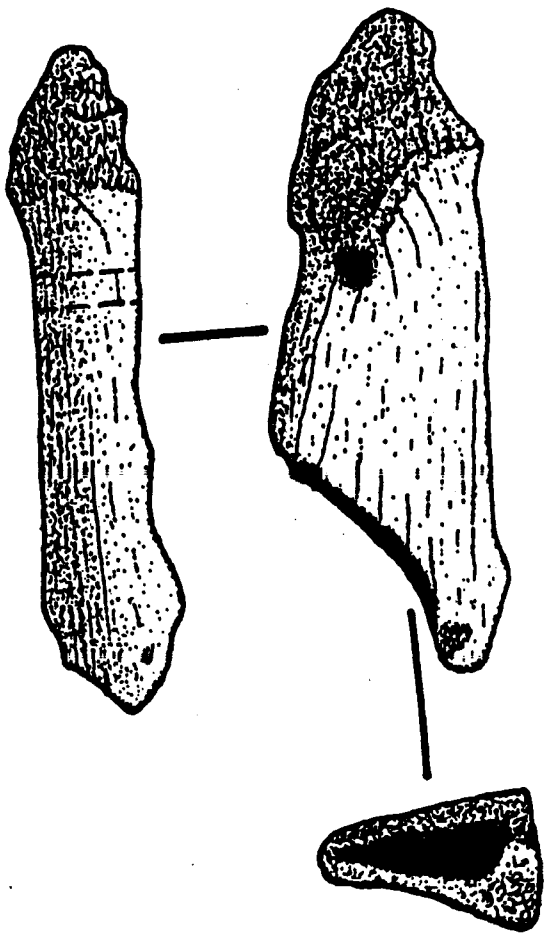
KERN COUNTY ARCHAEOLOGICAL SOCIETY

JOURNAL



1994

VOLUME 5

KERN COUNTY ARCHAEOLOGICAL SOCIETY JOURNAL

VOL. 5, 1994

Editors: Sharynn-Marie Valdez and Scott R. Jackson

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Kern County Archaeological Society
P.O. 9793
Bakersfield, CA 93389

The Kern County Archaeological Society Journal is published on an occasional basis. The Journal publishes articles and reports on the archaeology and ethnography of Kern County and surrounding areas.

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Cover illustration: Fossilized bone atlatl engaging spur from Tulare Lake, courtesy of Gerritt L. Fenenga (length of specimen is 51 mm.).

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MESSAGE FROM THE EDITORS

This is the fifth issue of the Kern County Archaeological Society Journal published to date: Vol. 1 in 1977, Vol. 2 in 1984, Vol. 3 in 1992, and Vol. 4 in 1993. It is the goal of the KCAS to publish a Journal each year. We are interested in papers on the archaeology or ethnography of the San Joaquin Valley and surrounding areas, written by members of the KCAS: professional, student, and avocational.

We intend the papers to make a contribution to the anthropology of the San Joaquin Valley and southern California. We will strive to include as much material as possible and encourage authors to submit their papers for consideration. We appreciate the editoral assistance of Jill Gardner and Mark Q. Sutton.

Sharynn-Marie Valdez
Scott R. Jackson
Editors, Vol. 5.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-2721, BUTTONWILLOW

Scott Baxter, Alan Salazar, and Gretchen Maxwell, Dept. of Sociology and Anthropology, CSU Bakersfield

INTRODUCTION

Site CA-KER-2721 is located in the southern San Joaquin Valley near the town of Buttonwillow (Fig. 1). It lies immediately adjacent to the western boundary of the Buena Vista Slough. The site consists of a sparse shell and lithic scatter accompanied by a dark soil and shell midden (Fig. 2). It is located in a Lower Sonoran Grassland plant community, a recently acknowledged desert with an annual rainfall of less than six inches. The site is covered with saltbush (*Atriplex polycarpa*) and various grasses. The region was once a perennial grassland that has since been destroyed by cattle grazing (Twisselmann 1967:91).

In an effort to learn more about this little known area of the San Joaquin Valley excavations were undertaken there by the California State University, Bakersfield field class under the direction of Robert Parr during the Spring of 1991. The material recovered during these excavations was then cataloged in the CSU, Bakersfield catalog class during the Fall of 1992. This paper is a summary of the results from the cataloging class. The material from the site is now being stored at CSU, Bakersfield.

FIELD TECHNIQUES

Three basic field techniques were utilized: surface collection, surface scrapes, and test excavations. All diagnostic items noticed on the surface were flagged, mapped with a transit and tape, collected, and bagged. There were two surface scrapes conducted (SS-1 and SS-2). Each surface scrape was 5 x 5 m. in dimension and oriented north-south. Each surface scrape was adjacent to a test unit. The soil was passed through 1/8-in. screen. All materials recovered from the screens were bagged.

Two test units (TU-1, TU-2), each 1-m. x 2-m. in dimension, were excavated in arbitrary ten-centimeter levels with trowel and shovel. The two units were oriented north-south. Due to the fact that TU-1 was located within the boundaries of SS-1, this unit was started 5 cm. below the surface. It was excavated in ten centimeter levels to a depth of 125 cm. before it was terminated. TU-2 was excavated to a depth of 70 cm. before termination.

SOILS

The soil at KER-2721 was composed mostly of silts, but became progressively more clay like at depth. The soil in TU-1 was grayer and more midden like than the soil in TU-2 (Fig. 3). With the exception of rodent holes from the upper two levels of TU-1 no disturbance of the soil was noted.

LABORATORY TECHNIQUES

All materials were cataloged by provenience (surface, unit, level, etc.) and given consecutive numbers. Formed artifacts were given separate catalog numbers. The length, width, thickness, and weight of each artifact was recorded. Debitage was separated by material, weighed, and assigned a number. Faunal remains were separated by material (shell, bone, and insect) and weighed. The shell was further categorized into *Physa*, *Anodonta*, and land snail. Bone was separated into identifiable and unidentifiable categories, retaining their original numbers.

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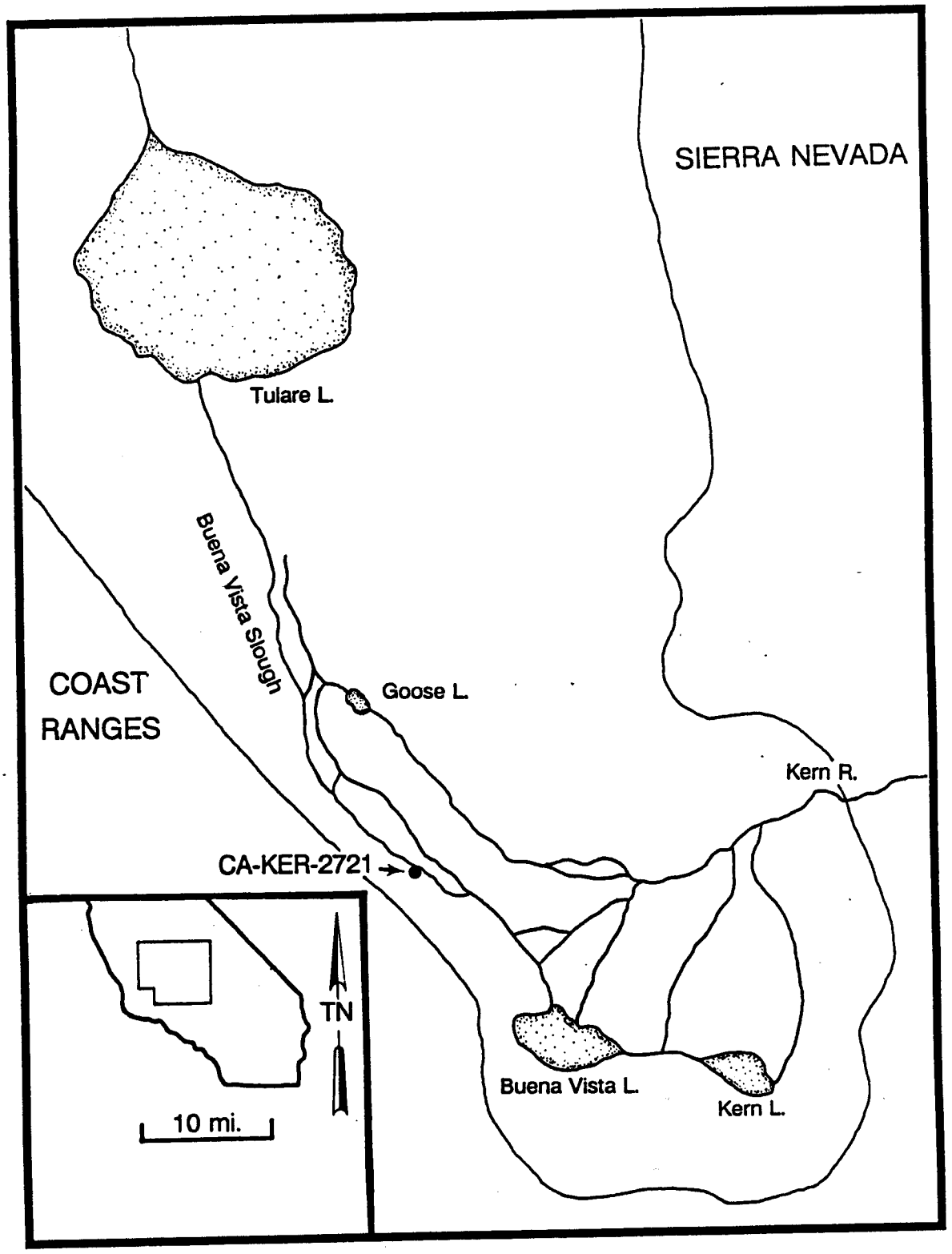

Fig. 1. Location of the CA-KER-2721 site.

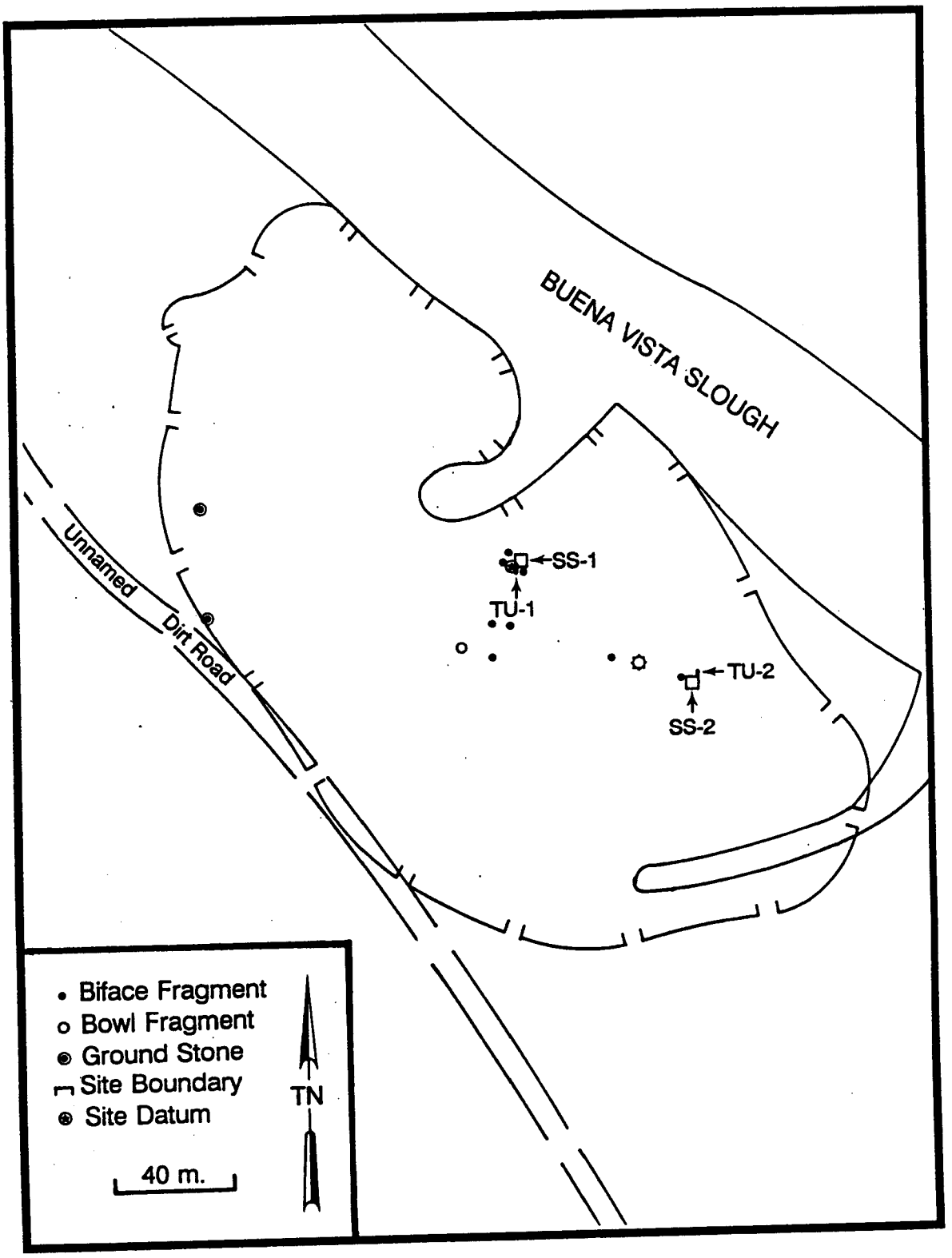

Fig. 2. Map of the CA-KER-2721 site.

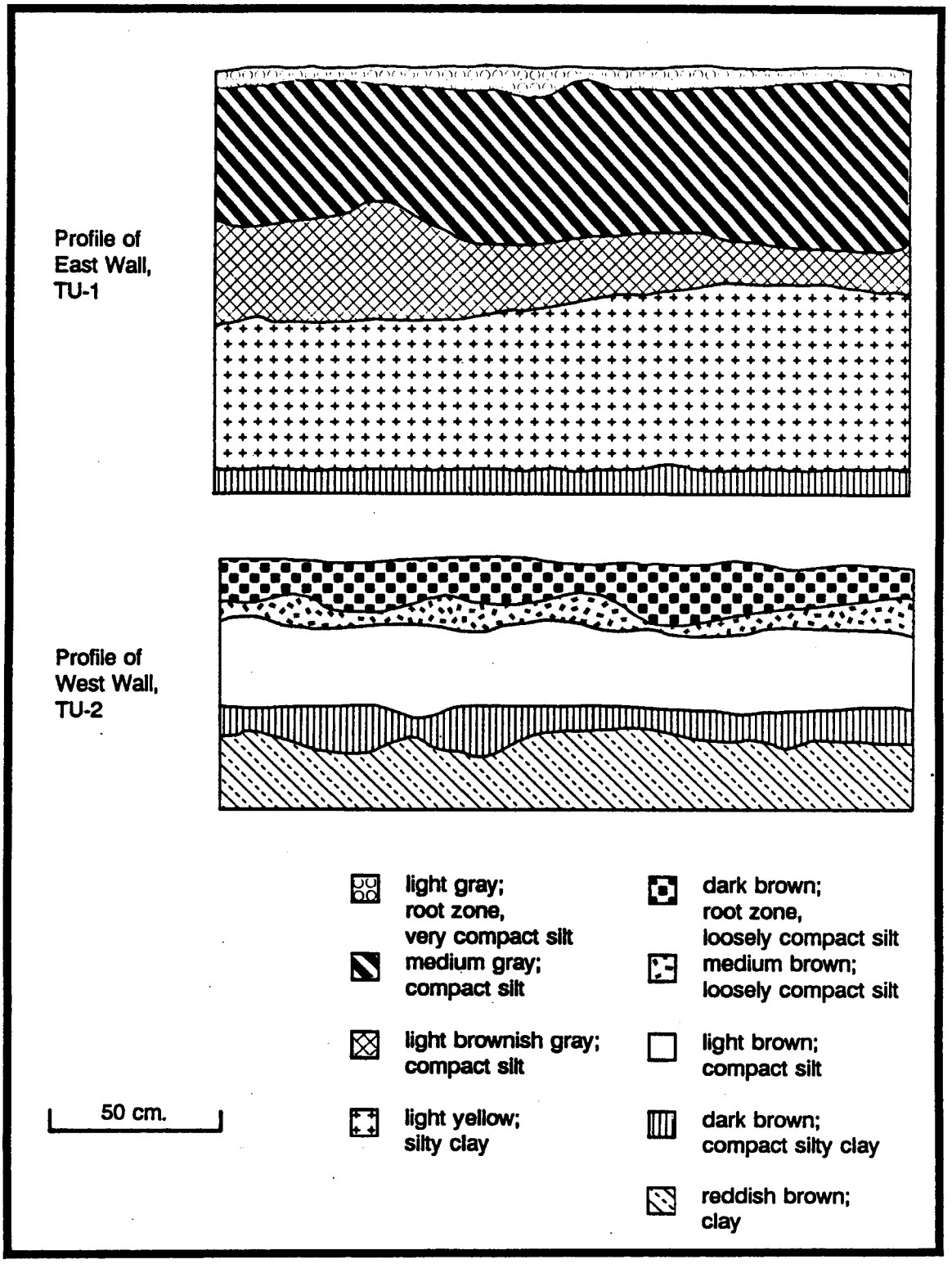

Fig. 3. Side wall profiles of TU-1 and TU-2, CA-KER-2721

RESULTS

MATERIAL CULTURE

Ground Stone

A steatite bowl fragment (Fig. 4a) was recovered from the surface of the site (see Table 1). In addition, four fragments of unidentified ground stone were recovered (Table 1). Two came from the 25 to 45-cm. level of TU-1. Both were made of quartzite and one showed evidence of battering on one end. A third is granite and was recovered from the 55 to 65-cm. level of TU-1. The fourth piece of unidentified ground stone was found in the back dirt of TU-1, but no provenience was recorded.

Flaked Stone

Projectile Points. Two possible projectile points were found (Table 1). A chert Cottonwood Triangular point fragment (Fig. 4b) was found on the surface of the site. One small chert biface fragment (Fig. 4c) was tentatively identified as an "ear" from a large projectile point (e.g., Elko).

Biface Fragments. Two biface fragments were found at the site (Table 1). One chert biface fragment was recovered from SS-2 and one was recovered from the 0 to 10-cm. level of TU-2.

Cores. A possible bipolar core (Table 1) was recovered from SS-1. Another core fragment was recovered from the back dirt of TU-1, but no provenience was recorded.

Debitage. Most of the debitage recovered from the site (Table 2) consisted of chert, but a limited number of flakes of other materials were also recovered.

Olivella Shell Beads

A total of 12 *Olivella* beads was recovered from the site (Table 3), all were typed using Bennyhoff and Hughes (1987). Of the 12, eight Olivella beads are recovered from the surface of the site. Of those eight, five were split-punched type D-1 beads. Two are type G-1, tiny saucer beads. One of the beads is a spire and base ground type B3b medium barrel bead. Four of the beads were found subsurface. Of those four, a single split-punched type D-1 bead was recovered from the 5 to 15-cm. level of TU-1. Three tiny saucer type G-1 *Olivella* beads were recovered from the 0 to 10-cm. level of TU-2.

FAUNAL REMAINS

A small amount of marine and terrestrial bone (n = 142) and large quantities of shell were recovered from the site (tables 4-6). The shell was composed of *Anodonta*, *Physa*, and land snail.

Land Snail

There was 186 g. of land snail shell recovered from TU-1, 46.3 g. recovered from TU-2, and none from the surface for a total of 232.3 g. for the site.

Water Snail

There was 4.8 g. of water snail (*Physa* sp.) recovered from TU-1, 2.8 g. recovered from TU-2, and none from the surface for a total of 7.6 g. for the entire site.

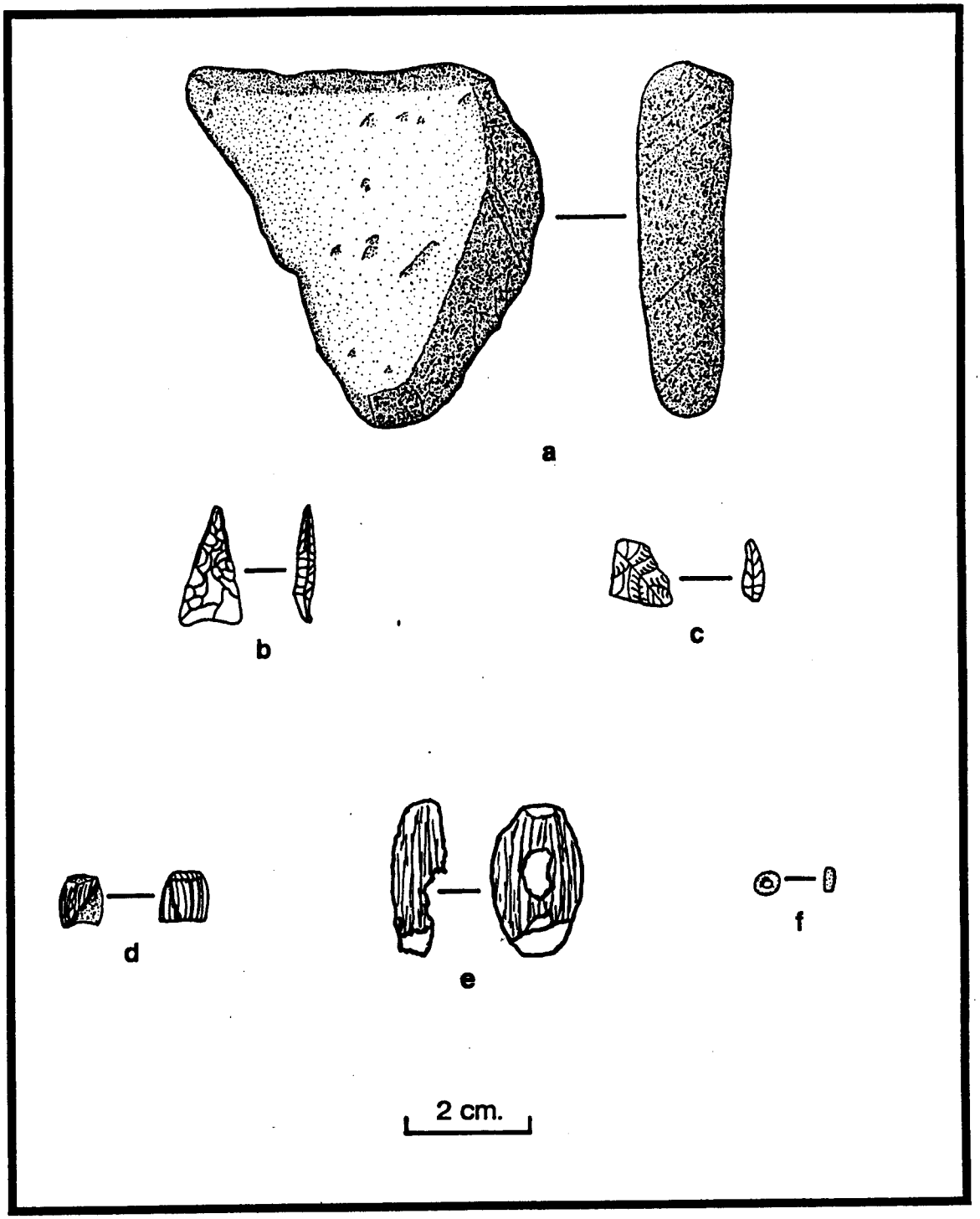

Fig. 4. Artifacts from CA-KER-2721: a) steatite bowl fragment (B-004); b) Cottonwood Triangular point (A2-003); c) possible projectile point "ear" (A2-004); d) *Olivella* B3b shell bead (B-002) e) *Olivella* D-1 shell bead (B-003); f) *Olivella* G-1 shell bead (2-009).

