments) all combine to affect the nature and extent of a marsh (Holland and Keil 1990:293). Marshes can be divided into three classes (following Raymond and Parks 1990:39), including wet meadow, emergent marsh, and submerged marsh, as determined by water depth. Wet meadow and emergent marshes are found in shallow water areas (usually less than ca. 1 m.) and are dominated by plants which are rooted below the water level, with leaves, stems, and flowers above the water (i.e., "emergent" vegetation). By contrast, submerged marshes are established in areas too deep to support emergent plants, and are dominated by floating vegetation (Holland and Keil 1990:293). Since ethnographic and historic accounts almost exclusively describe emergent marsh vegetation, those plants found in wet meadows and emergent marshes are considered to be those most likely to have composed the tule marsh community proper.

Burcham (1957) contended that the dominant plants found in southern San Joaquin Valley tule marshes historically were the common tule, bulrush, cattail (*Typha* spp.), spike rush (*Eleocharis* spp.), and sedges (*Carex* spp.) (see also Preston 1981:22). The dominant plants in the southern San Joaquin Valley tule marsh fall into two families: Cyperaceae (sedge family) and Typhaceae (cattail family) (Twisselman 1967:173, 193). Members of the sedge family include the bulrush, spike rush, and sedge, while cattails are members of the cattail family. The spike rush and sedge inhabit what was described above as wet meadow, while the bulrush and cattail are dominant in the emergent marsh. Each of these taxa are described below.

Bulrush. Most species of bulrush are perennial and all have upright culms (stems) that are either triangular or terete (basically cylindrical) in cross section. Some are leafy, while the leaves on others are reduced to basal sheaths (Munz 1974:902). The inflorescence is either an open umbel (a convex or flat-topped inflorescence, the flowers all rising from one point), a close cluster of numerous spikelets, or a solitary terminal spikelet. All have flowers that are perfect (both stamens and pistils are functional) and members of this genus bloom from May through August (Mason 1957:303; Farber 1982:67). Figure 2 illustrates anatomical features characteristic of the genus *Scirpus*.

Mason (1957:303-324) listed 17 different species of *Scirpus* currently found in the state of California, of which six are presently found in the southern San Joaquin Valley (Twisselman 1967:197-198). Twisselman (1967:117) pointed out that the valley is located on the Pacific waterfowl flyway, and that "although primitive vegetation may have been composed of relatively few species, there must have been scattered occurrences of many transitory species," perhaps as a result of introduction by migrating birds. This suggests that in prehistoric and early historic times, it is likely that in addition to the common tule (*Scirpus acutus*), there were a number of other members of the *Scirpus* genera present in the valley, and that these were all categorized under the tule "umbrella" by early visitors.

The common tule was the dominant bulrush in the marshes of the southern San Joaquin Valley. At one time, this species probably covered most of the territory surrounding Tulare Lake, as well as the lakes of the Buena Vista Basin to the south, and the Buena Vista Slough (a wetland corridor that connected the Buena Vista Basin with the Tulare Basin) (Twisselman 1967:197). Zigmond (1981:63) referred to *S. validus* as tule, but did not mention *S. acutus*. This is likely due to the fact that Zigmond's area of study was primarily the mountains that border the southeastern portion of the San Joaquin Valley, and not the valley floor itself.

Some of the specific attributes of *S. acutus* are that it is a perennial herb with thick brown rhizomes (tubular horizontal rootstocks) and an erect culm (Mason 1957:323). Culms may be as thick as 2 cm. (0.8 in.) and up to 5 m. (16.4 ft.) tall, with some specimens from Tulare Lake having been observed to reach 6.1 m. (20 ft.) in height (Hittell 1866:107). The culm is terete, with leaves forming a basal sheath around the stem. The inflorescence is capitate (in a globular or head-shaped cluster), and located at the upper terminus of the unbranched culm (see Fig. 2).