Table 1

ATTRIBUTES OF LITHIC ARTIFACTS FROM CA-KER-2721

CAT. NO.	DESCRIPTION	MATERIAL	PROVENIENCE	LENGTH (mm.)	WIDTH (mm.)	THICK. (mm.)	WEIGHT (g.)	FIG.
GROUND STONE								
B-001	unidentified	sandstone	surface	38.0	25	9.5	7.3	
B-004	bowl fragment (rim)	steatite	surface	55.0	45	13.5	57.7	4a
1-021	fragment, showed signs of battering	quartzite	TU-1, 25-45	24	28	27	29.2	
1-022	unidentified	quartzite	TU-1, 25-45	29	30.0	31.0	22.0	
1-035	unidentified	granitic	TU-1, 55-65	33.0	31.0	27.0	30.8	
1-082	unidentified	quartz	TU-1, backdirt	33.0	29.0	18.6	17.5	
FLAKED STONE								
A2-003	Cottonwood Triangular point	chert	SS-2	18.0	10.0	3.0	0.3	4b
A2-004	possible point fragment	chert	SS-2	9.0	9.0	3.0	0.3	4c
2-006	biface fragment	chert	TU-2, 0-10	14.5	9.5	3.0	0.4	
B-005	biface fragment	obsidian	surface	14.0	11.0	4.0	0.6	
CORES								
A-001	possible bipolar core	chalcedony	none	17.5	22.0	17.5	9.8	
1-083	core fragment	chert	none	44.0	23.0	23.0	18.5	

Fresh Water Clam

There was 151.25 g. of fresh water clam (*Anodonta* sp.) recovered from TU-1, 10.92 g. recovered from TU-2, and none from the surface for a total of 162.17 g. for the entire site.

Fish

A number of fish bones were recovered from the site but only a portion of them were identifiable to species level. One element (<1% of the collection) of Sacramento sucker (*Catostomus occidentalis*), an atlas vertebra, was positively identified although there is another probable vertebra (<1% of the collection) of this fish represented in the collection. This species is common through out the Sacramento-San Joaquin drainage. In large streams and rivers, the young inhabit the gravel shallows while the adults show a strong preference for deep pools where they can grow up to half a meter in length (McGinnis 1984:162).

Table 2

DISTRIBUTION OF DEBITAGE AT CA-KER-2721

PROVENIENCE (cm.)/ MATERIAL	CHERT	CHALCEDONY	OBSIDIAN	QUARTZ	QUARTZITE	TOTALS
SURFACE COLLECTION	–	–	2	–	–	2
Surface Scrape 1	14	9	1	–	–	24
Surface Scrape 2	77	–	–	–	–	77
TU-1						
0-5	3	–	–	–	–	3
5-15	26	2	–	–	–	28
15-25	46	–	–	–	–	46
25-45	172	–	–	–	–	172
45-55	32	–	–	–	–	32
55-65	69	–	–	–	–	69
65-75	15	–	–	–	1	16
75-85	6	–	–	3	–	9
85-95	2	–	–	–	23	25
95-105	–	2	–	–	24	26
105-115	3	–	–	–	1	4
115-125	–	–	–	–	–	–
TU-2						
0-10	161	1	–	2[1]	–	164
10-20	2	–	–	–	–	2
20-30	6	–	–	–	–	6
30-40	6	–	–	–	–	6
40-50	9	–	–	–	–	9
50-60	2	–	–	–	–	2
60-70	2	–	–	–	–	2
TOTALS	653	14	3	5	49	724

[1] Fire affected

Table 3

OLIVELLA SHELL BEADS FROM CA-KER-2721

CAT. NO.	PROVENIENCE	STYLE	LENGTH (mm.)	WIDTH (mm.)	THICK. (mm.)	PERFORATION DIAMETER (mm.)	WEIGHT (g.)	FIG.
B-002	106 m. at 261° from NW corner of SC-1	B3b	7.5	7.5	1.0	4.0	7.3	4d
B-003	40.5 m. from NW corner of TU-1	D-1	25.0	1.4	2.0	8.0 x 5.0	1.4	4e
B-007	20 m. at 186° from NW corner of SS-1	D-1	19.0	6.5	1.0	5.0 x 4.0	1.0	
B-010	2.12 m. at 116° from Datum	G-1	3.5	3.5	2.0	3.0	0.1	
B-011	3.8 m. at 305° from NW corner of TU-2	D-1	11.0	9.0	1.0	N/A	0.5	
B-012	23.2 m. at 203° from NW corner of TU-1	D-1	17.5	12.0	1.5	5.0 x 4.0	0.8	
B-013	1.7 m. at 249° from Datum of TU-2	G-1	4.0	4.0	2.0	2.0	0.2	
B-014	30.4 m. at 195° from NW corner of TU-1	D-1	18.0	7.0	1.5	4.0 x 3.5	0.6	
1-007	TU-1, 5-15	D-1	15.5	10.5	1.5	N/A	0.4	
2-009	TU-2, 0-10	G-1	4.0	3.5	2.0	1.0	0.3	4f
2-010	TU-2, 0-10	G-1	3.5	3.5	1.5	1.0	0.3	
2-011	TU-2, 0-10	G-1	4.0	4.0	2.0	1.5	0.3	

Sacramento perch (*Archoplites interruptus*) is represented by three vertebral elements (2%). Living in ponds and backwater habitats, this species posses the physiological ability to cope with the broad range of pH found throughout its Central Valley habitat. Once an important food source for Native Californians, it became a top game fish during settlement of the San Joaquin Valley with specimens up to 60 cm. in length (McGinnis 1984:203).

Although only identifiable to the family level seven vertebrae (5%) of minnow (Cyprinidae) were found. In addition, there are also two unidentified fish vertebrae (1%) present in the collection.

Amphibian

One possible specimen of an unidentified amphibian is present composing <1% of the collection.

Turtle

There are 17 fragments of turtle bone composing 12% of the collection, all of these were recovered from TU-1. Of these six were identifiable as pacific pond turtle (*Clemmys marmorata*), the remaining eleven were unidentified beyond the genera level.

Bird

Only one fragment of bird bone composing <1% of the collection was recovered from the site. It came from the 45 to 55-cm. level of TU-1, but was unidentified.

Table 4

DISTRIBUTION OF FAUNAL REMAINS FROM SURFACE SCRAPES

COMMON NAME	TAXON/PROVENIENCE	SS-1	SS-2	TOTAL NISP[1]	TOTAL WT.[2]
unidentified fish	Osteichthyes	–	1	1	0.02
unidentified small mammal	Mammalia	7	1	8	0.37
TOTAL NISP	–	7	2	9	–
TOTAL WT.[1]	–	0.29	0.1	–	0.39

[1] number of identified specimens
[2] weight in grams

Cottontail

This species (*Sylvilagus audubonii*) is represented by only one element composing <1% of the collection. It was recovered from TU-1.

Antelope Ground Squirrel

There are 2 elements of this species (*Ammospermophilus lecurus*) composing 1% of the collection. They were both recovered from TU-2.

Kangaroo Rat

There are three elements of this rodent (*Dipodomys* sp.) representing 2% of the collection. They were all recovered from TU-2.

Vole

There are 9 elements of this species (*Microtus californicus*) representing 6% of the collection. They were all collected from the same level of TU-2 and probably are the result of a burrow death.

Unidentified Rodent

There were 16 fragments of bone that were only identifiable as being that of a rodent and compose 11% of the collection. One fragment was recovered from TU-2, the remaining 15 fragments were recovered from TU-1.

Unidentified Mammal

There were 74 fragments of small mammal bone recovered from the site representing 52% of the collection. Seven fragments were recovered from SS-1 and one fragment was recovered from SS-2. From TU-1 55 fragments were recovered and the remaining eleven from TU-2.

There were also fragments of larger mammal bone recovered at the site. One each of medium mammal and large mammal bone fragments were recovered from TU-1 both composing <1% of the collection.

Table 5

VERTICAL DISTRIBUTION OF FAUNAL REMAINS, TU-1

COMMON NAME	TAXON/LEVEL (cm.)	0-5	5-15	15-25	25-45	45-.55	55-65	65-75	75-85	85-95	95-105	105-115	115-125	TOTAL NISP[1]	TOTAL WT.[2]
land snail	mollusk	0.01	2.4	2.8	16.1	12.0	13.2	22.9	77.8	15.2	4.4	11.3	7.9	--	186.01
water snail	*Physa* sp.	--	--	--	0.4	0.1	0.5	0.2	1.9	0.4	0.4	0.4	0.5	--	4.80
fresh water clam	*Anodonta* sp.	0.01	0.2	1.0	29.1	46.35	69.3	1.5	1.4	1.2	0.5	0.4	0.3	--	151.26
Sacramento sucker	*Catostomus occidentalis*	--	--	1	--	1	--	--	--	--	--	--	--	2	--
Sacramento perch	*Archoplites interruptus*	--	--	--	3	--	--	--	--	--	--	--	--	3	--
unident. minnow	Cyprinidae	--	--	--	3	2	3	--	--	--	--	--	--	8	--
unident. fish	Osteichthyes	--	--	--	--	--	1	1	--	--	--	--	--	2	--
Pacific pond turtle	*Clemmys marmorata*	--	--	--	2	--	4	--	--	--	--	--	--	6	--
unident. turtle	*Clemmys* sp.	--	1	9	--	--	--	1	--	--	--	--	--	11	--
unident. bird	Aves	--	--	--	--	1	--	--	--	--	--	--	--	1	--
cottontail	*Sylvilagus audubonii*	--	--	1	--	--	--	--	--	--	--	--	--	1	--
unident. rodent	Rodentia	--	--	13	1	--	1	--	--	--	--	--	--	15	--
unident. small mammal	Mammalia	--	2	7	22	14	8	1	--	--	1	--	--	55	--
unident. medium mammal	Mammalia	--	--	--	--	1	--	--	--	--	--	--	--	1	--
unident. large mammal	Mammalia	--	--	--	--	1	--	--	--	--	--	--	--	1	--
TOTAL NISP	--	--	3	31	31	24	13	3	--	--	1	--	--	106	--
TOTAL WEIGHT	--	0.02	2.6	3.8	45.6	58.45	83.0	24.6	81.1	16.8	5.3	12.1	8.7	--	342.07

[1] number of identified specimens; [2] weight in grams; [3] no weight available; specimen missing from collection

Table 6

VERTICAL DISTRIBUTION OF FAUNAL REMAINS, TU-2

COMMON NAME	TAXON/LEVEL (cm.)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	TOTAL NISP[1]	TOTAL WT.[2]
land snail	Mollusk	3.0	4.1	1.35	2.8	5.6	10.2	7.1	--	34.15
water snail	*Physa* sp.	--	--	--	--	0.1	0.2	2.5	--	2.80
fresh water clam	*Anodonta* sp.	--	0.02	--	0.7	0.4	8.7	1.1	--	10.92
poss. amphibian	Plethodontidae	--	--	--	--	--	--	1	1	--
antelope ground squirrel	*Ammospermophilus lecurus*	--	--	--	--	--	2	--	2	--
kangaroo rat	*Dipodomys* sp.	--	--	--	3	--	--	--	3	--
vole	*Microtus californicus*	--	9	--	--	--	--	--	9	--
unident. rodent	Rodentia	--	--	--	--	--	1	--	1	--
unident. small mammal	Mammalia	1	--	--	--	--	10	--	11	--
TOTAL	--	1	9	--	3	--	13	1	27	--
TOTAL WEIGHT	--	3.0	4.12	1.35	3.5	6.1	19.1	10.7	--	47.87

[1] number of identified specimens; [2] weight in grams

DATING

No chronometrics are available from the site. However, the *Olivella* beads are useful in placing the site in time. Both D-1 and B3b beads were identified: the B3b type occurs in the Early to Middle transition (Bennyhoff and Hughes 1987:122) while the D-1 type occurs during the Middle to Late transition (Bennyhoff and Hughes 1987:125). This indicates an occupation either over a long period of time or at two widely separated time periods. The Cottonwood Triangular projectile point found at the site dates from the late prehistoric (Heizer and Hester 1978:11-12) and so may be an indicator of a late occupation. The exact time of occupation of the site is not clear.

CONCLUSIONS

The CA-KER-2721 site is interpreted as small occupation site, perhaps occupied on a seasonal basis. There are larger, more complex, sites known in the immediate vicinity and it is possible that CA-KER-2721 was a satellite for those other sites (assuming contemporaneity). One major discrepancy between this site and other sites is its lack of burials. While burials were reported at other sites none were found at this site. However, burials have been discovered within half of a mile of CA-KER-2721.

ACKNOWLEDGEMENTS

Special thanks to Kenneth Gobalet, Gerrit Fenenga, Dorothy Fleagle, Mark Q. Sutton, and Robert Yohe II for their help in the analysis of the materials from the site. Thanks also to Jay Hinshaw, Robin Johnson, and Susan Rubin for their aid in cataloging the material from the site.

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A "TEMBLOR CHERT" LOCATION: PRELIMINARY RESULTS OF INVESTIGATIONS NEAR MCKITTRICK

David J. Scott, Dept. of Sociology and Anthropology, CSU Bakersfield

One question that has been advanced by researchers in the Southern Valley Yokuts and in Interior Chumash territory is the "source or sources" of a popular lithic raw material, commonly called Temblor Chert (Johnson 1985:54-55; Hartzell 1990; Jennings and Johnson 1990; Johnson 1990; Sutton 1990; Berggreen 1992; Osborne 1993; Scott 1993; C. Singer, personal communication 1993). Recent survey efforts by the author in the Temblor Mountains has resulted in the discovery of several sources of this material, including several quarries and workshops related to stone tool technology. This paper is a summary of these preliminary efforts.

BACKGROUND

CHUMASH TERRITORY

Two locations of quality Monterey chert have been identified in Chumash territory, one on Santa Rosa Island (Arnold 1987, 1992) and the other in the Vandenburg Air Force Base vicinity (Glassow et al. 1981, 1991). While Monterey chert is one of the predominant lithic materials found in coastal sites, chert from other sources also occurs in lesser amounts (Lynn Gamble and Chester King personal communication 1992). Several researchers in the area have commonly referred to this other chert as "Temblor Chert." One other source of chert, Franciscan, is found in the Santa Ynez River drainage area (Berggreen 1992).

Temblor Chert has also been reported in inland Chumash areas. In sites (CA-SLO-94/95) found in the lower Cuyama River valley, Temblor Chert comprises nearly 50% of the lithic material (Berggreen 1992). Further to the east, Temblor Chert also has been reported from sites located in the Carrizo Plain (Johnson 1985). In the far eastern reaches of inland Chumash territory, at *Kastiq* (CA-KER-307), Temblor Chert constitutes the majority of the lithic material (J. Johnson, personal communication 1993).

YOKUTS TERRITORY

In the southern San Joaquin Valley, chert has comprised the majority of lithic material recovered or discovered during archaeological investigations. Wedel reported large numbers of chert artifacts/debitage at Buena Vista Lake (CA-KER-39 [Wedel 1941; Hartzell 1992]). At Goose Lake (CA-KER-766), more than 90% of the lithic material recovered was chert (Laframboise et al. 1992). Chert comprised the majority of lithic material recovered from CA-KER-3073 located on the floor of the great central valley (Parr and Osborne 1992; Osborne 1993). In the west side of the San Joaquin Valley, chert again was the major lithic material recovered from several sites located along the Buena Vista Slough (Baxter et al. 1994; M. Q. Sutton, personal communication 1993). It has been hypothesized that this chert material was from the Temblors in the west and/or the Sierra Nevada foothills in the east (Sutton 1990).

TEMBLOR CHERT RESEARCH

After being directed to a previously unrecorded site, the author has undertaken preliminary literature review, survey, and field research in the Temblor Mountains of western Kern County (Fig. 1). Approximately 1,500 acres, west of McKittrick, California are receiving extensive attention from the author and various volunteers.

Kern County Archaeological Society Journal 5:15-21 (1994).

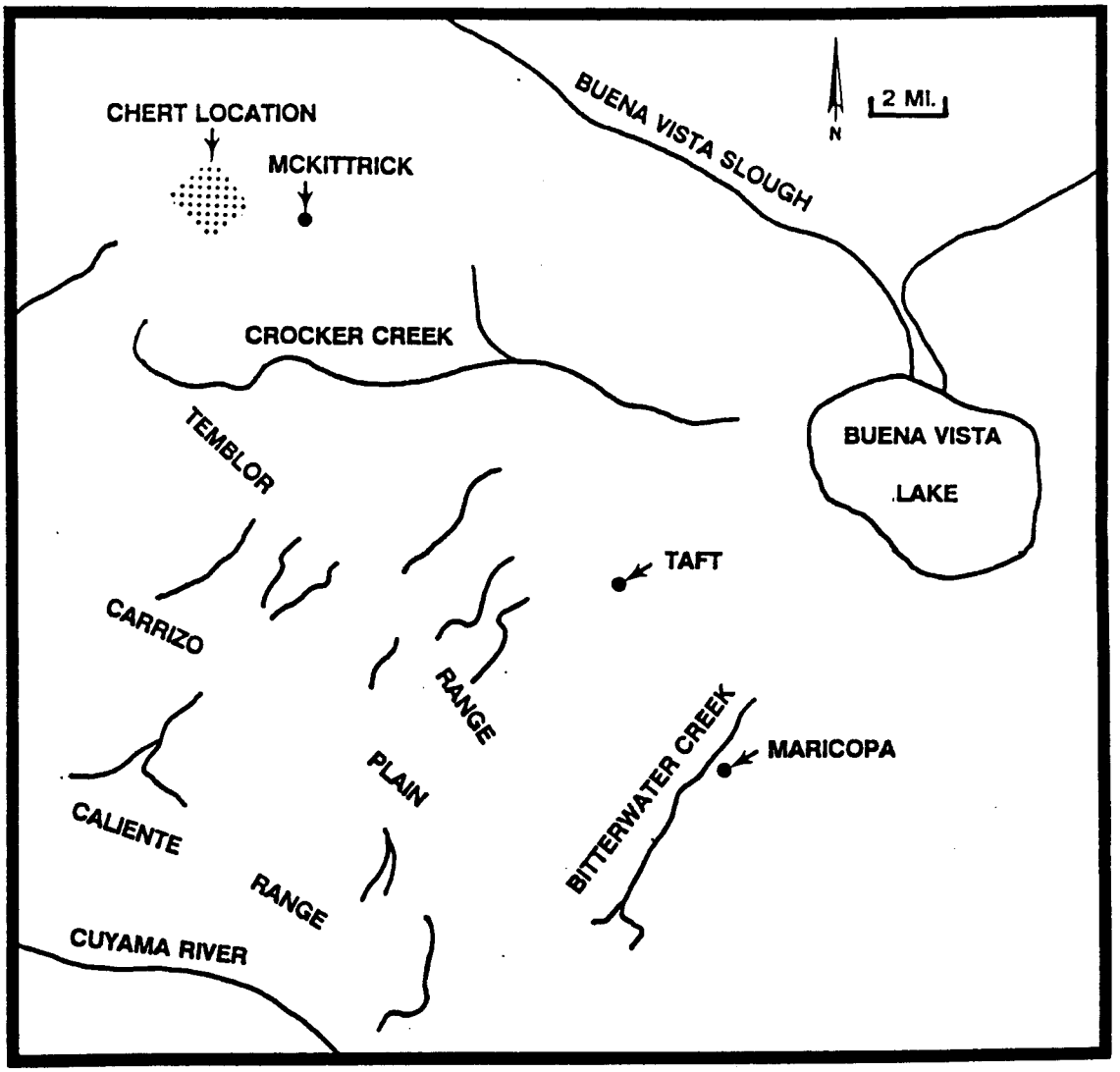

Fig. 1. General location of "Temblor Chert."

WHAT IS TEMBLOR CHERT?

The characterization of Temblor Chert is very subjective at best. Berggreen (1992:23) described the chert as a tabular Monterey chert ". . . of opaline chert that ranges in color from white and cream, to tan, yellow-green, gray and brown . . . the surface of some gray specimens there is a fine purple-red veining." C. Singer (personal communication 1993) said that the chert is of a grey to grey-green color. C. King (personal communication 1992) said that the chert is light to dark grey. In the location recently discovered by the author, all of the colors listed above have been noted, along with additional colors. Elliott (1966) described chert found in a location on the west side of the Temblors as having multicolored chert. To my knowledge, no researcher has yet used the Munsel Color Chart or the Geological Society of America Rock-Color Chart to characterize the colors. The use of either tool would help to lessen the subjectivity and confusion of the color of Temblor Chert.

The chert in the project area is found in two forms, tabular and nodule. It is located in the Monterey geologic formation (silicious shale is the major component) that comprise much of the Temblor Mountains (Dibblee 1962). The chert is of various hues and combinations, including milk white, grays, greens, browns, and pink. It is both lustrous and without any sheen. In various locations in the research area the chert appears almost clear and chalcedony-like. The apparent flaking quality of the chert varies as reflected in the quantity of fragmentary biface preforms, broken cores, and assay debris. This is the result of inclusions or impurities found in the lithic material.

PREVIOUS ARCHAEOLOGICAL WORK IN THE RESEARCH AREA

Two formal surveys (Clewlow 1978; Uli 1984) have been conducted within portions of the research area. The location of numerous sites and isolates were a result of the surveys. These sites have been classified as quarries, casual lithic sources, reduction sites, hunting locals, and "unknown" (Clewlow 1978). One of the sites (CA-KER-824) recorded by Clewlow (1978) was the subject of subsurface analysis (Bramlette et al. 1982). That site was described as a large multi-purpose locality that was utilized during the early prehistoric period and went into apparent disuse before the Late Horizon (Bramlette et al. 1982:56). All three reports (Clewlow 1978; Bramlette et al. 1982; Uli 1984) discussed the possible importance of the chert in the Mckittrick area to the prehistoric peoples of the area.

RECENT ARCHAEOLOGICAL INVESTIGATIONS

Recent field investigations by the author have led to the discovery of three new sites (CA-KER-3371, BS-1, and BS-2) and updating and reinterpretation of one previously recorded site (CA-KER-871). Three quarries and a workshop were located during partial surveys of the area. Two of the quarries (CA-KER-871 and CA-KER-3371) were located on ridge tops, and the third (BS-2) on a steep hillside (> 50°). The workshop (BS-1) is probably associated with BS-2 (and likely other undiscovered quarries) as it lies approximately 300 meters to the southeast in a small saddle.

Quarries

The ridge top quarries (CA-KER-871 and CA-KER-3371) exhibit quarrying, assaying, and workshop characteristics, including primary and secondary lithic reduction activities. The chert is generally of cobble size and of a light olive gray (Rock Color Chart value 5 Y 6/1) with white inclusions. Additional chert from both sites displays fine purple-red veining. Numerous broken biface preforms and primary and secondary flakes indicate the nature of the workshop at these sites.

The quarry (BS-2) located on the hillside consists of a bed of chert cobbles approximately 150 meters (492 ft.) long by an average thickness of 10 meters (33 ft.) eroding from a diatomaceous earth hillside (angle of > 50°). The cobbles range in color from a moderate brown (Rock Color Chart value 5YR 4/4) to a moderate brown (Rock Color Chart value 5 YR 3/4) and are incased in a thin white crust. There is a possible aboriginal trail leading from the canyon floor to the chert bed. Due to the nature of the quarry (situated on a steep hillside) only assaying activities and a few primary flakes are present. The canyon floor has been destroyed by mechanical means (related to oilfield activities) obscuring remains of any prehistoric activates that may have been related to the quarry.

Workshops

The workshop (BS-1) is located in a small saddle just 300 meters southeast of the hillside quarry (BS-2). The presence of primary and secondary flakes and broken bifaces (Fig. 2) indicates that biface preform manufacture seems to have been the site focus. The chert artifacts and flakes present range in color from white (Rock Color Chart N 9) to moderate brown (Rock Color Chart 5 YR 3/4). The range of colors present in the workshop indicates that besides the BS-2 site there are additional quarries in the area.

While biface preform production appears to be the major industry present at CA-KER-3371, several bipolar flakes and a bipolar core were noted (Fig. 2). Additionally, a few generalized amorphous multidirectional cores and fragments were observed (Fig. 2).

OTHER TEMBLOR CHERT LOCATIONS

Another location of Temblor Chert has been identified on the west side of the Temblors. It has been described as "extremely hard brittle multicolored opaline chert" (Elliott 1966:45-46), and is thin-bedded and laminated with siliceous shales.

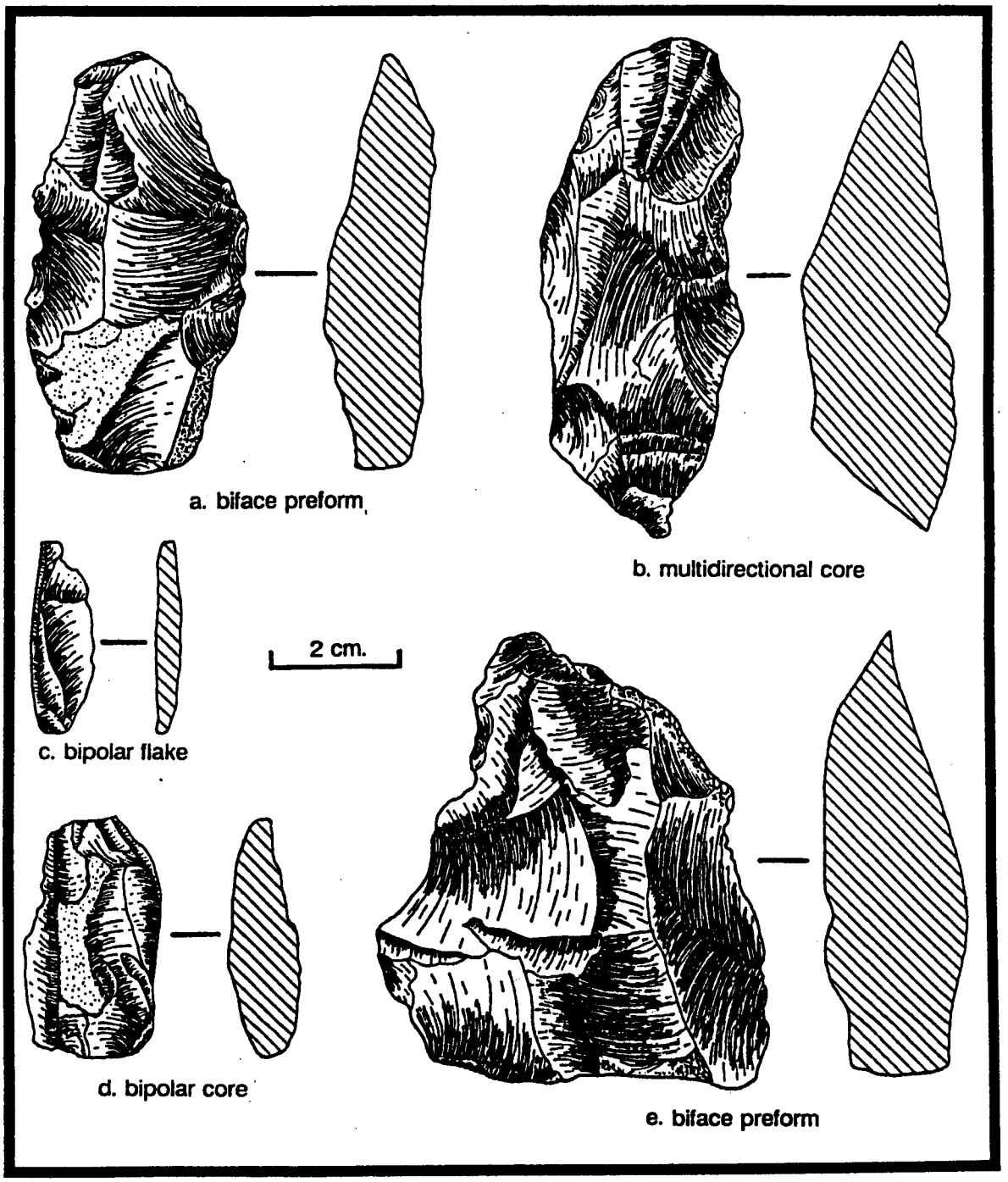

Fig. 2. Artifacts from the "Temblor Chert" location: a) biface preform from BS-1; b) multidirectional core from CA-KER-3371; c) bipolar flake from CA-KER-3371; d) bipolar core from CA-KER-3371; e) biface preform from CA-KER-871.

DISCUSSION

Without a localized source of chert, it can be hypothesized that the southern valley Yokuts and the Inland Chumush acquired chert through trade or from various prospects located through-out their respective territories. The

discovery of a specific location for quality Temblor Chert could lead to further understanding of the cultural complexities, and the identification of exchange systems or interaction spheres between inland and coastal peoples.

The presence of an extensive bedrock mortar complex in the area, and a stone bowl fragment in a quarry/workshop site indicates that the prehistoric populations of the area probably made extensive use of this chert location. The biface preforms may indicate preparation of the chert for long distance trade. The microblades and burin core may indicated further craft specialization.

Even without further investigations, it is clear that the research area represents a substantial location of Temblor Chert. It is not known at the present time whether this group of sites represents a complex comparable to the two major Monterey chert locations and craft specialization found in the Coastal Chumash area. It is possible that a more clear understanding of resource procurement strategies and the relationships between the southern San Joaquin Valley prehistoric inhabitants and the inhabitants of the coastal areas will be gained. The absence of temporally diagnostic artifacts prevents the assignment of dates to the archaeological sites discussed.

Attempts to formulate methods for fingerprinting the chert sources found in the McKittrick location are just beginning. Among those under consideration are thin sections, chemical analysis, and atomic methods. The Temblor Mountains are low grade radioactive and it maybe possible to fingerprint chert from the area by using atomic methods.

ACKNOWLEDGEMENTS

I thank David Johnson, who introduced me to the McKittrick chert location; to my son, Bryon Scott for discovering the BS-1 and -2 sites; Gerrit Fenenga and John Johnson for support and guidance; Scott Baxter for providing field support and illustrating the artifacts; and finally to Sharynn-Marie Valdez for her editorial comments.

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TEST EXCAVATIONS AT SEVEN SITES IN THE SOUTHERN SIERRA NEVADA NEAR LAKE ISABELLA, CALIFORNIA

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INTRODUCTION

In 1990, CSU, Bakersfield conducted test-level archaeological investigations at seven sites as part of an environmental impact study conducted for Southern California Edison's Kern River No. 3 project. These sites are located in the southern San Joaquin Valley and the southern Sierra Nevada near Lake Isabella. Previous to this work, an archaeological inventory (Sutton and Pruett 1989) of the Kern River No. 3 properties was conducted and 15 archaeological sites were located. Test-level archaeological investigations were conducted at seven of the sites to determine their significance. This is the report on those excavations.

ENVIRONMENTAL SETTING

The project area is located in the southern Sierra Nevada, near Lake Isabella (Fig. 1). The Sierra Nevada is a dominant feature in the diverse physical and ecological landscape of California, cresting at an elevation of approximately 14,000 feet. The Sierra Nevada is a geologically young and active mountain range, well known for its role in forming the unique flora of California and supporting abundant wildlife.

The Kern River emanates from the western slopes of Mount Whitney (14,494 ft. in elevation), the highest point in the contiguous United States. The Kern River drainage system encompasses the extreme southern end of the Sierra Nevada. This drainage system is representative of the west slope of the Sierra Nevada, but its proximity to the southwestern deserts and the Great Basin give it an unusual character.

The Kern River is unique in its physical attributes. It is the only major river in the region aligned north/south. Almost the entire length of the northern fork follows a remarkably straight fault zone. The watershed of the northern fork is approximately 1,050 square miles and is comparable to that of other Sierran rivers. The Kern River is largely undisturbed and undeveloped down to 3,500 feet.

The biotic communities of the area are characterized by mixed chaparral including chamise, whiteleaf manzanita, wedgeleaf ceanothus, and fremontia. A blue oak savanna community lies adjacent to the river between the powerhouse and Corral Creek. Conifer forest is found on the higher slopes and ridges adjacent to the project. Vegetation along the river consists of typical riparian communities. Deer winter in the lower part of the north fork region that includes the project area. In the spring the deer move up the drainage to higher elevations, though a small number remain all year in the wintering area.

CULTURAL SETTING

People have inhabited the southern Sierra Nevada for at least 10,000 to 12,000 years. The archaeological record for the region is poorly understood. Only a minimal outline of cultural chronology and process is known. It is known that at least two different ethnic groups, the Tübatulabal and the Foothill Yokuts, inhabited this region at the time of Euroamerican contact, but few data are available on these people. Limited archaeological work has been reported for the southern Sierra Nevada and consequently, few data on the regional prehistory are available (see Moratto 1984:331-334).

Kern County Archaeological Society Journal 5:22-85 (1994).

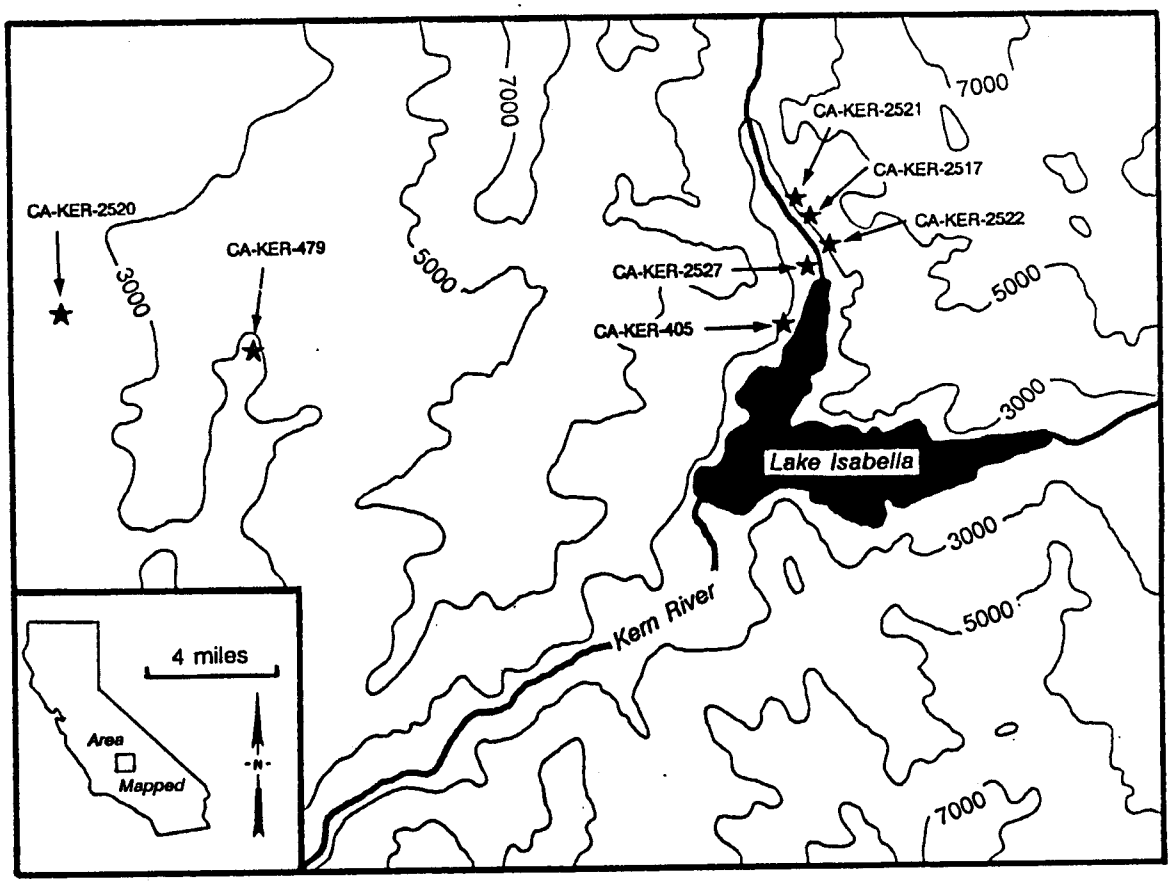


Fig. 1. General location of the seven sites tested.

Among the early work in the region was that of Steward (1929), who documented some of the rock art, and of Voegelin (1938), who documented a number of Tübatulabal village sites and locations. Fenenga (1947) assessed the cultural resources of the Lake Isabella basin prior to the construction of the dam. In that assessment, Fenenga conducted a partial inventory of 17 sections of land, recorded 14 sites (and test-excavated one; see Meighan et al. 1984:27). This work demonstrated the archaeological sensitivity of the region. The ethnographic sensitivity of the area was also noted (Blount et al. 1984:84).

Other inventory work in the Isabella area (much of it on Army Corps of Engineers land) included surveys by Wallace (1970), Hanks (1973), Schiffman (1976), Glassow and Moore (1978), and Meighan et al. (1984). In addition, numerous smaller surveys conducted as part of environmental review processes have been performed in the area, including the inventory of the Kern River No. 3 project area (Sutton and Pruett 1989). (These reports are on file at the Southern San Joaquin Valley Archaeological Information Center.)

Few sites have been tested and/or excavated in the region. Fenenga (1947) proposed major excavations at several sites prior to the construction of Isabella Dam, but they were not carried out (with the exception of a single test unit at CA-KER-001; see Meighan et al. 1984:20-21, 27).

The CA-KER-260 and CA-KER-574 sites (likely the same site), located just south of Isabella Dam and adjacent to a transmission line, apparently was excavated by Fresno State College in 1970-1971. No report on that work has been completed and the disposition of the collection and notes is unknown. The CA-KER-17 rock art site (see Harper-Slaboszewicz and Cooper 1988) is located directly across the Kern River from the CA-KER-260/CA-KER-574 site(s).

A "Tübatulabal Indian Hamlet Site" near Kernville (CA-KER-2398) was tested by Schiffman (1974). Schiffman (1974:2) considered the site to correspond with an ethnographic Tübatulabal hamlet (No. 16, *Holit*) recorded by Voegelin (1938:43). Both surface and subsurface collections were made, and a large variety of artifacts was discovered. Ceramics and Desert series projectile points were among the artifacts recovered, confirming a late date for at least the upper portion of the site.

In the late 1970s, Schiffman also conducted excavations at CA-KER-479, a large village and cemetery located on the Raljon Ranch, west of Lake Isabella. This site contained numerous features, including mortars, cupules, hunting blinds, and hearths. In addition, a wide variety of artifacts was discovered and burials were present. Unfortunately, no report on the results of this work has been written.

The Long Canyon Village site (CA-KER-311), located on the South Fork of the Kern River, was investigated by Salzman (1977; also see Hanks 1973). While the primary purpose of the investigation was to develop management proposals, the site was mapped and limited surface collections were made.

Perhaps the best known aspect of aboriginal occupation of the southern Sierra Nevada in general, and the Isabella area in particular, is rock art. Rock art in the region has been noted by many researchers, including Steward (1929) and Heizer and Clewlow (1973). Whitley (1984) provided a general overview of the rock art studies in the region. Specific rock art studies have been conducted at several sites (Andrews 1977; Schiffman 1977, 1988; Schiffman and Andrews 1981; Pruett 1982; Harper-Slaboszewicz and Cooper 1988), particularly in conjunction with astronomical research.

Pictographs generally are abstract, curvilinear, angular, and circular with very few anthropomorphic or zoomorphic figures. Rock art is considered to have served a variety of functions including depictions of both mythical and real events; calibration of calendrical and astronomical events, hunting and fishing magic, and the recording of life cycle transitions. Petroglyphs are not as common as pictographs and are considered to be older.

RESEARCH METHODS

Each site was mapped (with the aid of existing site maps when possible) depicting the major physiographic and cultural features. A permanent datum was established and test units and surface collections were located in reference to that point. Diagnostic artifacts located on the surface were flagged, mapped, and collected.

Excavation units were 1 x 2 meters in size and were excavated in arbitrary 10 cm. horizontal levels. All soil from the units was passed through 1/8 in. mesh screen and all cultural materials were saved and bagged. Provenience was kept by unit and level. Units were excavated to culturally sterile soil. Upon completion of the excavation, a profile drawing of one sidewall was made, photographs were taken, and the unit was backfilled.

All of the materials recovered from the various sites were catalogued. Each formed artifact (or fragment thereof) received a separate number. Debitage of the same material, faunal remains, and floral remains were grouped and received one number per level. Metric attributes (length, width, thickness, and weight) were obtained on each of the formed artifacts. Recovered faunal remains were analyzed using standard techniques (Fenenga 1994; this volume). Carbonized floral materials preserved in the site were saved in the field. This material will be identified to the nearest taxon.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-405

This site originally was recorded as two (or possibly three, see below) separate sites, CA-KER-405 and CA-KER-406. Clearly, these are the same site (as noted by Meighan et al. 1984). Therefore, CA-KER-406 has been deleted from the site record file and the entire site has been designated CA-KER-405. The sites were recorded by Schiffman in 1977 (also see Glassow and Moore 1978) and rerecorded in 1983 as part of the Lake Isabella survey

(Meighan et al. 1984). At that time, Meighan et al. (1984) chose to retain the separate CA-KER-405 and CA-KER-406 numbers even though it was felt that these numbers identified the same site. In addition, Meighan and colleagues felt that the CA-KER-407 site, located on the western side of Burlando Road, also was a part of CA-KER-405, thus forming a single large site (CA-KER-407 was not included as part of CA-KER-405 at this time as it could not be relocated).

Thirty-two features had been recorded at the site, including milling features, cupules, a "rockshelter," and historic materials dating to the late 1800s. Two features not previously recorded were located and mapped during this project. The first of these (Feature oo [formerly Feature 406-O]) consists of a small boulder containing a single bedrock metate. The second (Feature K) is a single boulder with an historic petroglyph. The initials R. C., M. C., W. C., and the date '1867' are carved into the boulder. A map of the site is provided as Figure 2.

Prehistoric artifacts previously observed on the surface of the site consist of an obsidian biface and a few milling stones. Historic artifacts include solder-top cans, amethyst glass, brown and green bottles with applied tops, square nails, and numerous pieces of unidentified metal. Midden had been noted in association with a large boulder (Feature A) but not at other locations. It was considered possible that the rockshelter (Feature B) also contained a midden deposit. Vandal pits are common at the site. The Borel transmission line right-of-way passes through the center of the site but little or no damage appears to have been caused by the installation of the power poles currently in place.

FIELD METHODS

An examination of the surface of the site was made to locate and collect diagnostic materials. No temporally diagnostic materials were discovered but several complete milling stones were located and collected.

Three test units were excavated at this site. The first (TU-1) was located south of and adjacent to Feature A (Fig. 3); the second (TU-2) was placed within the rockshelter (Feature B, Fig. 4), and the third (TU-3) was located (Fig. 5) between a mortar location (Feature S) and a cupule boulder (Feature G). A pestle was discovered protruding into the north sidewall of TU-3 in the 10 to 20-cm. level; therefore a small extension of the unit was excavated. Excavation depths varied, depending on the conditions; TU-1 went to 130 cm., TU-2 to 40 cm., and TU-3 to 80 cm.

STRATIGRAPHY AND SOILS

No clear uniform site-wide stratigraphy was noted; the soils varied in each of the test units. The soils in TU-1 (Fig. 6) consisted of a brown sandy loam extending to a depth of approximately 130 cm., although few artifacts were recovered at that depth. The soil became lighter (more yellow) in color as the unit became deeper. Considerable rodent disturbance was present, as seen in the soil profile. The soils in TU-2 (Fig. 7) consisted of differing soils in shallow lenses, indicative of sheetwash and/or other disturbance. Decomposing granite formed the base stratum. The primary soil stratum in TU-3 (Fig. 8) consisted of a brown-grey sandy silt overlain by several shallow strata of alluvium. A tan soil containing coarse gravel formed the base layer.

MATERIAL CULTURE

A total of 153 prehistoric artifacts was recovered from the site. In addition, 641 historic artifacts were collected. The recovered artifacts are summarized in Table 1.

Ground Stone

The ground stone assemblage at the site is diverse. In addition to the numerous bedrock milling features, numerous manos (n = 24), a metate fragment, pestles (n = 8), and unidentified ground stone (n = 9) were recovered. Each category is described below.

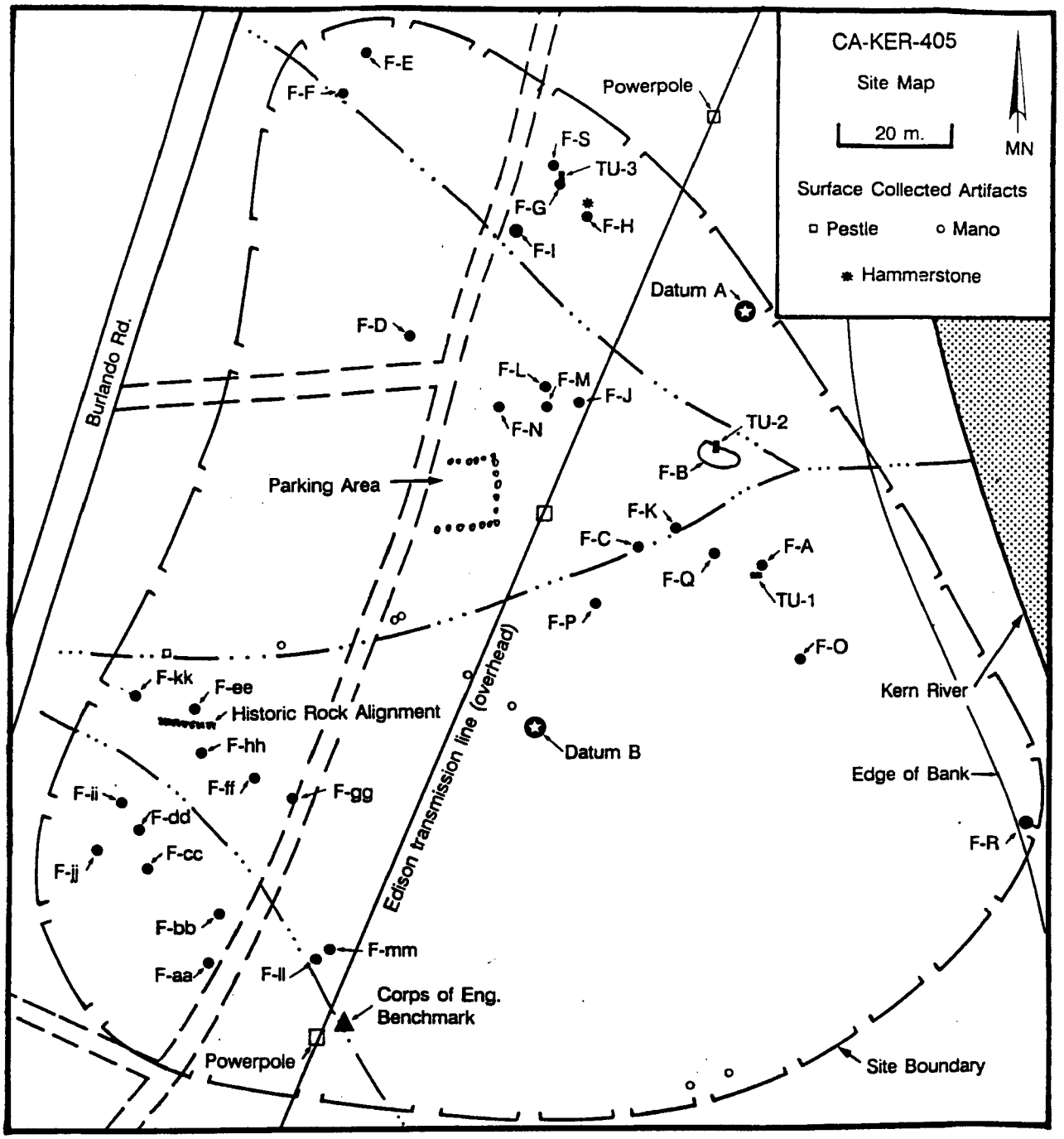


Fig. 2. Map of the CA-KER-405 site.