Cattails. Two species (*Typha latifolia* and *T. domingensis*) from the cattail family are currently present in the marshes of the southern San Joaquin Valley (Twisselman 1967:173; Munz 1974:1012). They are rhizomatous perennials with smooth, linear leaves that are sheathed close to the base and that open as they ascend

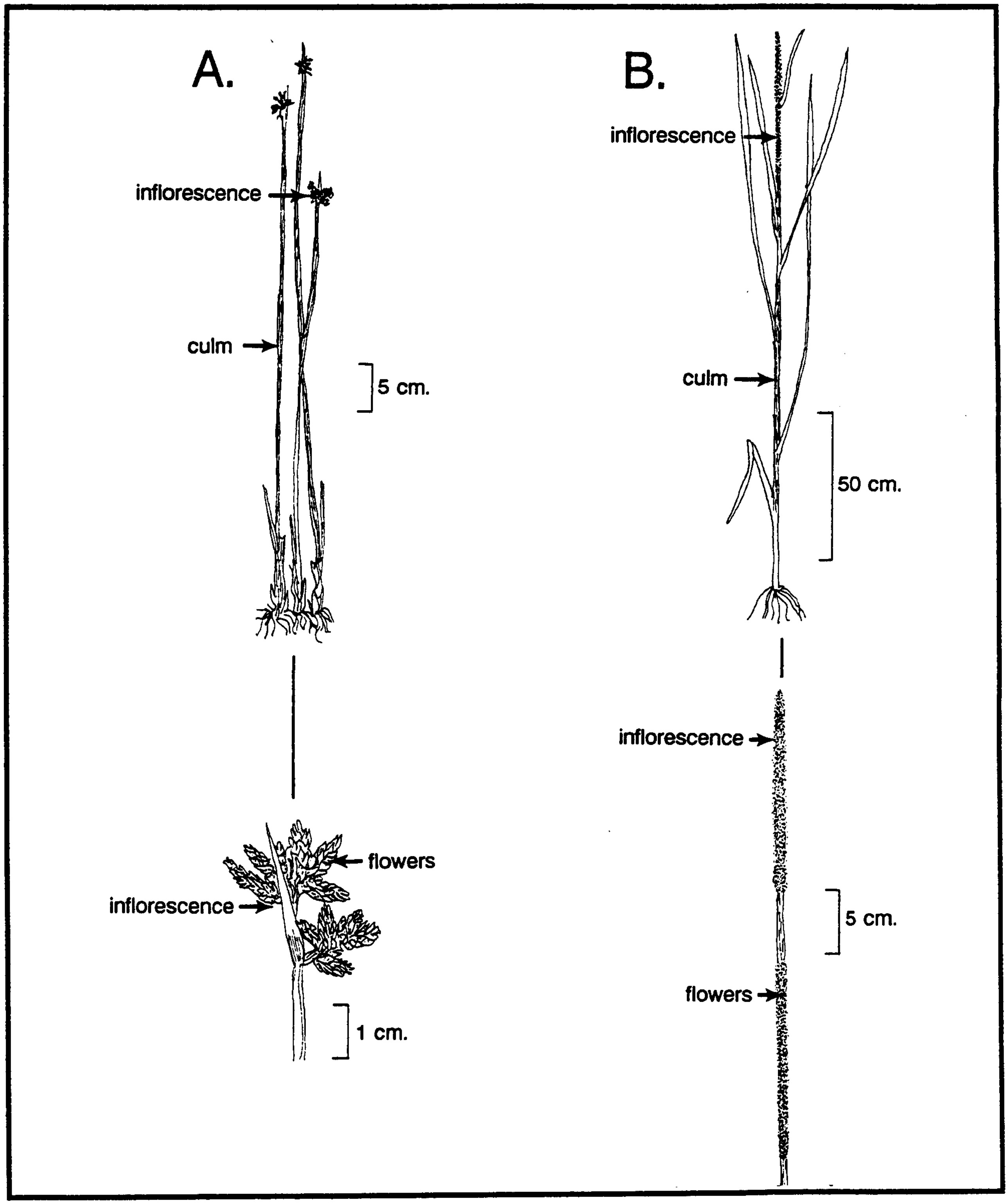

Fig. 2. (a) Anatomy of the common tule (*Scirpus acutus* var. *occidentalis*); (b) Anatomy of the cattail (*Typha latifolia*) (adapted from Hickman 1993:1149, 1311).

the culm (Mason 1957:36-37). Flowers are in tall spikes with the male portion of the spike located above "a thick, brown, cigar-shaped cluster of female flowers" (Farber 1982:65). Cattails bloom from June through July. Figure 2 illustrates anatomical features associated with the genus *Typha*.