Manos. Eleven complete and 13 fragmentary manos were recovered. Where form could be identified (n = 19), all were bifacially ground. Of the manos found in the excavations, four of the five complete and six of the 13 fragments came from TU-1 (as did most of the unidentified ground stone, see below). The provenience and attributes of the manos are presented in Table 2 and several are illustrated in Figure 9.

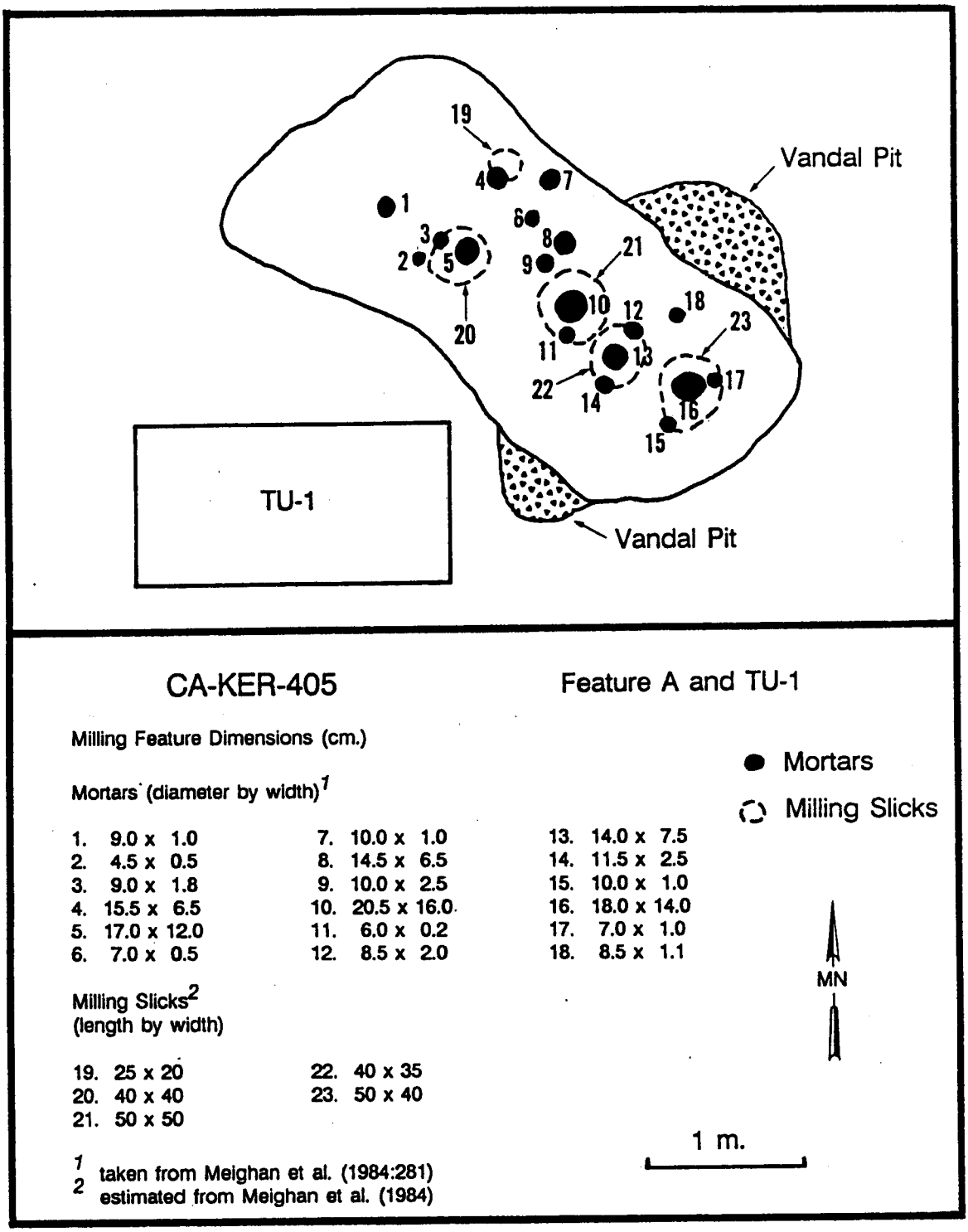


Fig. 3. Location of TU-1 at Feature A, CA-KER-405.

Metate. A single granite metate fragment came from the site, found in the 10 to 20-cm. level of TU-3. The specimen measures 142 x 66 x 53 mm. and weighs 948.8 g. The absence of portable metates, in the presence of the large number of bedrock milling features, is not surprising.

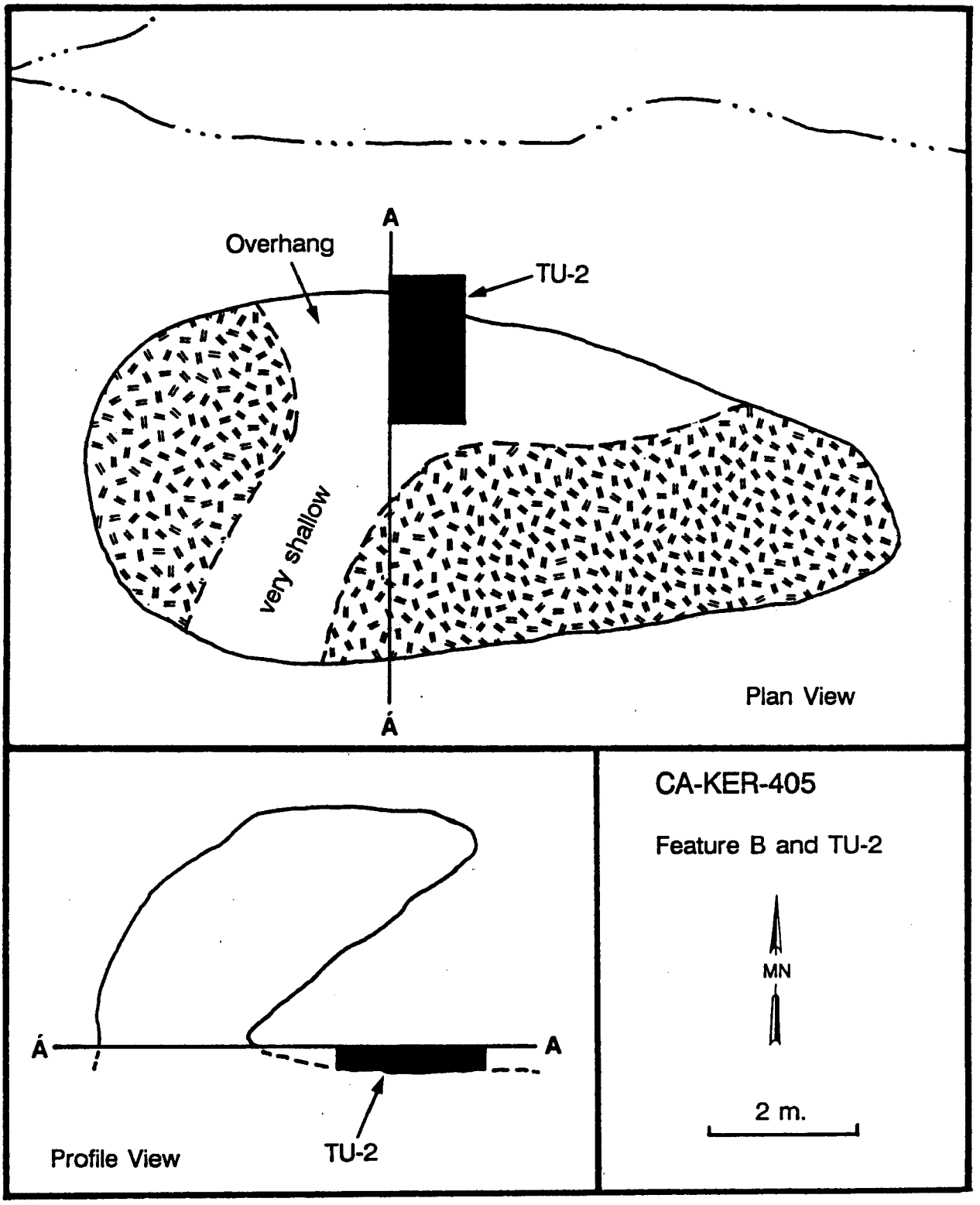


Fig. 4. Location of TU-2 within the "Rockshelter," CA-KER-405.

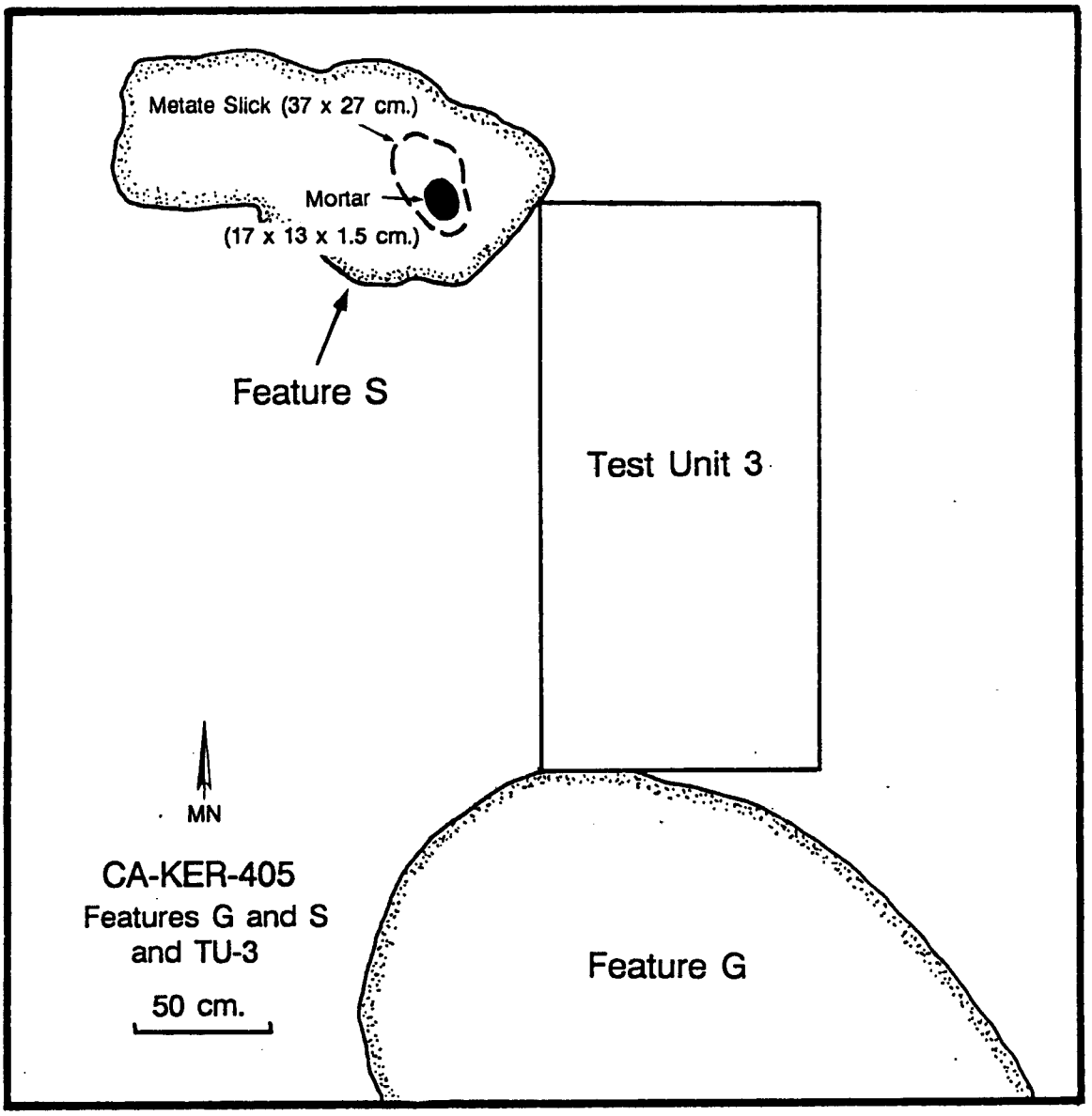


Fig. 5. Location of TU-3 at features G and S, CA-KER-405.

Pestles. Six complete and two fragmentary pestles were recovered, all made of granite (see Fig. 10). Three of the complete specimens and one fragment were collected from the surface. In several cases, the pestles also had been used as manos. The provenience and attributes of the pestles are presented in Table 3.

One of the pestles (Fig. 10b) was discovered directly beneath the cupule boulder (Feature G) and appears to have a pecked point roughly the same size as some of the cupules. No other ground surfaces are present on the specimen, therefore it likely is not a pestle. It is possible that this tool was used in the manufacture of the cupules.

Other such tools were described at CA-FRE-2109 (Foster et al. 1990). Four cobbles with battered ends were found at a cupule boulder (No. 24) containing 15 cupules. One of the specimens "fits perfectly into ten of the fifteen cupules . . . and was probably used to finish the cupules through smoothing" (Foster et al. 1990:61). Foster (personal communication 1990) also identified such tools at CA-SBA-260.

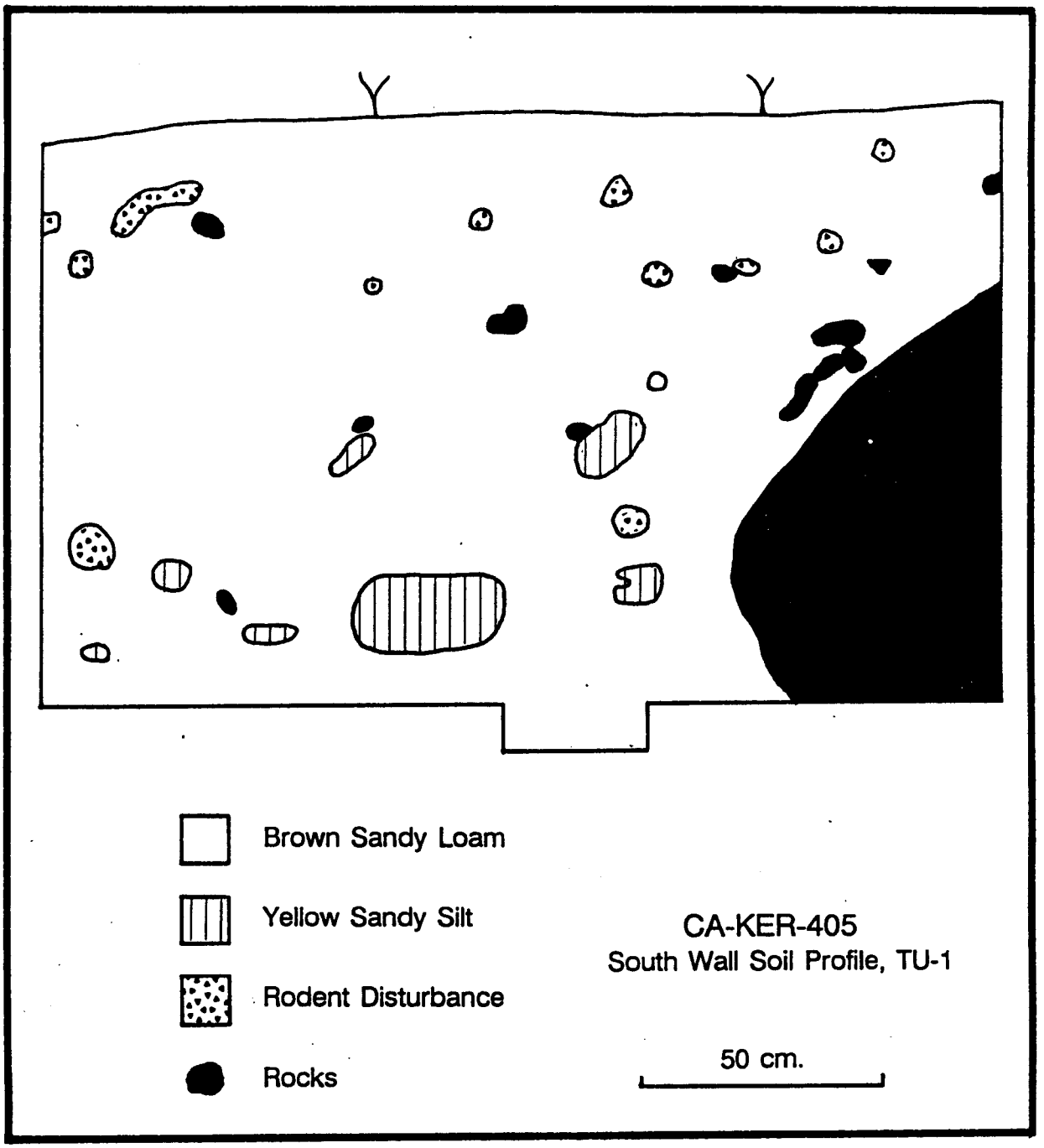


Fig. 6. Soil Profile of the South Wall of TU-1, CA-KER-405.

Unidentified Ground Stone. Nine fragments of ground stone that could not be identified as to form were recovered. Eight of the pieces came from the TU-1 excavation. The provenience and attributes of the unidentified ground stone are presented in Table 4.

Hammerstones. Two hammerstones were recovered. The first (SC-001; 69 x 61 x 31 mm., 177.4 g.) came from the surface and the other (1-009; 86 x 69 x 51 mm., 430.6 g.) from the 80 to 90-cm. level of TU-1.

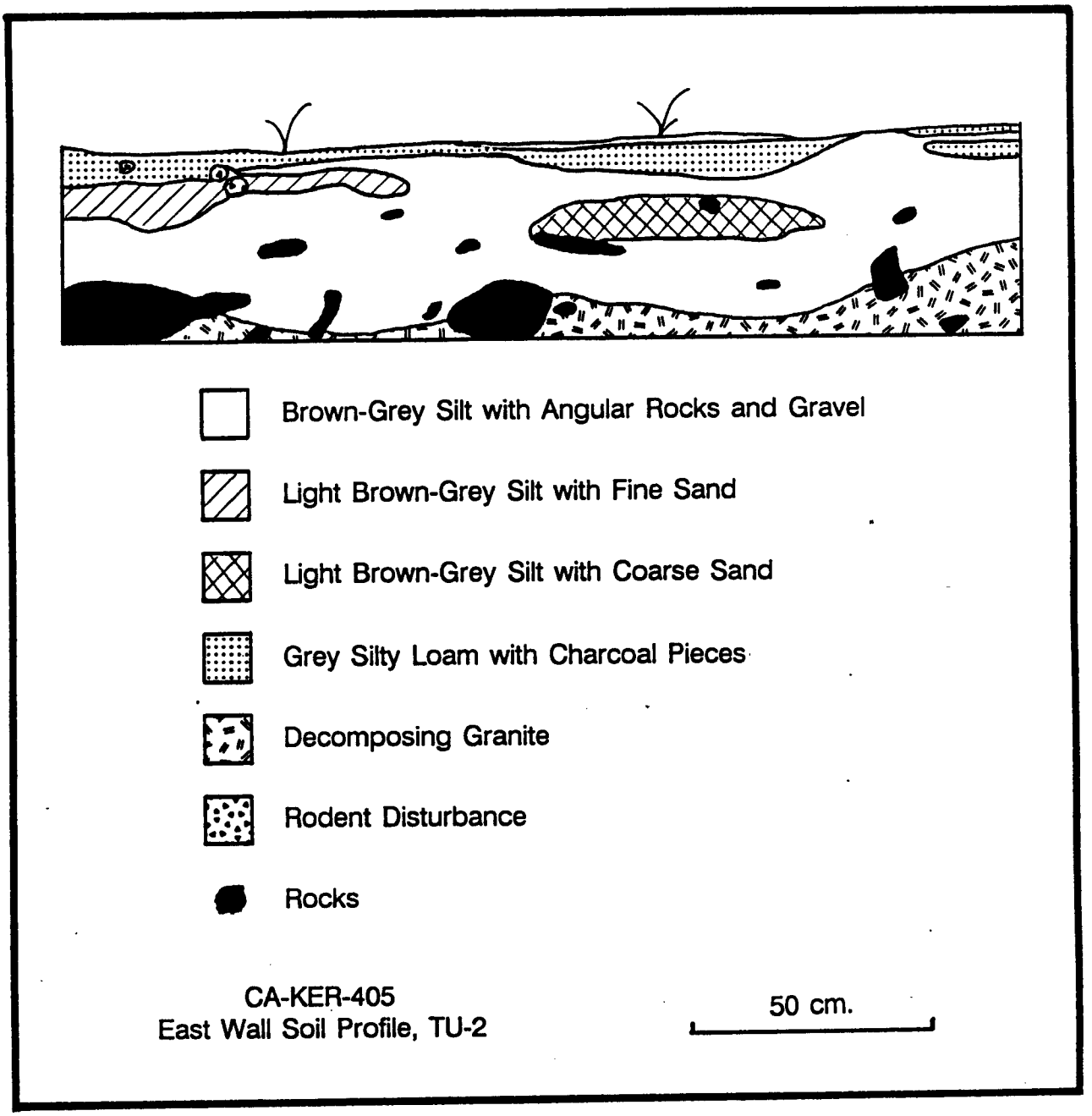


Fig. 7. Soil Profile of the East Wall of TU-2, CA-KER-405.

Flaked Stone

Projectile Points. Two projectile points were recovered in the excavations. A complete obsidian Rose Spring series point came from the 40 to 50-cm. level of TU-3. The specimen (3-057; Fig. 11a) measures 27.9 x 11.8 x 4.9 mm. and weighs 1.34 g. Rose Spring series points date generally to the Sawtooth Phase (see Moratto 1984:331-334).

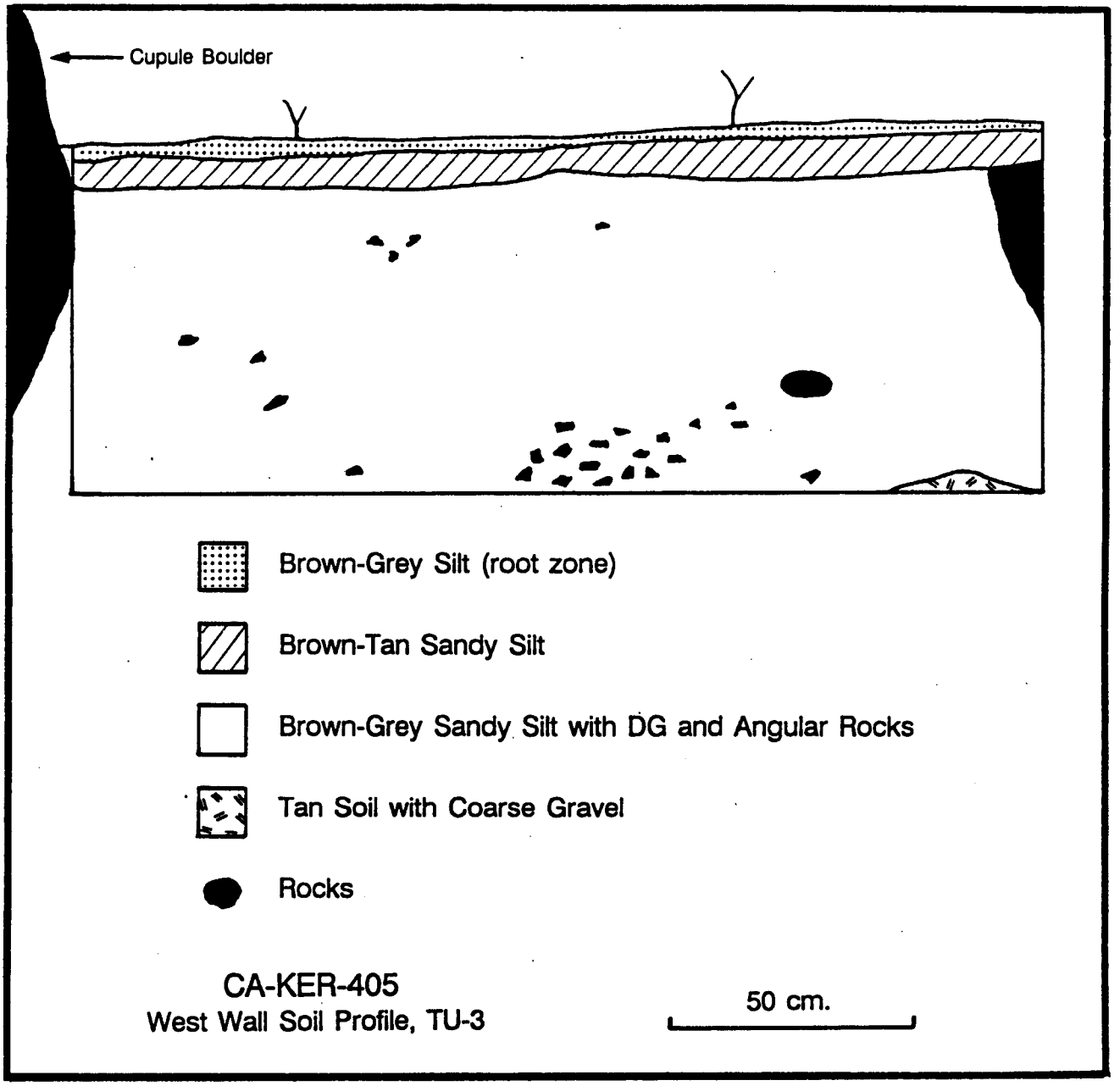


Fig. 8. Soil Profile of the West Wall of TU-3, CA-KER-405.