Spike rush. Mason (1957:281) described spike rushes as "a group of usually small plants with a long history of confusion" in classification. Eighteen different species are common to California, but only one (*E. macrostachya*) is currently present in the San Joaquin Valley (Twisselman 1967:196). Although common in the Yokuts territory, there are no known references in the ethnographic or contemporary literature regarding the exploitation of this genus, and it will not be discussed further here.

Sedges. Generally restricted to areas of greater elevation, only one species of sedge (*Carex lanuginosa*) can be found on the floor of the southern valley today (Twisselman 1967:194). Sedges are quite common throughout other regions of California, and were extensively employed by the Foothill Yokuts (as well as other groups) as a basketry material (Kroeber 1925:532). The scarcity of sedges in the San Joaquin Valley implies that they were not a major component of the marsh plant community, nor heavily exploited by native groups, and no further consideration will be paid to the sedges.

What is Meant by the Term "Tule"?

It is the author's opinion that, in most cases, when reference is made to tule or tule exploitation in the southern San Joaquin Valley, what is actually being talked about is any member of the genus *Scirpus* (bulrush) or the genus *Typha* (cattail). This conclusion is based on several lines of evidence. First, only bulrushes and cattails were used by Yokuts groups, as recorded in the published ethnographic and ethnohistorical literature. Second, bulrushes and cattails are both found in emergent marshes, whereas rushes and sedges are more common in wet meadow habitats with much shallower water. The emergent marsh habitat matches very well with early Spanish descriptions of tulares and tulars. Finally, as mentioned above, the word tulare is Spanish for "swamp with flags," and the large inflorescences found on both bulrushes and cattails are very likely candidates for the "flags" which the Spanish and other explorers observed.

TULE UTILIZATION

The balance of this paper is concerned with some of the ways in which *Scirpus* and *Typha* were utilized by the Southern Valley Yokuts. Ethnographic and contemporary references on the subject will be compared.

Tules as Food

The abundant supply of bulrushes and cattails in the marshes of the southern San Joaquin Valley certainly must have supplied much of the nutrition for some Southern Valley Yokuts tribelets. Statements such as "tule roots (*pu muk*) were gathered, dried, pounded, and used as a flour for mush" (Gayton 1948:15), and "a starchy flour for mush was prepared from dried and pounded tule roots" (Wallace 1978:450), are common in the ethnographic literature. Also, young roots were often eaten raw (Medsger 1972:162), and the seeds of the tule (bulrush?) were collected and processed (Gayton 1948:15). Additionally, the plants of the tulare provided habitat for other important resources, such as waterfowl, fish, turtles, etc.

Contemporary researchers have compiled a comprehensive list of bulrush and cattail food applications. According to Kirk (1975:175), the roots of all species of bulrushes are edible. The starchy roots may be eaten raw or baked, dried, or ground into flour. Young roots can be crushed and boiled, resulting in a sweet syrup. The seeds can be parched and eaten or ground up for use in mush, and the pollen may be pressed into cakes and baked. The heart at the base of the stem is also quite starchy and makes a fine "filler" in soups (Gibbons and Tucker 1979:29).

Cattail is used in ways similar to bulrush. A type of bread can be made from the pollen, and the thick root can be either toasted or dried raw and ground into meal or flour (Balls 1962:32-33). Simms (1985:121) achieved extremely high caloric return rates from experimental harvest of cattail pollen in Utah. All cattail species possess a core that contains as much starch as corn, but with less fat (Kirk 1975:171), and the heart is tender enough to be eaten raw (Gibbons and Tucker 1979:11). In the summer, the staminate flower spikes can be cooked and eaten; they are sometimes referred to as "Cossack asparagus" (Medsger 1972:196). Medsger (1972) differentiated cattail from bulrush by food-type category; cattail falls into the "edible roots and tubers" category, while bulrush is part of the "salad plants and potherbs" category.

Tule as a Raw Material

Mats. Mats fashioned from tule were employed in a wide variety of applications, and exhibited a diversity in use akin to the modern day army poncho. For example, different sized mats were used to construct portable housing, floor coverings, mattresses, and sun shades. These mats could also be sewn together with string made from the fibers of milkweed (*Asclepias* spp.), and were easily rolled up and transported to different locations (Latta 1977:380).

Watercraft. Many marsh plants have air tubes in their roots and air pockets in their stems that diffuse air and store oxygen (Farber 1982:49). As a result, these plants are buoyant. Watercraft, both small and large, were fabricated by lashing together bundles of tule (Latta 1977:77). These boats, called "balsas," stayed afloat due to the buoyancy of the reeds, as opposed to being of watertight design and construction.