The Pinto series specimen (1-094; Fig. 11b) also of obsidian, is nearly complete, and came from the 90 to 100-cm. level of TU-1. It measures 23.2 x 19.8 x 5.3 mm. and weighs 2.46 g. Pinto series points are markers for the Lamont Phase (see Moratto 1984:331-334).

Utilized Flakes. Four utilized flakes were identified in the collection, all obsidian and all from TU-1. The provenience and attributes of the utilized flakes are presented in Table 5.

Debitage. A total of 99 flakes was recovered from the three test units, most of which (82; 83%) are obsidian. The majority (80; 81%) of the debitage came from TU-1, as did most of the other artifact classes. The distributions of the debitage in the units are presented in Tables 6-8.

Table 1
SUMMARY OF ARTIFACTS RECOVERED FROM CA-KER-405 (SURFACE AND ALL TEST UNITS)

Artifact	Depth (cm.) Surf.	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130	Totals
manos	6	--	--	2	--	2	--	--	1	--	--	--	--	--	11
mano fragments	--	1	1	1	1	4	5	--	--	--	--	--	--	--	13
metate fragment	--	--	1	--	--	--	--	--	--	--	--	--	--	--	1
pestles	3	--	1	--	2	--	--	--	--	--	--	--	--	--	6
pestle fragments	1	--	--	1	--	--	--	--	--	--	--	--	--	--	2
unidentified ground stone	--	--	3	--	1	3	1	1	--	--	--	--	--	--	9
hammerstones	1	--	--	--	--	--	--	--	--	1	--	--	--	--	2
Rose Spring point	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1
Pinto point	--	--	--	--	--	--	--	--	--	--	1	--	--	--	1
utilized flakes	--	1	1	--	--	1	--	--	1	--	--	--	--	--	4
debitage	--	3	10	5	12	9	16	12	11	5	3	3	3	7	99
quartz crystal	--	--	1	--	--	--	--	--	--	--	--	--	--	--	1
shell bead	--	--	--	1	--	--	--	--	--	--	--	--	--	--	1
glass beads	--	1	--	--	--	--	1	--	--	--	--	--	--	--	2
Totals	11	6	18	10	16	20	23	13	12	6	4	3	3	7	153
historic[1]	--	394	138	73	20	15	--	--	--	--	--	--	1	--	641

[1] historic materials not included in totals

Quartz Crystal

One small quartz crystal was found in the 10 to 20-cm. level of TU-1. The specimen measures 12.9 x 4.8 x 3.3 mm. and weighs 0.2 g. No evidence of modification was noted and no foreign material (e.g., mastic) was noted.

Shell Bead

One *Olivella biplicata* shell bead was found in the 20 to 30-cm. level of TU-1. The specimen (1-034; Fig. 11c) measures 6.5 mm. in diameter, is 1.6 mm. thick, and has a perforation diameter of 1.3 mm. This bead is classified as an F2b Round Saddle following the typology of Bennyhoff and Hughes (1987:130). These beads are thought to be markers for the Middle Period (e.g., the Canebrake Phase, ca. 3,200 to 1,350 B.P.).

Historic

A great deal of historic material was found in the excavations, mostly the result of modern activities (e.g., trash). Test Unit 1 contained the least amount of intrusive materials (mainly confined to the upper 50 cm.), with the other two units having roughly equal amounts of material. In TU-2 historic materials were found throughout the deposit, although the greatest concentration was found in the 0 to 10-cm. level. Considerable historic material was found in the first 30 cm. of TU-3 but none in subsequent levels.

Table 2
PROVENIENCE AND ATTRIBUTES OF MANOS, CA-KER-405

Cat. No.	Provenience	Material	Form[1]	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
COMPLETE								
SC-003	surface	granite	BSh	91	78	58	592.0	
SC-005	surface	granite	BSh	134	102	46	947.1	
SC-006	surface	granite	B	156	114	51	1,576.8	
SC-007	surface	granite	B	100	81	47	675.4	9a
SC-008	surface	granite	B	129	89	53	910.2	9b
SC-009	surface	granite	B	94	94	43	514.4	
1-030	TU-1, 20-30	granite	B	138	107	36	885.0	9c
1-052	TU-1, 40-50	granite	--	89	81	41	426.2	
1-054	TU-1, 40-50	granite	B	137	103	61	1,287.1	9d
1-088	TU-1, 70-80	granite	BSh	124	109	56	1,014.3	
3-040	TU-1, 20-30	granite	BSh	155	109	56	1,406.3	
FRAGMENTS								
1-001	TU-1, 0-10	granite	B	69	51	45	310.5	
1-050	TU-1, 40-50	granite	--	83	57	53	362.2	
1-051	TU-1, 40-50	granite	BSh	59	49	44	157.4	
1-056	TU-1, 40-50	granite	BSh	64	56	37	157.6	
1-068	TU-1, 50-60	granite	B	74	56	53	223.4	
1-069	TU-1, 50-60	granite	BSh	69	64	58	410.6	
2-017	TU-2, 10-20	granite	BSh	89	53	58	372.3	
2-023	TU-2, 20-30	granite	B	66	35	41	104.9	
3-046	TU-1, 30-40	granite	B	109	81	58	608.5	
3-059	TU-1, 40-50	granite	--	86	55	53	326.6	
3-063	TU-1, 50-60	granite	--	69	48	36	126.4	
3-066	TU-1, 50-60	granite	--	74	66	53	239.8	
3-067	TU-1, 50-60	granite	BSh	174	93	56	1,055.3	

[1] U = unifacial; B = bifacial; Sh = shaped

While most of the historic materials represent recent trash, a small number of square nails and fragments of amethyst glass were found, indicating an occupation dating from the late 1800s to the early 1900s. The nature of such an occupation or use is unknown, but may be related to mining.

Glass Beads. Two glass trade beads (one complete and one fragment) were recovered. The complete specimen (1-075) is red with a white center, measures 4.8 mm. long, 3.3 mm. in diameter, has a hole diameter of 1.5 mm., and weighs 0.12 g. The specimen was found in the 50 to 60-cm. level of TU-1. The fragment (1-006; 0 to 10-cm. level of TU-1) is the length-wise half of a blue hexagon bead and weighs 0.05 g. The complete specimen would have

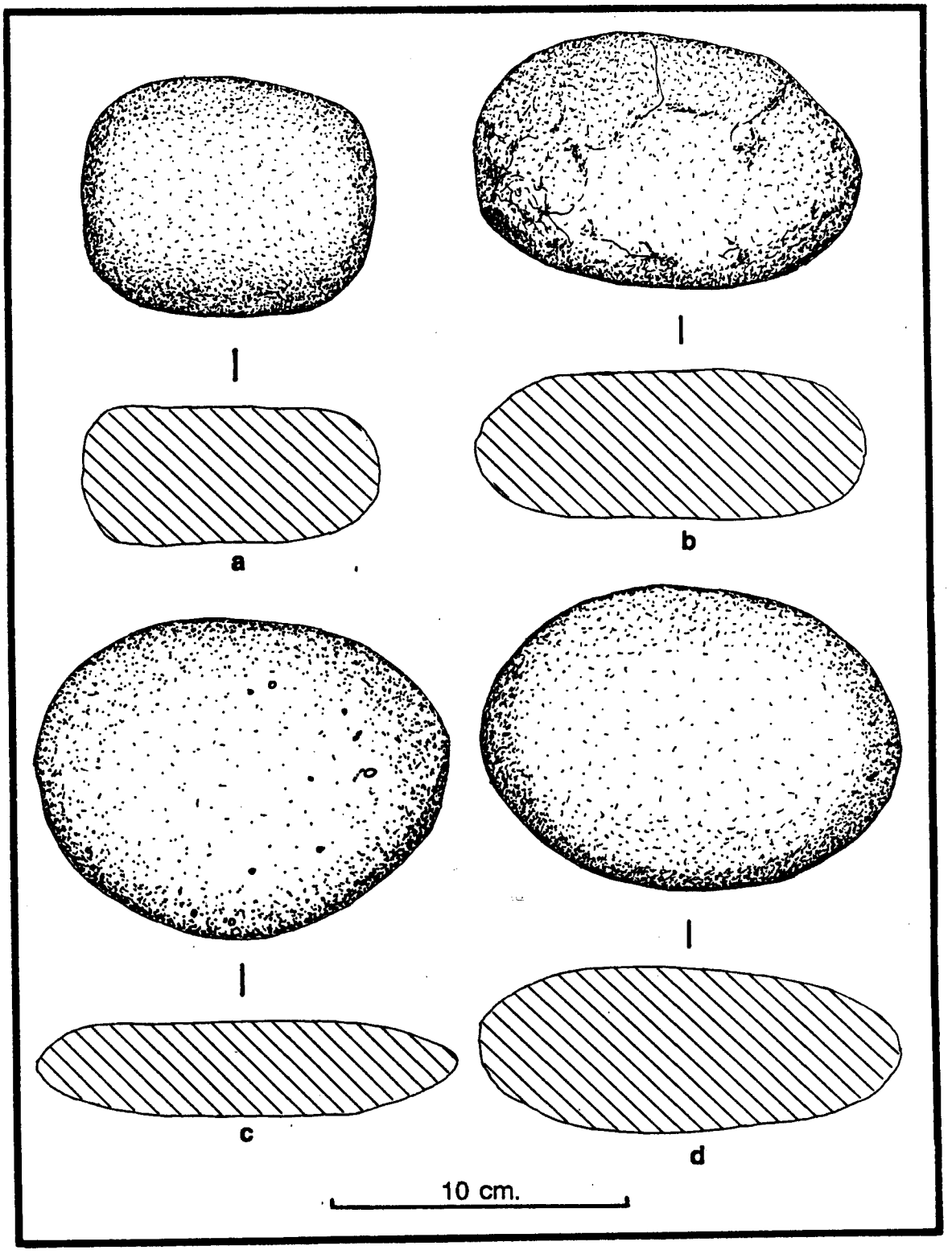


Fig. 9. Manos from CA-KER-405: a) SC-007; b) SC-008; c) 1-030; d) 1-054.

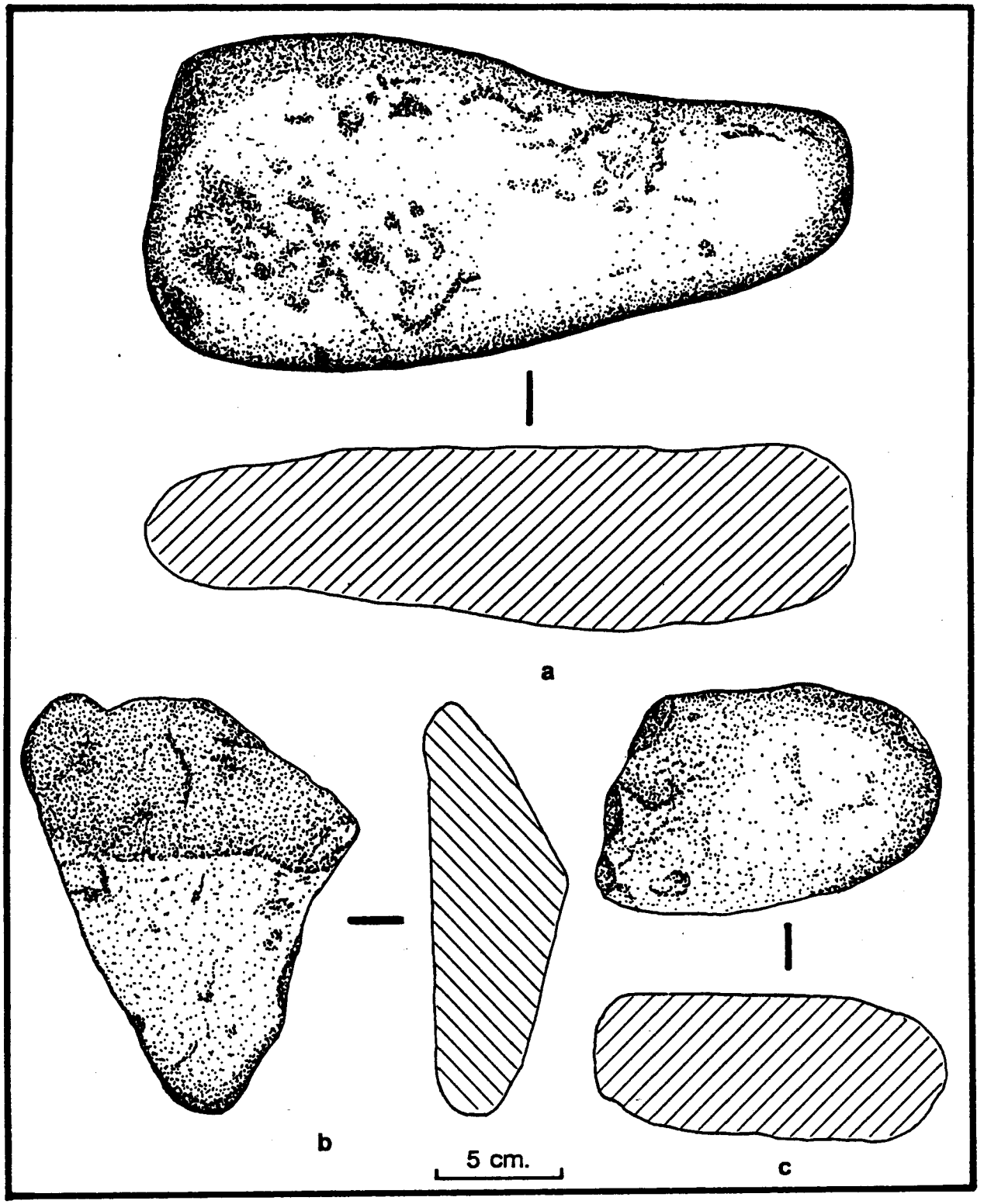


Fig. 10. Pestles from CA-KER-405: a) 3-032; b) 3-047; c) 1-029.

Table 3
PROVENIENCE AND ATTRIBUTES OF PESTLES, CA-KER-405

Cat. No.	Provenience	Material	Form[1]	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
COMPLETE								
SC-002	surface	granite	B	187	123	82	2,429.2	
SC-004	surface	granite	--	170	101	55	1,642.0	
SC-011	surface	granite	--	159	109	80	1,852.6	
1-039	TU-1, 30-40	granite	--	235	166	84	5,216.3	
3-032	TU-3, 10-20	granite	B	295	135	77	5,329.7	10a
3-047	TU-3, 30-40	granite	--	164	135	50	950.1	10b
FRAGMENTS								
SC-010	surface	granite	--	150	103	84	1,556.2	
1-029	TU-1, 20-30	granite	--	127	102	66	1,161.7	10c

[1] B = mano-like wear on two surfaces

Table 4
PROVENIENCE AND ATTRIBUTES OF GROUND STONE FRAGMENTS, CA-KER-405

Cat. No.	Provenience	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
1-009	TU-1, 10-20	granite	76	37	28	102.8
1-010	TU-1, 10-20	granite	41	23	19	17.5
1-012	TU-1, 10-20	granite	29	23	10	8.9
1-038	TU-1, 30-40	granite	76	63	16	70.4
1-053	TU-1, 40-50	granite	83	47	32	132.1
1-055	TU-1, 40-50	granite	69	51	39	143.8
1-067	TU-1, 50-60	granite	64	52	48	147.8
1-076	TU-1, 60-70	granite	53	51	51	175.8
3-058	TU-3, 40-50	granite	81	71	56	260.6

measured 5.0 x 3.5 mm. Both beads are of American rather than Spanish origin and so date between ca. 1840 to 1880. Further, as both beads were discovered in the upper portion of the deposit, a multi-component site is indicated.

OBSIDIAN STUDIES

Thirteen pieces of obsidian (10 flakes, a utilized flake, and two projectile points) were submitted for sourcing and hydration analyses (Table 9). The rind measurements range from 3.8 to 9.5 microns and there seems no clear pattern of increasing rind thickness with depth. This may suggest that while the deposit has some age, it is mixed (e.g., bioturbation).

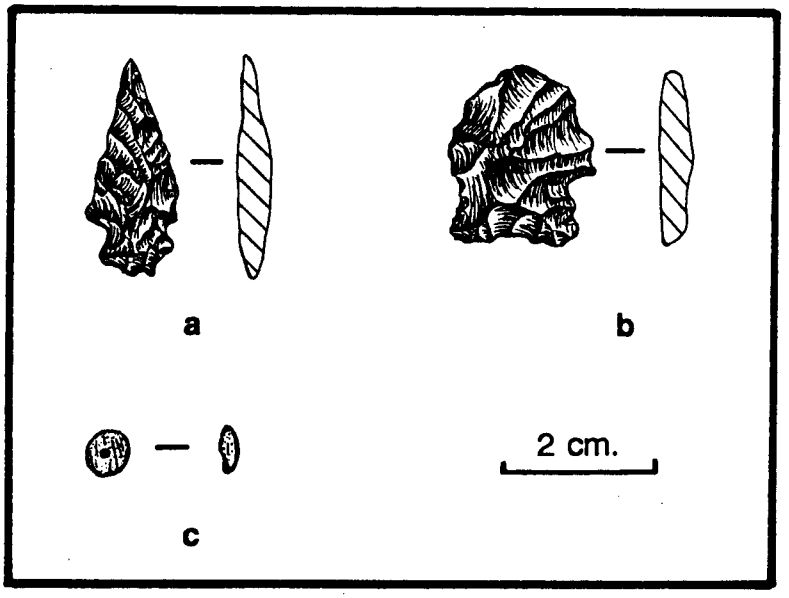


Fig. 11. Projectile points and shell bead, CA-KER-405: a) Rose Spring series projectile point (3-057); b) Pinto series projectile point (1-094); c) *Olivella* F2b shell bead (1-034).

Table 5
PROVENIENCE AND ATTRIBUTES OF UTILIZED FLAKES, CA-KER-405

Cat. No.	Provenience	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
1-002	TU-1, 0-10	obsidian	12	7	3	0.27
1-014	TU-1, 10-20	obsidian	15	12	3	0.44
1-061	TU-1, 40-50	obsidian	22	15	3	1.70
1-083	TU-1, 70-80	obsidian	19	14	8	1.87

FAUNAL REMAINS

The faunal assemblage from the site consists of 188 vertebrate specimens plus 40.45 g. of shell. Included in the recovered taxa are several domesticated species and an abundance of pond turtle. An analysis of the recovered faunal material was presented in Fenenga (1994; this volume).

DATING

The only methods available to date the site are through the use of temporally sensitive artifacts and obsidian hydration results. The aboriginal artifacts found at the site span a considerable time. Pinto and Rose Spring series projectile points, the F2b *Olivella* bead, and the glass trade beads suggest the site was occupied from as early as 5,000 B.P. to the protohistoric and even into the historic after 1840. The obsidian hydration measurements range from 3.8 to 9.5 microns and suggest some time depth for the occupation. We do not feel it is possible to assign calendar dates to the obsidian measurements, but the 5,000 B.P. date does not seem unreasonable for the initial occupation.

INTERPRETATIONS

There are several known areas of deep midden deposits containing abundant cultural remains at the site. A variety of artifacts, reflecting various activities including food procurement and processing, flaked stone manufacturing

Table 6
DISTRIBUTION OF DEBITAGE BY MATERIAL AND LEVEL, TU-1, CA-KER-405

Level (cm.)	obsidian	chalcedony	granitic	quartz	Totals
0-10	–	–	–	–	–
10-20	4	–	3	–	7
20-30	–	–	–	–	–
30-40	7	3	–	–	10
40-50	6	1	–	–	7
50-60	11	–	–	2	13
60-70	10	2	–	–	12
70-80	9	–	–	1	10
80-90	5	–	–	–	5
90-100	3	–	–	–	3
100-110	3	–	–	–	3
110-120	3	–	–	–	3
120-130	6	1	–	–	7
Totals	67	7	3	3	80

Table 7
DISTRIBUTION OF DEBITAGE BY MATERIAL AND LEVEL, TU-2, CA-KER-405

Level (cm.)	obsidian	basalt	Totals
0-10	–	2	2
10-20	2	–	2
20-30	3	–	3
30-40	–	–	–
Totals	5	2	7

and retouch, personal adornment, and power was recovered. In addition, a large number of diverse milling features, including mortars, slicks, and cupules are present.

The CA-KER-405 site is a large and complex habitation/milling site, or "village." The site appears to contain at least three components: 1) prehistoric; 2) protohistoric; and 3) historic. It is not clear whether this latter component was associated with the native occupation.

Research Questions

A variety of research questions could be addressed with the information present in the CA-KER-405 site, as outlined below.

Identity and Location of Ethnographic Villages. The study by McCarthy and Blount (1990) identified a number of ethnographically reported Tübatulabal villages or other locations. While likely not a complete list, the

Table 8
DISTRIBUTION OF DEBITAGE BY MATERIAL AND LEVEL, TU-3, CA-KER-405

Level (cm.)	obsidian	basalt	granitic	Totals
0-10	--	1	--	1
10-20	1	--	--	1
20-30	2	--	--	2
30-40	1	--	1	2
40-50	2	--	--	2
50-60	3	--	--	3
60-70	--	--	--	--
70-80	1	--	--	1
Totals	10	1	1	12

Table 9
RESULTS OF OBSIDIAN STUDIES, CA-KER-405

Cat. No.	Provenience	Artifact Type	Lab No.[1]	Microns	Remarks	Source
2-015	TU-2, 10-20	flake	13838	5.7	--	Coso Volcanic Field
2-016	TU-2, 10-20	flake	13839	3.8	one side	Coso Volcanic Field
2-024	TU-2, 20-30	flake	13840	7.2	one side	Coso Volcanic Field
3-043	TU-3, 20-30	flake	13842	6.1	--	Coso Volcanic Field
1-040	TU-1, 30-40	flake	13841	SD[2]	--	Coso Volcanic Field
3-055	TU-3, 40-50	flake	13848	5.5	--	Coso Volcanic Field
3-057	TU-3, 40-50	Rose Spring point	13843	4.4	--	Coso Volcanic Field
1-071	TU-1, 50-60	flake	13844	6.8	one side	Coso Volcanic Field
1-083	TU-1, 70-80	utilized flake	13846	6.1	--	Coso Volcanic Field
3-073	TU-3, 70-80	flake	13845	SD[2]	--	Coso Volcanic Field
1-095	TU-1, 90-100	flake	13849	6.8	--	Coso Volcanic Field
1-094	TU-1, 90-100	Pinto point	13847	4.6	one side	Coso Volcanic Field
1-104	TU-1, 110-120	flake	13850	9.5	--	Coso Volcanic Field

[1] UCLA Obsidian Hydration Lab Number

locating of such sites and an examination of their archaeological manifestations are an important research question regarding the identification of "Tübatulabal" material culture, questions regarding Tübatulabal settlement-subsistence systems, and acculturation. It is possible that the CA-KER-405 site is one of these locations.