Structures. Houses (both individual and communal), granaries, and ramadas were all built of tule. Individual houses employed a wooden framework (two upright forked posts connected by a long pole) that was covered either with woven tule mats (Gayton 1948:13), or rows of thatched tule (Latta 1977:350-51). Large, communal houses capable of accommodating ten or twelve families were constructed in the same fashion (Kroeber 1925:521). Another type of structure was noted in the Tulare Lake area. These were dome-shaped dwellings, fabricated by weaving together living plants and fastening them at the top (Latta 1977:85-87).

ARCHAEOLOGICAL EVIDENCE OF TULE EXPLOITATION

The archaeological record of the southern San Joaquin Valley contains numerous examples of the exploitation of tule. Human burials wrapped in tule (either woven into mats or unmodified) have been recovered from several sites in the Buena Vista Lake area (e.g., Gifford and Schenck 1926:105-106; Wedel 1941:116; Walker 1947:5-6; von Werlhof 1960). Clay objects with surface impressions indicating that they had been wrapped in tule were described by Wedel (1941:46). It has been hypothesized that the tule wrapping served to retard desiccation of the clay (Heizer 1937:41).

CONCLUSION

What is tule? It is the contention of this author that over time, the word tule has been applied on a number of levels. *Scirpus acutus*, or the common tule, was probably the most prominent and utilized plant in the marsh plant community of the southern San Joaquin Valley prior to extensive marsh reclamation. Additionally, the name tule has also been generally applied when referring to any member of the genus *Scirpus*. Finally, tule is often used as a blanket term to cover all of the large marsh plants that are present in a marsh, and in this case, any member of the genera *Scirpus* (bulrush) or *Typha* (cattail).

REFERENCES

Balls, Edward K.
1962 Early Uses of California Plants. Berkeley: University of California Press.

Beals, Ralph L.
1974 Indian Land Use and Occupancy in California. In: California Indians I, David Agee Horr ed., pp. 9-264. New York: Garland Publishing Inc.

Bolton, Herbert Eugene
1935 In the South San Joaquin Ahead of Garces. Bakersfield: Kern County Historical Society.

Brown, Vinson
1957 The Californian Wildlife Region: Its Common Wild Animals and Plants. Happy Camp: Naturegraph Company.

Burcham, Levi T.
1957 California Range Land: An Historical-Ecological Study of the Range Resources of California. Sacramento: State Department of Natural Resources.

Caughey, John Walton
1952 The Indians of Southern California in 1852: The B. D. Wilson Report and a Selection of Contemporary Comment. San Marino: The Huntington Library.

Farber, Phyllis M.
1982 Common Wetlands Plants of Coastal California: A Field Guide for the Layman. Mill Valley, CA: Pickleweed Press.

Gayton, A. H.
1948 Yokuts and Western Mono Ethnography I: Tulare Lake, Southern Valley, and Central Foothill Yokuts. University of California Anthropological Records 10(1).

Gibbons, Euell, and Gordon Tucker
1979 Euell Gibbons' Handbook of Edible Wild Plants. Virginia Beach: The Donning Company.

Gifford, E. W., and W. Egbert Schenck
1926 Archaeology of the Southern San Joaquin Valley, California. University of California Publications in American Archaeology and Ethnology 23(1).

Gudde, Erwin G.
1969 California Place Names: The Origin and Etymology of Current Geographical Names. Berkeley: University of California Press.

Hartzell, Leslie L.
1992 Hunter-Gatherer Adaptive Strategies and Lacustrine Environments in the Buena Vista Lake Basin, Kern County, California. Ph.D. dissertation, University of California, Davis.

Heizer, Robert F.
1937 Baked-clay Objects of the Lower Sacramento Valley, California. American Antiquity 3(1):34-50.

Hickman, James C. (ed.)
1993 The Jepson Manual: Higher Plants of California. Berkeley: University of California Press.

Hittell, John H.
1866 The Resources of California: Comprising Agriculture, Mining, Climate, Commerce, and the Past and Future Development of the State. San Francisco: A. Roman and Company.

Holland, V. L., and David J. Keil
1990 California Vegetation (fourth edition). San Luis Obispo: El Corral Publications.

Kirk, Donald R.
1975 Wild Edible Plants of Western North America. Happy Camp: Naturegraph Publishers.

Kroeber, A. L.
1925 Handbook of California Indians. Bureau of American Ethnology Bulletin 78.

Latta, Frank F.
1977 Handbook of Yokuts Indians (second edition). Santa Cruz: Bear State Books.

Mason, Herbert L.
1957 A Flora of the Marshes of California. Berkeley: University of California Press.

Medsger, Oliver Perry
1972 Edible Wild Plants: The Complete, Authoritative Guide to Identification and Preparation of North American Edible Wild Plants. New York: Collier Books.

Munz, Philip A.
1974 A Flora of Southern California. Berkeley: University of California Press.

Preston, William L.
1981 Vanishing Landscapes: Land and Life in the Tulare Lake Basin. Berkeley: University of California Press.

Raymond, Anan W., and Virginia M. Parks
1990 Archaeological Sites Exposed by Recent Flooding of Stillwater Marsh Carson Desert, Churchill County, Nevada. In: Wetland Adaptations in the Great Basin, Joel C. Janetski and David B. Madsen, eds., pp. 33-61. Brigham Young University Museum of Peoples and Cultures Occasional Papers No. 1.

Simms, Steven R.
1985 Acquisition Cost and Nutritional Data on Great Basin Resources. Journal of California and Great Basin Anthropology 7(1):117-126.

Twisselman, Ernest C.
1967 A Flora of Kern County, California. San Francisco: University of San Francisco Press.

von Werlhof, J. C.
1960 Notes on Various Tulare and Kern County Sites. Berkeley: University of California Archaeological Survey Manuscript 292.

Walker, Edwin F.
1947 Excavation of a Yokuts Indian Cemetery. Bakersfield: Kern County Historical Society.

Wallace, William J.
1978 Southern Valley Yokuts. In: Handbook of North American Indians, Vol. 8., California, Robert F. Heizer, ed., pp. 448-461. Washington: Smithsonian Institution.

Wedel, Waldo
1941 Archaeological Investigations at Buena Vista Lake, Kern County, California. Bureau of American Ethnology Bulletin 130.

Zigmond, Maurice L.
1981 Kawaiisu Ethnobotany. Salt Lake City: University of Utah Press.

BIBLIOGRAPHY FOR THE YOKUTS AND RELATED TOPICS—1996 SUPPLEMENT

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INTRODUCTION

The following references are an additional supplement to the bibliography originally published in Volume 3 (1992) of the *Kern County Archaeological Society Journal*, as well as the updates included in Volumes 4 (1993), 5 (1994), and 6 (1995). Readers with additional references are encouraged to contact the editors in order to facilitate the continued updating of the Yokuts bibliography.

BIBLIOGRAPHY

Acken, C. S.

1976 How Indians Caught Wild Pigeons. In: A Collection of Ethnographic Articles on the California Indians, R. F. Heizer, ed., p. 56. Ramona: Ballena Press.

Anonymous

1892 An Aboriginal Mill. Visalia Daily Morning Delta (newspaper), November 6.

1976 The Tulare Lakes. In: A Collection of Ethnographic Articles on the California Indians, R. F. Heizer, ed., pp. 57-60. Ramona: Ballena Press.

1993a Yokuts Indians, Rodriguez-Nieto Guide. Berkeley: California Indian Library Collection. (Reproduced from the Language Archives at the Language Laboratory, University of California, Berkeley.)

1993b Yokuts Indians, Photographs. Berkeley: California Indian Library Collection. (Reproduced from: The Phoebe A. Hearst Museum of Anthropology Collection of Photographs.)

Arguelles, Marcus R.

1983 Overview of Cultural Resources, Kern and Pixley National Wildlife Refuges, California. Report on file at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.

Atwater, Brian F., David P. Adam, J. Platt Bradbury, Richard M. Forester, Robert K. Marks, William R. Lettis, G. Reid Fisher, Kenneth W. Gobalet, and Stephen W. Robinson

1986 A Fan Dam for Tulare Lake, California, and Implications for the Wisconsin Glacial History of the Sierra Nevada. Geological Society of America Bulletin 97:97-109.

Barrett, Samuel A.

1907 Yokuts and Shoshonean Notes. Notes on file at the Phoebe A. Hearst Museum of Anthropology, University of California, Berkeley.

Beeler, Madison S.