Acculturation. The presence of protohistoric and historic components at the site raises the question of co-occupation (either temporally or physically) of the site with Euroamericans. Although the data remain unclear on that point, it remains possible that the native occupants of the site lived there during Euroamerican times and participated in the economic and social systems brought to the area by that group.

Temporal Placement of the Site. A fundamental question to ask in any archaeological investigation is one of dating. The dating of the site is fundamental to the examination of many questions. While no chronometric

information was forthcoming from the site, there clearly is that potential. There were quantities of fire-affected rock recovered in several of the units that indicate the presence of hearths and other features that may yield materials suitable for chronometric assays.

The Role of the Site in Trade. The presence of a number of known trade items (obsidian and glass beads) presents an opportunity to investigate the relationship between the CA-KER-405 site and other sites in the region (e.g., CA-KER-2527). Being located on the Kern River (and assuming this as a main trade route), the inhabitants of CA-KER-405 may have been involved in a trade network as middlemen serving peoples away from the river, on less active trade routes. In addition, there is the potential of investigating changing trade patterns, or perhaps an effect of Euroamerican contact on those patterns.

Regional Subsistence Systems. A relatively large amount of turtle bone was recovered at the site (see Fenenga 1994, this volume), suggesting that riparian resources were exploited by the inhabitants of the site. The absence of fish in the sample recovered to date is puzzling. Were fish not exploited? Is seasonality a factor? Fish were recovered at the CA-KER-2520 site located away from the river; is there a connection in a subsistence pattern between the two sites?

Regional Settlement Patterns. If the CA-KER-405 site is a "village," there likely are smaller ancillary sites associated with it. Linking CA-KER-405 with other surrounding sites may provide a picture of regional settlement patterns, and how those patterns may have changed over time. Data important to this question would include trade items, lithic sources, and faunal remains (e.g., the presence of turtle and perhaps fish).

Population Movements and Replacements. In our current understanding of the history of the Northern Uto-Aztecan language group, the Tübatulabal have been in place for approximately the last 3,000 years (Lamb 1958:99). However, the "homeland" for the various Numic and Takic languages also is thought to be in the vicinity of the southern Sierra Nevada and western Mojave Desert (e.g., Sutton 1987:156).

Given the above, it may be that the CA-KER-405 site can contribute to an understanding of diachronic ethnicity in the region, as the site may date from about 5,000 B.P. How long have the Tübatulabal occupied the area (assuming we can identify a "Tübatulabal" archaeological assemblage)? Have there been incursions by Numic or Takiç peoples? Who (or what archaeological culture) occupied the region prior to the Tübatulabal?

A detailed understanding of material culture and settlement-subsistence patterns is necessary to understand such problems. Such an understanding cannot be gained from a single site but must include information from site systems. Thus the CA-KER-405 site may contribute important information that, combined with other data, could help answer this question.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-479

This site is located on the Raljon Ranch, about two miles southwest of Glennville. The site was described (Schiffman, original site record) as a large diverse village site. Features at the site include more than 200 bedrock milling features (primarily mortars), cupules, hunting blinds, and hearths. Artifacts noted by Schiffman (in the site record) include projectile points, metates, manos, pestles, ceramics, shell ornaments, drills, awls, needles, and beads of shell, stone, and glass. Burials also were present. The site was excavated by Schiffman for several years in the mid to late 1970s, using field classes from Bakersfield College; however no report on the results of this work has been prepared.

The southernmost portion of this site (the Southern Locus; Fig. 12) is within the Vestal transmission line right-of-way. During the inventory, permission was granted (by the landowner) to inspect the transmission line right-of-way only; so the extent, nature, and integrity of the main portion of the site, including any relationships to the materials within the right-of-way, could not be determined. The only materials observed within the right-of-way were 13 bedrock mortars, two cupules, and one milling slick located on four outcrops. The subsurface testing program was confined to this location.

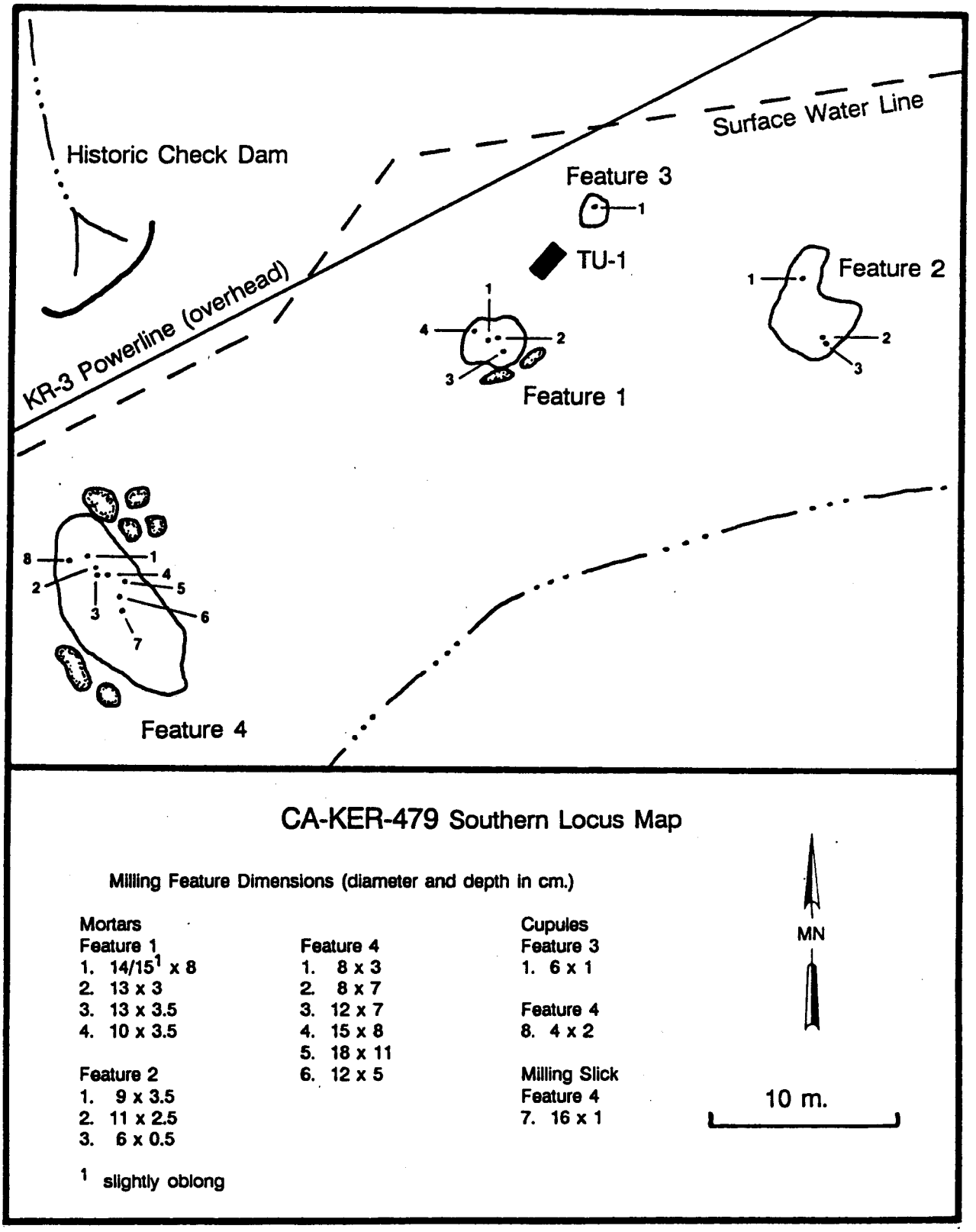


Fig. 12. Map of the CA-KER-479 site.

FIELD METHODS

The locus was mapped (Fig. 12) and one test unit was placed between features 1 and 2. It was excavated in 10 cm. levels to 40 cm. and one 20 cm. level to 60 cm.

MATERIAL CULTURE

A total of 10 historic items and 17 pieces of debitage was recovered from the excavation (Table 10). No materials were noted on the surface.

Historic

Nine of the 10 historic items found are pieces of a flat metal, probably can fragments. The other item was a piece of twisted wire (baling wire-size).

Prehistoric

All of the 17 prehistoric artifacts recovered are debitage (15 obsidian and two chalcedony). The obsidian pieces are small and appear to represent retouch activities. Not one of the pieces are large enough for obsidian sourcing or hydration analyses.

FAUNAL REMAINS

Four small fragments of bone were recovered: one from the 20 to 30-cm. level; one from 30 to 40 cm.; and two from 40 to 60 cm. None contain diagnostic features and so they remain unidentified.

FEATURES

Four milling features (1-4) were identified at the Southern Locus (see Fig. 12) containing a total of 13 mortars, one slick, and two cupules.

DATING

No materials suitable for chronometric dating were recovered from the site. The obsidian flakes are too small to conduct sourcing or hydration studies and no temporally diagnostic artifacts were discovered. However, the main portion of the site appears (from the limited information on the site record) to date to the late prehistoric (e.g., the Chimney Phase), and it is likely that the Southern Locus does as well.

INTERPRETATIONS

The distribution of debitage in TU-1 would indicate that a shallow, sparse deposit is present. The Southern Locus represents a special purpose (milling activity) locality used by the inhabitants of CA-KER-479.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-2517

This site consists of five milling stations (features A-F) surrounded by a dark soil (thought to be midden) over an area approximately 50 by 25 m. (Fig. 13). Eighteen mortars and four metate slicks were noted when the site was first recorded. Additionally, one obsidian flake and an estimated 20 to 30 milling tools (primarily manos and pestles) were observed on the surface of the site. The southern portion of the site was damaged (apparently by the construction of an access road; see Fig. 13). Numerous artifacts are present in the road cut and it is clear that a portion of the original site deposit is missing. It is possible that bedrock milling features might also have been removed.

Table 10
SUMMARY OF ARTIFACTS RECOVERED FROM THE SOUTHERN LOCUS, CA-KER-479

Level (cm.)	historic	obsidian debitage	chalcedony debitage	Totals
0-10	--	3	--	3
10-20	9	5	1	15
20-30	--	4	1	5
30-40	--	1	--	1
40-60	1	2	--	3
Totals	10	15	2	27

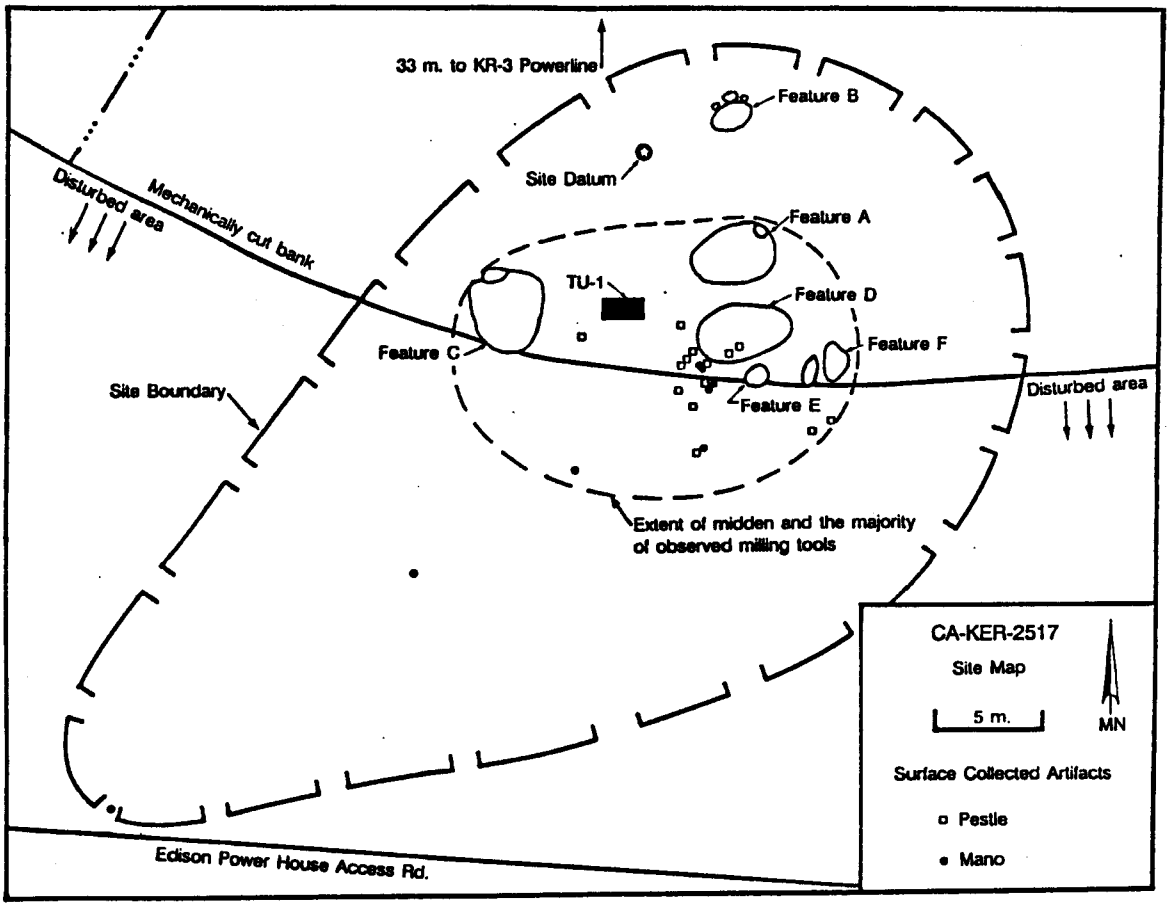


Fig. 13. Map of the CA-KER-2517 site.

FIELD METHODS

Each of the five features identified at the site were mapped and recorded (Figs. 14 and 15). The surface of the site was examined and all formed tools were pinflagged. In the inventory, 52 pestles and pestle fragments, 27 manos and mano fragments, and 18 fragments of unidentified ground stone were located. Of that total, a judgmental sample of 22 was collected (discussed below). The others were left on the surface.

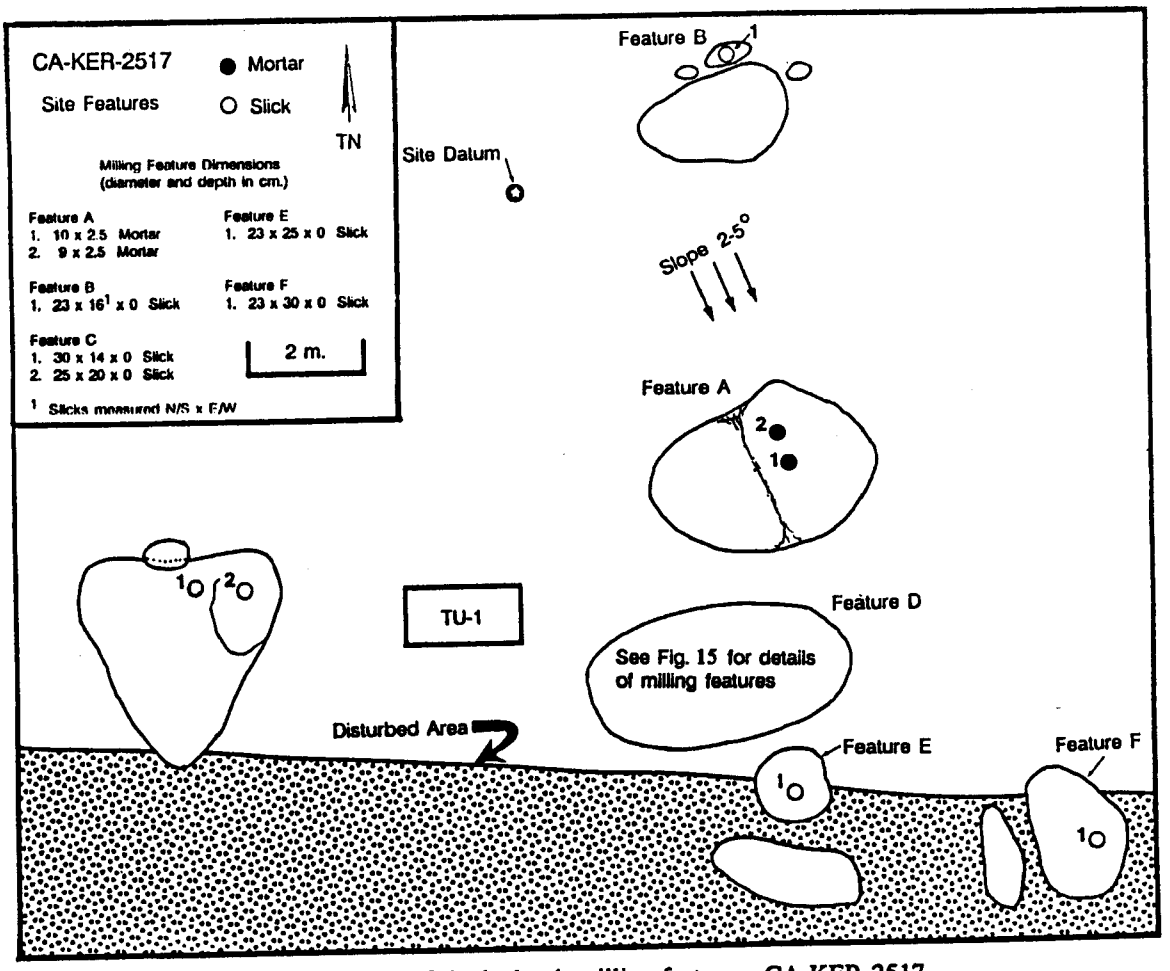


Fig. 14. Map of the bedrock milling features, CA-KER-2517.

Feature D was partly covered by soil. The entire feature was exposed and mapped (Fig. 15), with the removed soil being screened for cultural remains. A single test unit was placed in the approximate center of the site and excavated to a depth of 50 cm. A shallow midden with much cultural debris was discovered.

STRATIGRAPHY

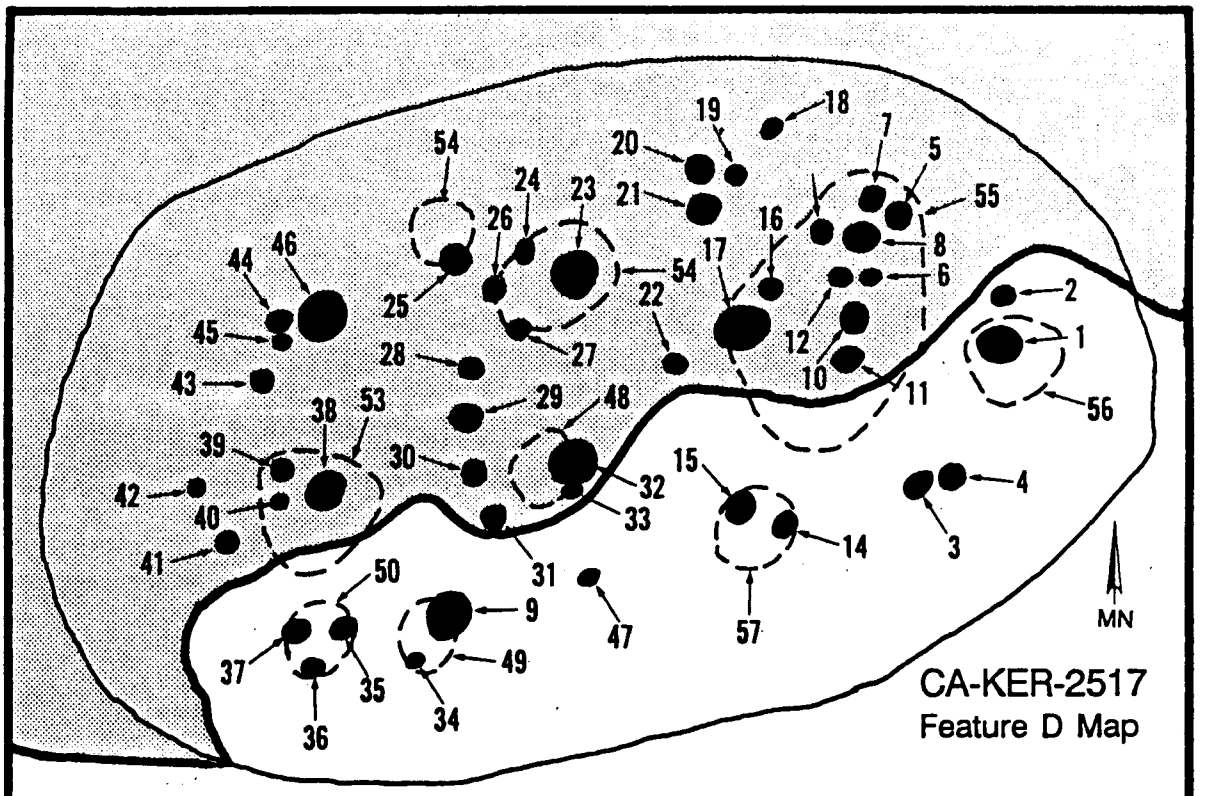
Three soil strata were observed in the excavation unit (Fig. 16). Stratum 1 is a thin layer of dark grey loam representing the root zone. Stratum 2, the primary cultural deposit, consists of a dark grey silt containing pea gravel. Stratum 3 is comprised of a culturally sterile decomposing granite.

Subsurface Feature

A concentration of 16 milling stones, primarily manos or mano fragments, was located within the 30 to 50-cm. levels of TU-1 (Fig. 17). The milling stones were encountered in the same stratigraphic level (see Fig. 16); therefore, they may be a part of a feature.

MATERIAL CULTURE

A total of 91 artifacts was recovered; 22 from the surface (Lot SC), and 48 from TU-1 (Lot 1), and 21 from the excavation above Feature D (Lot 2). The recovered materials are summarized in Table 11.



Portion of Feature Originally Below Surface of Ground

Mortars

Milling Slicks

Milling Feature Dimensions

Mortars
(diameter and depth in cm.)

1.	14 x 6	22.	9 x 1.5	43.	11 x 2.5
2.	11 x 2.5	23.	17 x 16	44.	10 x 3.5
3.	12 x 3.5	24.	11 x 4	45.	10 x 2
4.	9 x 1	25.	12 x 3.5	46.	18 x 18
5.	12 x 3.5	26.	10 x 2.5	47.	10 x 3
6.	8 x 1	27.	11 x 3.5		
7.	9 x 2	28.	10 x 1.5		
8.	13 x 5	29.	13 x 6.5		
9.	19 x 18	30.	11 x 3		
10.	13 x 7	31.	11 x 2.5		
11.	11 x 4	32.	20 x 19		
12.	10 x 2	33.	8 x 1.5		
13.	9 x 1.5	34.	9 x 1		
14.	11 x 2.5	35.	14 x 8.8		
15.	13 x 6	36.	9 x 2		
16.	10 x 4	37.	11 x 2.5		
17.	15 x 16.5	38.	19 x 19		
18.	8 x 1	39.	11 x 5.5		
19.	10 x 4	40.	11 x 6		
20.	12 x 4.5	41.	11 x 3.5		
21.	13 x 5.5	42.	7 x 0.5		

Milling Slicks
(length by width[1] in cm.)