1971 Noptinte Yokuts. In: Studies in American Indian Languages, J. Sawyer, ed., pp. 11-76. Berkeley: University of California Publications in Linguistics 65.

Breschini, Gary S., and Trudy Haversat

1985 Archaeological Inventory of San Luis, Kesterson, and Merced National Wildlife Refuges, Merced County, California. Report on file at the U. S. Fish and Wildlife Service, Portland.

Breschini, Gary S., Trudy Haversat, and Michael J. Moratto

1985 Archaeological Survey and Testing for the Kern Tile Drain Research Project, Kern National Wildlife Refuge, Northern Kern County, California. Report on file at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.

Brown, Robert R.

1940 History of Kings County, Narrative and Biographical. Hanford: A. H. Cawston.

Bunnell, Lafayette Haughton

1911 Discovery of Yosemite and the Indian War of 1851 Which Led to that Event. Los Angeles: G. W. Gerlicher.

Dieckman, John J.

1973 The Archaeology of Buena Vista Village, Kern County, California. Report on file at the Kern County Museum, Bakersfield.

Fenenga, Gerrit L.

1995 Man and Pleistocene Fauna at Tulare Lake. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Fredrickson, David A.

1962 Archaeological Salvage Operations Near Lemoore, California. Report on file at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.

Gamble, Geoffrey

1978 Wikchamni Grammar. Berkeley: University of California Publications in Linguistics 89.

Gardner, Jill, Kimberly Pinney, Hubert Switalski, and Athene Mitchell

1995 Archaeological Investigations at the Van den Enden Site, Tulare Lake, California. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Gobalet, Kenneth W., and Gerrit L. Fenenga
1993 Terminal Pleistocene--Early Holocene Fishes from Tulare Lake, San Joaquin Valley, California. PaleoBios 15(1):1-8.

Goldman, R. A.
1908 Summer Birds of the Tulare Lake Region. The Condor 10(5):200-205.

Gray, Thorne B.
1993 The Stanislaus Indian Wars: The Last of the California Northern Yokuts. Modesto: McHenry Museum Press.

Grayson, Colonel Andrew J.
1920 Game in the San Joaquin Valley in 1853. California Fish and Game 6(3):104-107.

Grunsky, C. E.
1930 Tulare Lake--A Contribution to Long-time Weather History. Monthly Weather Review 58(7):288-290.

Hewes, G. W., and W. C. Massey
1940-1942 Central San Joaquin Reconnaissance, 1940-1942. Berkeley: University of California Archaeological Survey Manuscript No. 381.

Hurtado, Albert L.
1988 Indian Survival on the California Frontier. New Haven: Yale University Press.

Hylkema, Mark G.
1992 Some Perspectives on Upland Settlement Patterns of the Central Diablo Range of California. Paper presented at the annual meetings of the Society for California Archaeology, Pasadena.

Jackson, Thomas L.
1990 Prehistoric Ceramics of the Southwestern Sierra Nevada, California. In: Hunter-Gatherer Pottery from the Far West, Joanne M. Mack, ed., pp. 159-170. Nevada State Museum Anthropological Papers No. 23.

Johnson, J. R., A. Miller, and L. Agren
1991 Papers of J. P. Harrington at the Santa Barbara Museum of Natural History. Anthropological Linguistics 33(4):367-378.

Latta, Frank F.
1936 El Camino Viejo á Los Angeles. Bakersfield: Kern County Historical Society.

1949 Black Gold in the Joaquin. Caldwell: The Caxton Printers.

1980 Joaquin Murrieta and His Horse Gangs. Santa Cruz: Bear State Books.

Latta, F. F. and W. R. Dumble
MS Notes on Archaeological Sites on the West Side of the San Joaquin Valley. Berkeley: University of California Archaeological Survey Manuscript No. 133.

Linton, C. B.
1908 Notes from Buena Vista Lake, May 20 to June 16, 1907. The Condor 10(5):196-198.

Loveall, John, Jim Cassidy, and Ryan Bloching
1995 Archaeological Investigations at the Mr. Ed Site, Tulare Lake, California. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Macko, Michael E., and Edward B. Wiel
1991 Specialized Food Procurement at CA-KER-1437, the Elliot Ranch Site. In: Papers on California Prehistory: 3, Gary S. Breschini and Trudy Haversat, eds., pp. 79-94. Coyote Press Archives of California Prehistory No. 33.

Magruder, Genevieve Kratka
1950 The Upper San Joaquin Valley, 1772-1870. Bakersfield: Kern County Historical Society.

Manifold, Douglas, Patricia Manifold, and Greg Reza
1995 Archaeological Investigations at the Corral Site, Tulare Lake, California. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Mitchell, Annie R.
1949 Major James D. Savage and the Tularenos. California Historical Society Quarterly 28:323-341.

Moore, Mathew
1995 Late Prehistoric Population Boundaries and Movements on the West Side of the San Joaquin Valley. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Moratto, Michael J.
1995 Medieval Droughts and Cultural Ecology in the Sierra Nevada, California. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Mundy, W .J.
1990 The 1985 and 1986 Generals Highway Archaeological Survey, Sequoia National Park, California. Yosemite Research Center, Publications in Anthropology 10(1).

Nichols, Michael J. P.
1983-1984 Old California Uto-Aztecan. Journal of the Steward Anthropological Society 15(1-2):23-46.

Osborne, Richard H., and Mark Q. Sutton
1993 Archaeological Inventory and Assessment of the Proposed Pacificana Project, Kern County, California. Report on file at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.

Parkman, E. Breck
1986 Cupule Petroglyphs in the Diablo Range, California. Journal of California and Great Basin Anthropology 8(2):246-259.

1988 Further Notes on Cupule Petroglyphs in the Diablo Range, California. Journal of California and Great Basin Anthropology 10(1):114-117.

Parr, Robert E.
1994 Archaeological Assessment of 4,525.45 Acres of Land West of Bakersfield, Kern County, California. Report on file at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.

Parr, Robert E., and Richard Osborne
1992 Archaeological Survey Report for the Proposed Route Adoption Study on Highway 58, Bakersfield, Kern County, California. Report on file at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield.

Pilling, A. R.
1948 Notes on the D. M. Witt Collection, Artifacts from the Southern San Joaquin Valley. Berkeley: University of California Archaeological Survey Manuscript No. 56.

Planas, Lorrie A.
1991 The Dynamics of Cultural Change: A Study of the Indians of the Central San Joaquin Valley. Master's thesis, California State University, Sacramento.

Preston, Bill
1989 *Infinidad de Gentiles*: Aboriginal Population in the Tulare Basin. Association of Pacific Coast Geographers Yearbook 51:79-100.

1995 Aboriginal Foraging Involution in the Tulare Lake Basin. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Rhode, Pete
1995 Bussing Tables and Stacking Plates: A Brief Review of Central California Charmstones as Cultural Tracers. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Riley, L. M.
1987 Archaeological Investigations in the Merced River Canyon: Report of the 1983 El Portal Archaeological Project. Yosemite Research Center, Publications in Anthropology 2(1).

S. A. P.
1892 With the Tulare Indians. San Luis Obispo Tribune (newspaper), April 15.

Siefkin, Nelson
1995 Aboriginal Trails in the Southern San Joaquin Valley, California. Paper presented at the annual meetings of the Society for California Archaeology, Eureka.

Smith, W. P. U.
1932 The Development of the San Joaquin Valley, 1772-1882. Ph.D. dissertation, University of California, Berkeley.

Snyder, James B.
1990 Inventory of the Ethnographic Papers of Frank Forest Latta. Report on file at the Yosemite Research Library, Yosemite National Park.

Thrall, B., and A. H. Gayton
1938 Chukchansi Yokuts Culture. MS on file at the Bancroft Library, University of California, Berkeley.

von Werlhof, J. C.
1960 Notes on Various Tulare and Kern County Sites. Berkeley: University of California Archaeological Survey Manuscript No. 292.

Whistler, Kenneth W., and Victor Golla
1986 Proto-Yokuts Reconsidered. International Journal of American Linguistics 52(4):317-358.

Wickstrom, C. K. R.
1987 Issues Concerning Native American Use of Fire: A Literature Review. Yosemite Research Center, Publications in Anthropology 6(1).

1988 The 1986 Archaeological Investigations at Dorst Campground, Sequoia and Kings Canyon National Parks. Yosemite Research Center, Publications in Anthropology 4(1).

Witt, Donald
1964 The Sintache Site. The Digger's Digest 3(3):2-4.

1965 Yokuts Archaeology. The Digger's Digest 4(5):2-4.

1967 Early Man in California. The Digger's Digest 6(1):3-4.

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