48.	30 x 30
49.	35 x 32
50.	37 x 34
51.	35 x 31
52.	29 x 19
53.	50 x 50
54.	50 x 43
55.	100 x 100
56.	40 x 40
57.	40 x 38

[1] milling slicks have only trace depth

50 cm.

Fig. 15. Map of Feature D, CA-KER-2517.

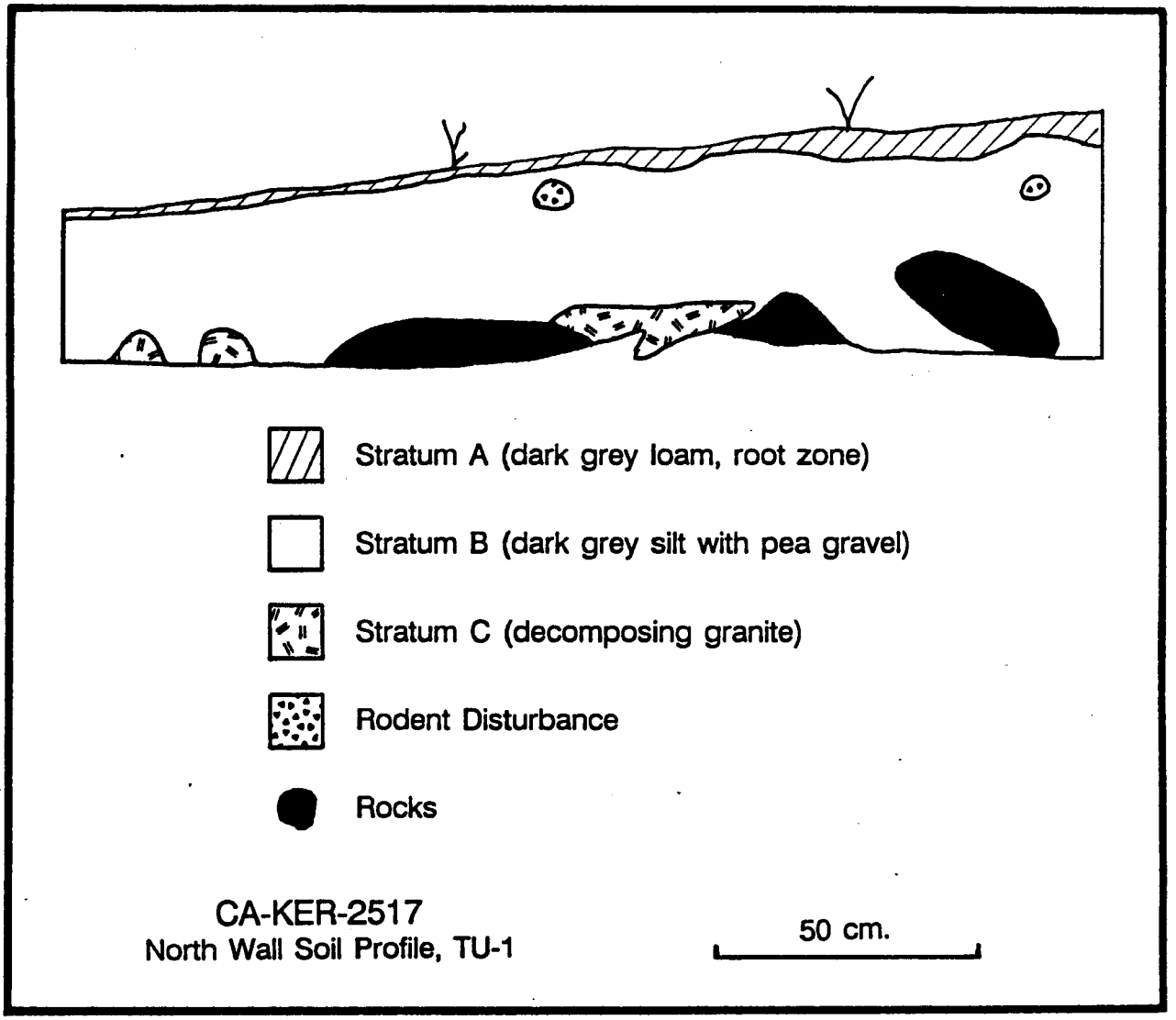


Fig. 16. Soil Profile of the North Wall of TU-1, CA-KER-2517.

Ground Stone

A large number of ground stone artifacts was located on the surface, including 52 pestles or pestle fragments, 27 manos or mano fragments, and 18 fragments of unidentified ground stone. Only 22 were collected from the surface. These artifacts, plus those recovered from the excavation unit (see Fig. 17), are described below.

Manos. Eleven complete manos were collected, nine from the surface. One mano fragment was collected from the surface and 23 mano fragments were discovered during the excavation. The provenience and attributes of the complete and fragmentary manos are presented in Table 12 and several are illustrated in Figure 18.

The complete manos were made from cobbles; six bifacially ground, four unifacially ground, and one ground on three surfaces. Of the 23 fragments, form was identified in 12 cases, all being bifacial with two also being shaped.

Pestles. Of the 52 pestles and pestle fragments observed on the surface of the site, 12 (eight complete and four fragments) were collected. In addition, three other fragments were discovered in TU-1. All the pestles are granitic and

Table 11
SUMMARY OF ARTIFACTS RECOVERED FROM CA-KER-2517

			Depth (cm.)					
Artifact	Surf.	Feature D[1]	0-10	10-20	20-30	30-40	40-50	Totals
manos	9	–	–	1	–	1	–	11
mano fragments	1	3	–	2	1	9	8	24
pestles	8	–	–	–	–	–	–	8
pestle fragments	4	–	–	3	–	–	–	7
ground stone balls	–	–	–	1	–	1	–	2
unidentified ground stone	–	4	–	1	2	5	1	13
stone bead	–	–	–	–	–	1	–	1
debitage[2]	–	12	–	2	4	3	1	22
shell bead	–	–	–	–	–	1	–	1
historic	N/A	–	–	–	2	–	–	2
Totals	22	19	–	10	9	21	10	91

[1] from soil covering Feature D
[2] all recovered debitage is obsidian

made from stream cobbles appropriately shaped so than none needed significant shaping or forming prior to use. In all cases, the pestles exhibit evidence of having been used as manos. The provenience and attributes of the pestles are presented in Table 13 and several are illustrated in Figure 19.

Stone Balls. Two small granite ground stone balls were recovered from TU-1. Neither are spherical and may have functioned as small manos. Specimen 1-024 measures 36.4 x 34.9 x 18.8 mm. and weighs 30.6 g. Specimen 1-062 measures 44.9 x 38.1 x 31.6 mm. and weighs 75.1 g.

Unidentified Ground Stone. Thirteen fragments of unidentified ground stone were recovered from the excavations. Nine were from TU-1; six of these (two of which were recovered *in situ*, see Fig. 17) came from the 30 to 50-cm. levels, in the area of the "feature" (discussed above). One of the fragments (1-054) had hematite smeared on its surface, indicating the processing of red ocher. The provenience and attributes of the unidentified ground stone are presented in Table 14.

Stone Bead. One stone bead (of an unidentified material) was found in the 30 to 40-cm. level of TU-1. The specimen (1-047; Fig. 20a) measures 7.35 mm. in diameter, 2.64 mm. thick, and has a hole diameter of 1.24 mm.

Flaked Stone

The only flaked stone recovered from the site consists of 22 of pieces obsidian debitage, most (n = 12) of which was recovered in the excavation above Feature D.

Shell Bead

A single *Olivella biplicata* shell bead was found in the 30 to 40-cm. level of TU-1. The bead (1-046; Fig. 20b) is oval in shape, 9.1 mm. in length, 6.9 mm. wide, and 1.6 mm. thick. The perforation diameter is 0.7 mm. This bead is classified as a F2a Full Saddle bead following the typology of Bennyhoff and Hughes (1987:132). These beads are thought to date to the Middle Period in California (e.g., the Canebrake Phase, ca. 3,200 to 1,350 B.P.).

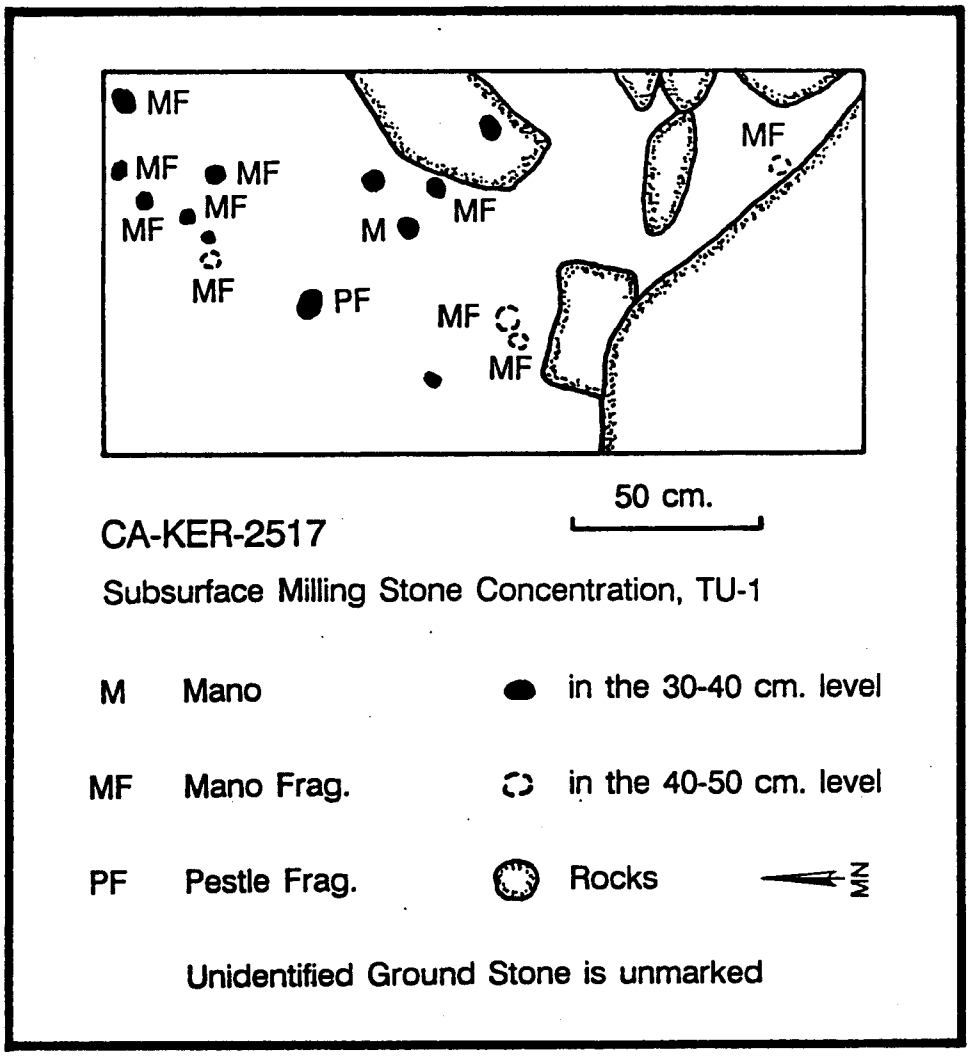


Fig. 17. Map of subsurface concentration of milling stones, TU-1, CA-KER-2517.

Other

In addition to the hematite discovered on the fragment of unidentified ground stone (discussed above), a small fragment of limonite was found in the excavation of the soil above Feature D.

Historic

Glass Trade Bead. One-half of a glass trade bead was recovered in the excavated soil above Feature D. The specimen (2-008) is red with a white center and measures 7.5 mm. long, has a diameter of 5.0 mm., and weighs 0.21 g. The hole diameter could not be determined. This type of bead dates to the American Period, after 1840.

Modern Glass. Two small pieces of clear glass were discovered in the 20 to 30-cm. level of TU-1. This indicates that some disturbance of the deposit has occurred, most likely by bioturbation.

Table 12
PROVENIENCE AND ATTRIBUTES OF MANOS, CA-KER-2517

Cat. No.	Provenience	Material	Form[1]	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
COMPLETE								
SC-008	surface	granite	B	114	90	23	664.1	18a
SC-009	surface	granite	U	99	65	60	566.9	
SC-010	surface	granite	U	135	124	54	1,077.3	18b
SC-011	surface	granite	T	136	81	56	907.0	
SC-016	surface	granite	B	165	114	58	1,587.6	18c
SC-017	surface	granite	B	213	136	96	4,099.2	
SC-018	surface	granite	B	84	62	42	337.9	
SC-019	surface	granite	B	109	78	47	652.1	
SC-021	surface	granite	B	118	89	51	453.6	
1-031	TU-1, 10-20	granite	U	97	66	46	363.9	
1-063	TU-1, 30-40	granite	U	150	122	54	1,475.3	
FRAGMENTS								
SC-006	surface	granite	B	110	80	43	623.7	
1-029	TU-1, 10-20	granite	B	93	50	43	317.8	
1-030	TU-1, 10-20	granite	B	114	58	57	531.4	
1-039	TU-1, 20-30	granite	–	104	65	60	463.6	
1-049	TU-1, 30-40	granite	–	97	56	26	364.2	
1-051	TU-1, 30-40	granite	–	47	38	7	18.1	
1-053	TU-1, 30-40	granite	B	119	70	51	529.1	
1-056	TU-1, 30-40	granite	B	74	50	47	219.2	
1-057	TU-1, 30-40	granite	B	88	67	48	324.6	
1-059	TU-1, 30-40	granite	B	89	78	66	460.2	
1-060	TU-1, 30-40	granite	BSh	59	56	53	183.6	
1-064	TU-1, 30-40	granite	–	108	96	40	689.9	
1-066	TU-1, 30-40	granite	–	81	50	31	123.3	
1-072	TU-1, 40-50	granite	BSh	78	40	32	133.4	
1-076	TU-1, 40-50	granite	–	67	47	12	39.9	
1-077	TU-1, 40-50	granite	–	48	41	21	41.6	
1-079	TU-1, 40-50	granite	–	56	46	30	71.7	
1-080	TU-1, 40-50	granite	B	49	56	53	373.4	
1-084	TU-1, 40-50	granite	–	112	71	30	275.7	
1-085	TU-1, 40-50	granite	B	140	117	-69	1,474.0	18d
1-087	TU-1, 40-50	granite	–	55	45	20	45.0	
2-001	above Feat. D	granite	B	94	57	53	398.2	
2-010	above Feat. D	granite	–	89	68	58	313.4	
2-013	above Feat. D	granite	–	63	51	41	151.5	

[1] U = uniface; B = biface; T = triface; Sh = shaped

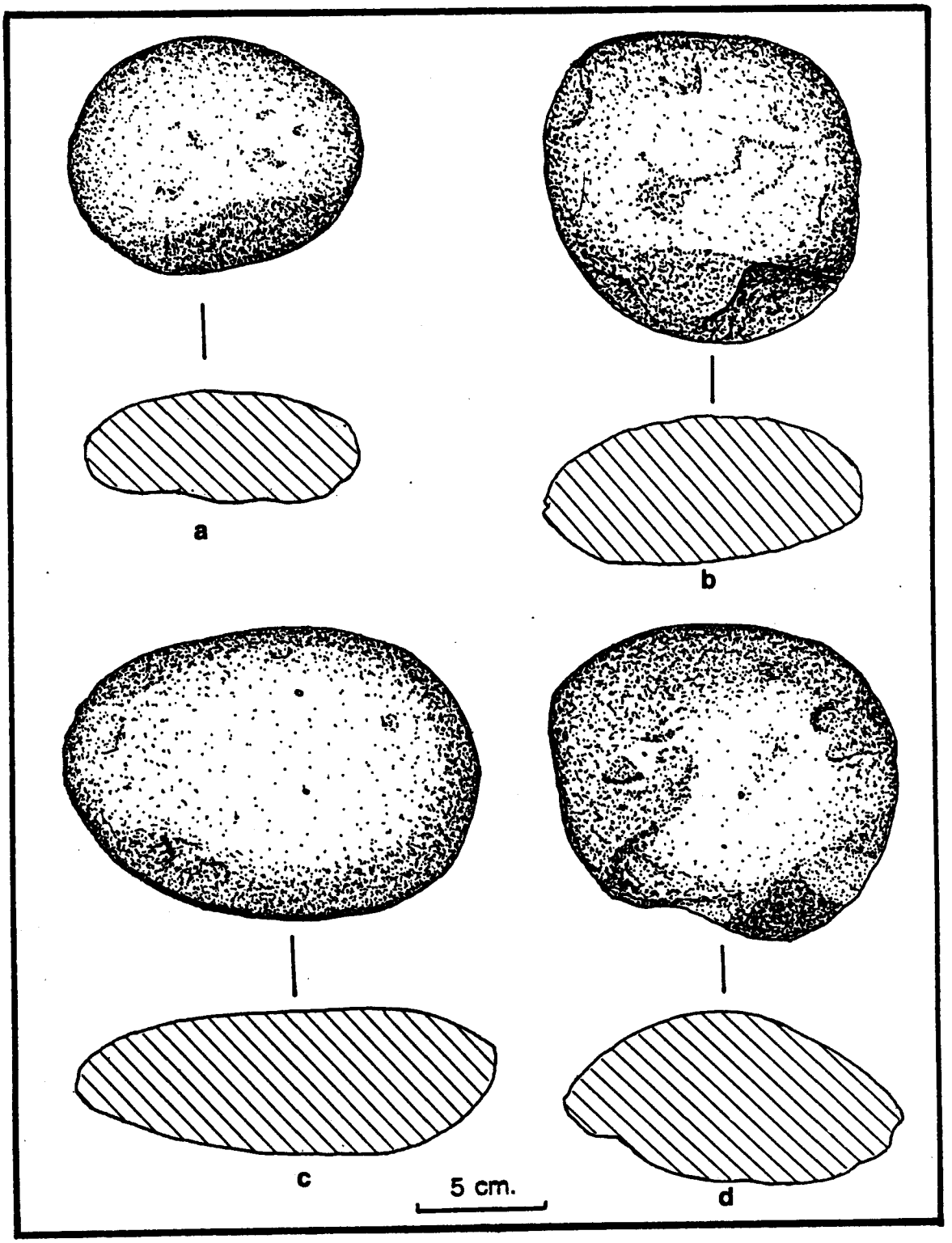


Fig. 18. Manos from CA-KER-2517: a) SC-008; b) SC-010; c) SC-016; d) 1-085.

Table 13
PROVENIENCE AND ATTRIBUTES OF PESTLES, CA-KER-2517

Cat. No.	Provenience	Material	Form[1]	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
COMPLETE								
SC-001	surface	granite	U	260	169	106	6,112.1	19a
SC-002	surface	granite	B	246	137	81	4,692.8	19b
SC-003	surface	granite	T	179	147	115	4,099.3	
SC-004	surface	granite	B	232	117	72	2,710.2	
SC-005	surface	granite	T	240	109	99	3,968.9	
SC-013	surface	granite	B	291	175	73	5,613.2	19c
SC-014	surface	granite	B	238	151	87	4,195.7	
SC-022	surface	granite	B	236	134	120	3,657.7	
FRAGMENTS								
SC-077	surface	granite	U	229	150	91	4,082.3	
SC-012	surface	granite	T	225	131	81	3,826.9	
SC-015	surface	granite	U	180	113	75	2,097.8	
SC-020	surface	granite	B	185	126	76	2,834.9	
1-027	TU-1, 10-20	granite	B	51	48	22	59.9	
1-028	TU-1, 10-20	granite	U	160	121	90	2.444.2	
1-032	TU-1, 10-20	granite	U	204	82	27	491.5	

[1] U = mano-like wear on one surface; B = mano-like wear on two surfaces; T = mano-like wear on three surfaces

FAUNAL REMAINS

The faunal assemblage from the site consists of only 26 vertebrate specimens, plus 72 g. of shell. Included in the recovered taxa are deer and black-tailed hare. An analysis of the recovered faunal material is presented in Fenenga (1994; this volume).

DATING

No materials suitable for chronometric assays were recovered from the site. Two obsidian flakes were submitted for sourcing and hydration analyses. The first flake (1-045) came from the 30 to 40-cm. level of TU-1 and possessed a hydration rind of 5.4 microns (UCLA-OHL-13851). The second flake (1-045) came from the midden above Feature D and possessed a hydration rind of 4.8 microns (UCLA-OHL-13852). Both were sourced to the Coso Volcanic Field.

The only temporally diagnostic artifacts found at the site were beads; an F2a *Olivella* bead dating to the Middle Period (e.g., the Canebrake Phase, ca. 3,200 to 1,350 B.P.) and a glass trade bead dating to the protohistoric. This may suggest that the site was utilized over an extended time period. The obsidian data appear to support a Middle Period date.

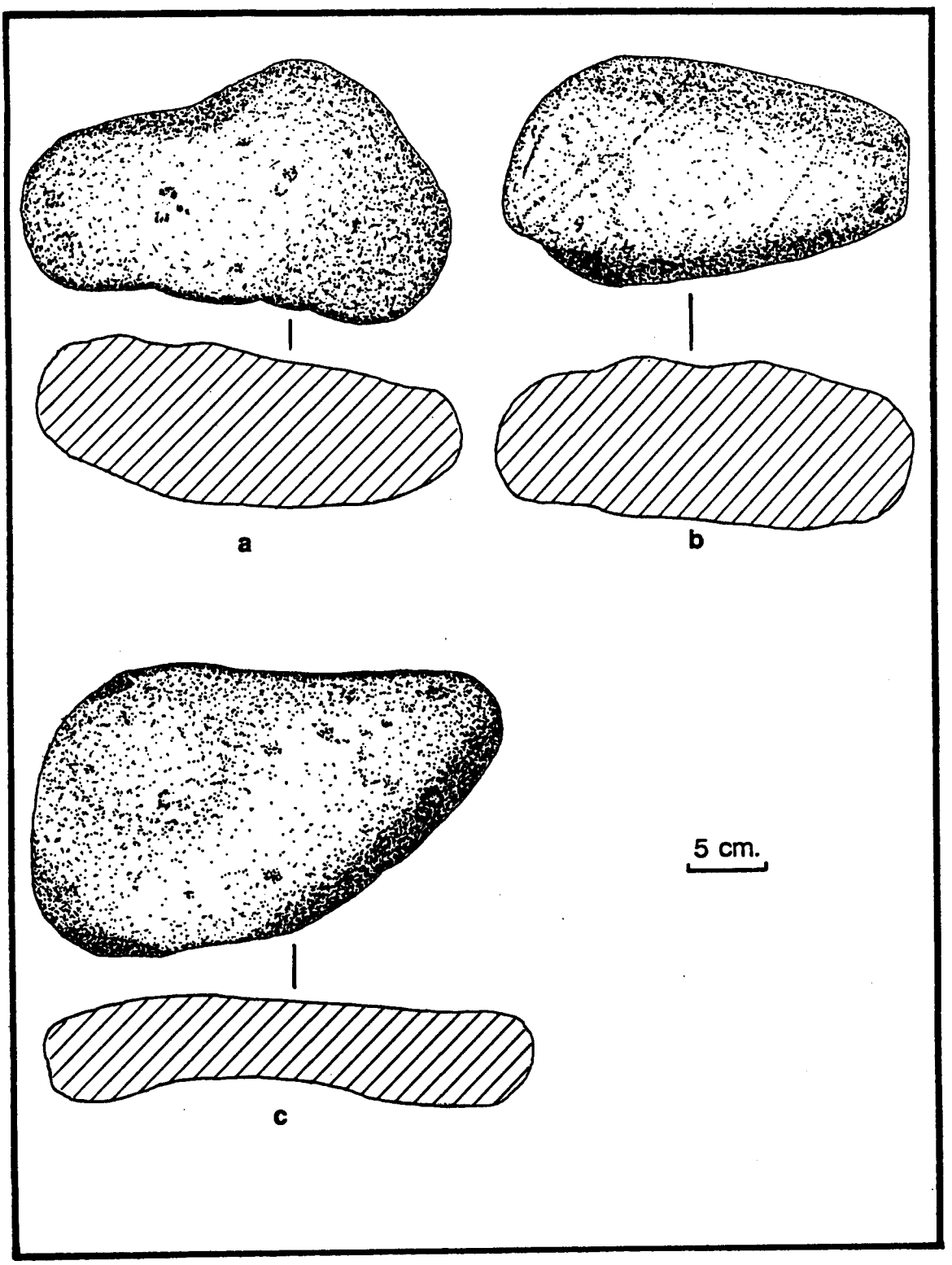


Fig. 19. Pestles from CA-KER-2517: a) SC-001; b) SC-002; c) SC-013.

Table 14
PROVENIENCE AND ATTRIBUTES OF UNIDENTIFIED GROUND STONE, CA-KER-2517

Cat. No.	Provenience	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
1-026	TU-1, 10-20	schist	73	37	11	40.9
1-040	TU-1, 20-30	granite	62	47	34	117.9
1-041	TU-1, 20-30	granite	87	60	35	188.1
1-048	TU-1, 30-40	granite	101	58	24	160.2
1-050	TU-1, 30-40	granite	97	59	28	154.1
1-052	TU-1, 30-40	granite	48	37	7	14.5
1-054	TU-1, 30-40	granite	60	53	48	260.7
1-055	TU-1, 30-40	granite	176	91	50	860.4
1-075	TU-1, 40-50	granite	53	36	23	40.5
2-009	above Feat. D	granite	46	28	15	11.4
2-011	above Feat. D	granite	81	63	21	149.5
2-012	above Feat. D	granite	73	39	20	49.7
2-014	above Feat. D	granite	99	58	30	201.7

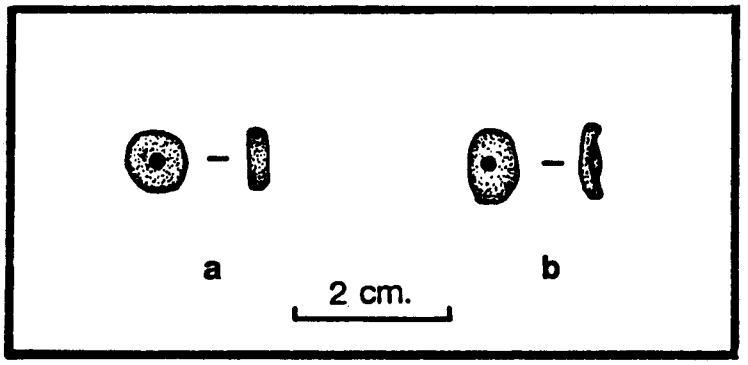


Fig. 20. Stone and shell beads from CA-KER-2517: a) stone bead (1-047); b) *Olivella* bead (1-046).

INTERPRETATIONS

The majority of artifacts found at CA-KER-2517 consists of manos and pestles. This, coupled with the presence of the relatively large number of milling features, suggests that the site served as a special purpose milling site where unknown resources were processed. In addition, the presence of some midden and a few other types of artifacts suggests short-term occupation as well.

The CA-KER-2517 site is interpreted as being a milling station, occupied on more than a daily, but still short-term, basis. The people using the site had their primary residence elsewhere, most likely nearby. The site presently is viewed as part of an undefined settlement-subsistence system.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-2520

This site consists of three main loci of milling features, numbering 61 mortars and slicks, across an area of 210 by 140 m. (Fig. 21). During the inventory, one area of possible midden was noted adjacent to Locus B. One artifact, a broken mano, was observed on its surface. The site has been impacted by mining and might have been slightly impacted by recent ranching activities. The Vestal transmission line passes through the central portion of the site. One surface artifact (a broken mano at Locus B) was noted during the inventory but could not be relocated during the testing phase. Later, two complete manos were located and collected.

FIELD METHODS

The surface of the site was examined for artifacts and a test unit was placed in a flat area where an obsidian flake was noted in a rodent backdirt pile. The unit was excavated to 100 cm.

STRATIGRAPHY

Four soil strata were identified in the test unit profile (Fig. 22). Stratum 1 is a dark grey loamy silt that forms the root zone. Stratum 2 is a dark grey silt with some pea gravel and is the primary midden deposit. Stratum 3 consists of a brown silt with pea gravel and forms a transitional zone between the midden and the underlying culturally sterile soil. Stratum 4 is a compact yellowish-brown sandy silt and is culturally sterile.

MATERIAL CULTURE

A total of 457 artifacts was recovered, mostly debitage (439; 96.1%). The recovered material is summarized in Table 15.

Ground Stone

Manos. Two complete granitic manos were located and collected from the surface in the vicinity of Feature 10 (see Fig. 21). The first (SC-001; Fig. 23a) is bifacially ground, measures 110 x 106 x 39 mm., and weighs 757.4 g. The second (SC-002; Fig. 23b) is bifacial and shaped, measures 117 x 84 x 45 mm., and weighs 761.0 g. In addition, two granite mano fragments were recovered, one (1-014; 99.1 x 68.9 x 51.35 mm., 497.2 g.) from the 20 to 30-cm. level and the other (1-051; 61.1 x 53.1 x 37.9 mm., 122.6 g.) from the 90 to 100-cm. level.

Pestle. One complete granite pestle (Fig. 23c) was found *in situ* in the 70 to 80-cm. level. The specimen measures 155.0 x 67.5 x 59.5 mm. and weighs 985.6 g.

Unidentified Ground Stone. Five fragments of ground stone that could not be identified as to form were recovered. Their provenience and attributes are provided in Table 16.

Flaked Stone

Rose Spring Series Projectile Point. An obsidian Rose Spring series projectile point fragment was tentatively identified from the 20 to 30-cm. level. The specimen (1-052) measures 15.9 x 8.2 x 1.6 mm. and weighs 0.14 g. The artifact was identified on the basis of a worked notch in a flake; it appears as if it had been removed from the face of a Rose Spring point during manufacture or retouch. This identification should be considered provisional. Rose Spring series projectile points date to the Sawtooth Phase.

Biface Fragment. The mid-section of an obsidian biface was found in the 90 to 100-cm. level. The piece (1-053) measures 28.0 x 12.8 x 6.5 mm. and weighs 2.12 g. It appears that the specimen is a piece of a biface discarded during manufacture (thinning).

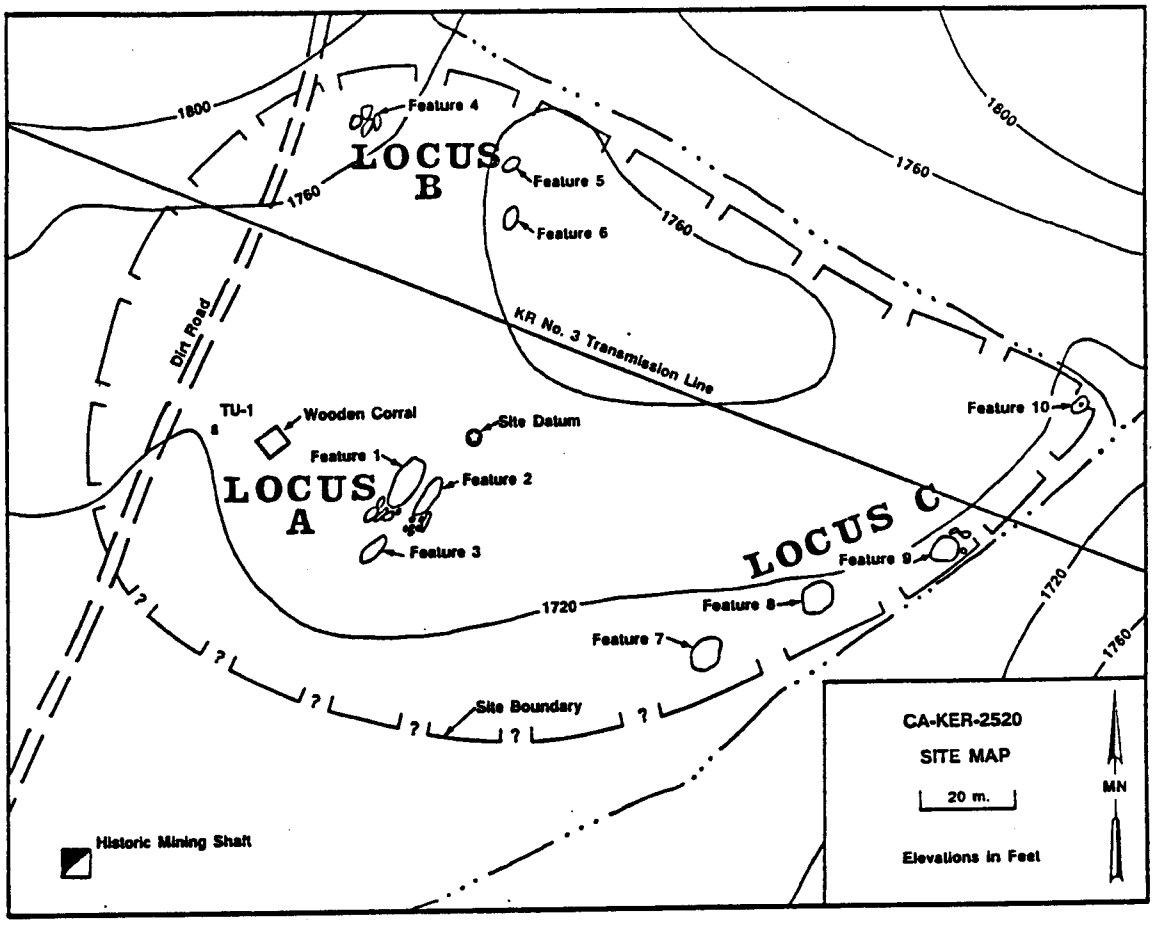


Fig. 21. Map of the CA-KER-2520 site.

Utilized Flakes. Two utilized obsidian flakes were recovered. One (1-056, 30.9 x 23.1 x 5.8 mm., 2.55 g.) came from the 30 to 40-cm. level; the other (1-057, 31.1 x 14.6 x 3.2 mm., 1.21 g.) from the 40 to 50-cm. level. The latter specimen was sourced to the Coso Volcanic Field and had a rind measurement of 8.1 microns (see below).

Debitage. A total of 439 pieces of debitage was recovered, mostly obsidian (405; 92.2). Much of the obsidian material reflects the working of biface tools, either in manufacture or rejuvenation. Some shatter is present, suggesting manufacture. The distribution of debitage is shown in Table 17.

Shell Bead

A single *Olivella biplicata* shell bead (1-012; Fig. 23d) was found in the 20 to 30-cm. level. The bead is 7.15 mm. in diameter, 2.95 mm. wide, with a perforation diameter of 2.0 mm. This bead is classified as a G2 Normal Saucer following the typology of Bennyhoff and Hughes (1987:132). These beads are thought to date to the Middle Period in California (e.g., the Canebrake Phase, ca. 3,200 to 1,350 B.P.).

Other

A fragment of hematite (red ocher) was recovered from the 70 to 80-cm. level. The specimen is quite small (0.1 g.) and it is not clear whether it is cultural in origin.

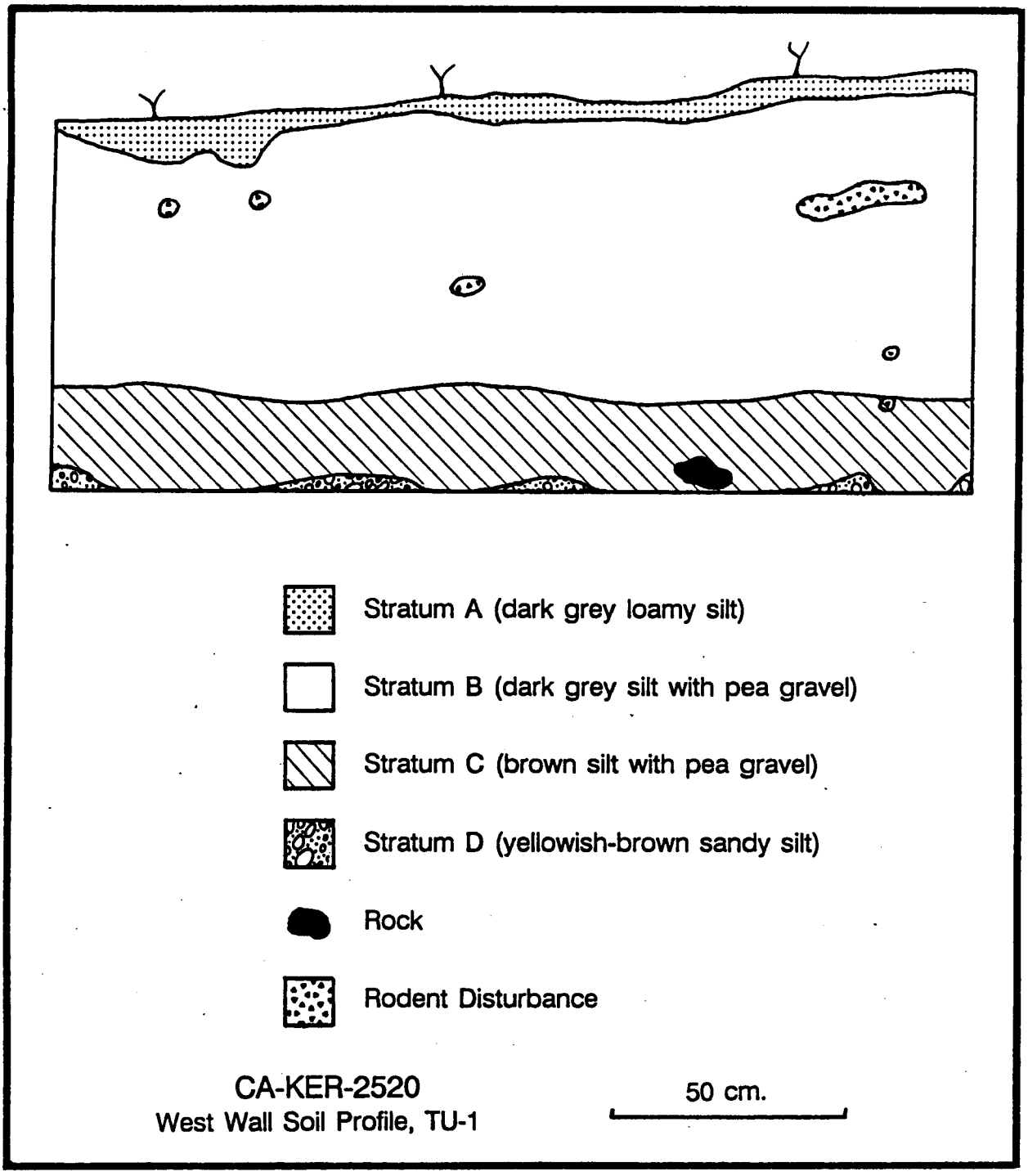


Fig. 22. Soil Profile of the West Wall of TU-1, CA-KER-2520.

FAUNAL REMAINS

The faunal remains from the site consist of 1,497 vertebrate specimens and 4.41 grams of shell. The vertebrate assemblage contains a variety of species including terrestrial animals, avifauna, and fish. The analysis of the faunal remains is presented in Fenenga (1994; this volume).

Table 15
SUMMARY OF ARTIFACTS RECOVERED FROM CA-KER-2520

Artifact	Depth (cm.) Surf.	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Totals
manos	2	–	–	–	–	–	–	–	–	–	–	2
mano fragments	–	–	–	1	–	–	–	–	–	–	1	2
pestle	–	–	–	–	–	–	–	–	1	–	–	1
unidentified ground stone	–	–	–	1	1	–	2	–	–	1	–	5
Rose Spring point	–	–	–	1	–	–	–	–	–	–	–	1
biface fragment	–	–	–	–	–	–	–	–	–	–	1	1
utilized flakes	–	–	–	–	1	1	–	–	–	–	–	2
debitage	–	9	36	61	58	57	53	34	44	58	29	439
shell bead	–	–	–	1	–	–	–	–	–	–	–	1
historic	–	–	1	–	–	–	–	–	1	1	–	3
Totals	2	9	37	65	60	58	55	34	46	60	31	457

OBSIDIAN STUDIES

Obsidian sourcing and hydration analyses were undertaken on five specimens (Table 18). Hydration values range from 5.4 to 8.9 microns.

DATING

The age of the site is unknown but there are several indications of age. The presence of the G2 *Olivella biplicata* shell bead dating from the Middle Period (e.g., the Canebrake Phase, ca. 3,200 to 1,350 B.P.), coupled with the (provisional) presence of a Rose Spring series projectile point, suggests that the site dates, at least in part, to the earlier portion of the Sawtooth Phase (ca. 1,350 to 650 B.P.). Few sites are known to date to this period in the southern Sierra Nevada (Glassow and Moore 1978:13). However, the obsidian hydration results seem to suggest an occupation somewhat earlier.

DISCUSSION

At the time of its recordation, there were few indications that a subsurface deposit existed at the site. The excavation unit demonstrated the presence of a substantial deposit containing a diversity of artifactual and ecofactual remains. While the presence and content of such a deposit were demonstrated, its extent was not.

No features were encountered in the single test unit and few rocks were noted in the excavation. The relatively even distribution of artifacts throughout the deposit (see Table 15) suggests the possibility that the deposit was mixed through bioturbation. Nonetheless, a considerable quantity of cultural material is present in the midden.

Obsidian was the most abundant lithic material used, indicating the inhabitants of the site were linked to a trade network. The presence of both fish and shellfish indicates that riparian resources were utilized to some degree. There currently are no data relating to the season of occupation. However, if the milling features were associated with acorn processing, then a fall occupation might be suspected.

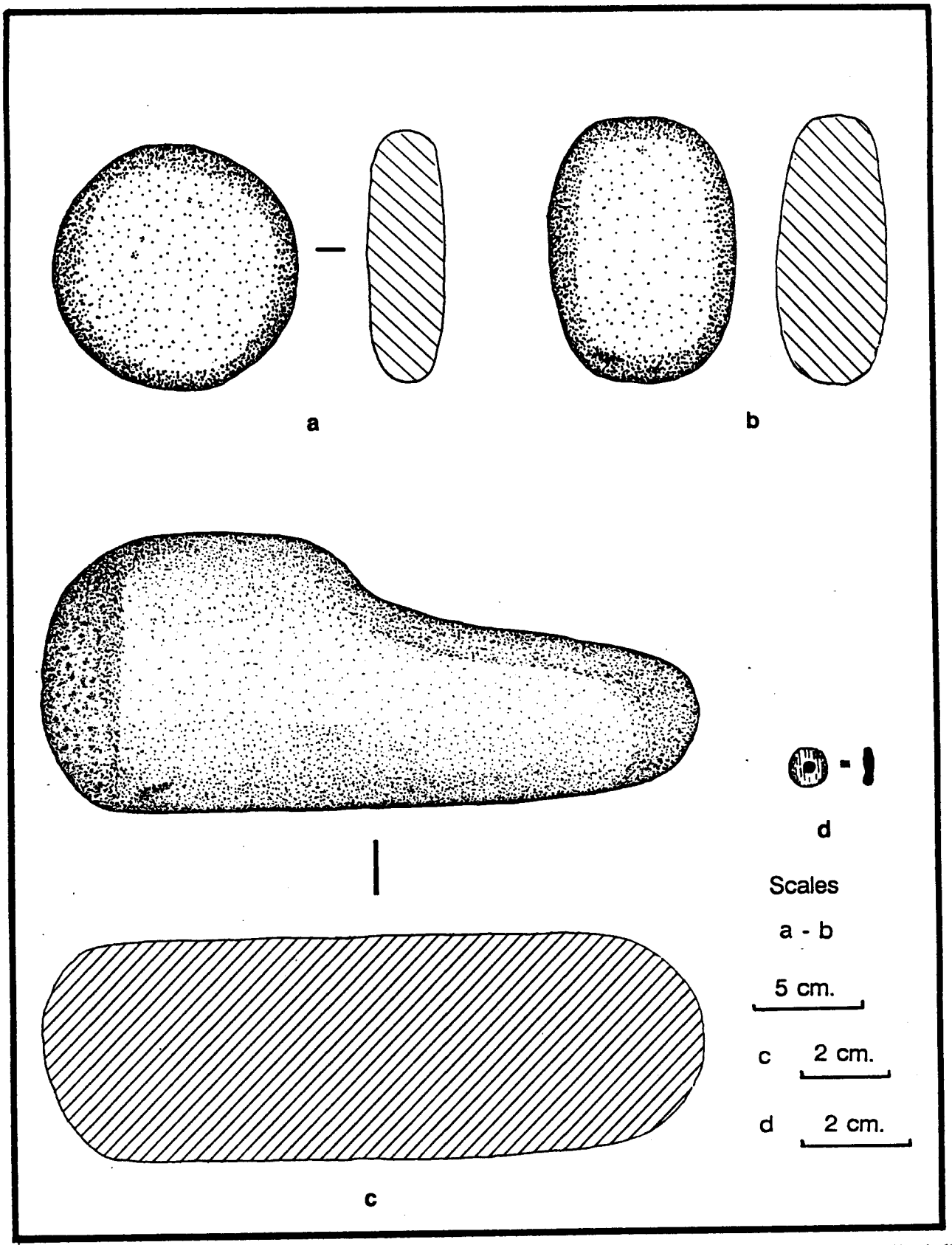


Fig. 23. Artifacts from CA-KER-2520: a) mano (SC-001); b) mano (SC-002); c) pestle (1-033); d) G2 *Olivella* shell bead (1-012).

Table 16
PROVENIENCE AND ATTRIBUTES OF UNIDENTIFIED GROUND STONE, CA-KER-2520

Cat. No.	Provenience	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
1-013	TU-1, 20-30	granite	49.9	40.8	17.1	33.1
1-019	TU-1, 30-40	granite	53.2	44.3	31.5	62.0
1-027	TU-1, 50-60	granite	24.5	22.7	8.3	3.0
1-028	TU-1, 50-60	granite	32.9	30.1	23.0	25.1
1-047	TU-1, 80-90	granite	29.5	20.9	15.1	10.1

Table 17
DISTRIBUTION OF DEBITAGE BY MATERIAL AND LEVEL, TU-1, CA-KER-2520

	Material					
Level (cm.)	obsidian	chalcedony	basalt	rhyolite	granitic	Totals
0-10	8	--	--	--	1	9
10-20	34	2	--	--	--	36
20-30	57	4	--	--	--	61
30-40	53	4	1	--	--	58
40-50	54	3	--	--	--	57
50-60	52	1	--	--	--	53
60-70	33	--	--	--	1	34
70-80	35	7	--	1	1	44
80-90	53	4	1	--	--	58
90-100	26	3	--	--	--	29
Totals	405	28	2	1	3	439

Table 18
RESULTS OF OBSIDIAN STUDIES, CA-KER-2520

Cat. No.	Provenience	Artifact Type	Lab No.[1]	Microns	Remarks	Source
1-002	TU-1, 0-10	flake	13853	7.1	one side	Coso Volcanic Field
1-009	TU-1, 20-30	flake	13854	5.4	--	Coso Volcanic Field
1-057	TU-1, 40-50	utilized flake	13857	8.1	--	Coso Volcanic Field
1-029	TU-1, 60-70	flake	13855	5.9	--	Coso Volcanic Field
1-044	TU-1, 80-90	flake	13856	8.9	--	Coso Volcanic Field

[1] UCLA Obsidian Hydration Lab Number

INTERPRETATIONS

The CA-KER-2520 site has been determined to be a large camp dating from the Sawtooth Phase. The presence of a relatively large number of milling features (n = 61), the depth of the deposit, and the diversity of the artifact and faunal assemblages would support this conclusion.

Research Questions

Temporal Placement of the Site. A fundamental question to ask in any archaeological investigation is one of dating. The dating of the site is fundamental to the examination of many questions. While no chronometric information was forthcoming from the site, there clearly is that potential. Although only one subsurface feature was discovered, the presence of fire-affected rock in the deopsit suggests that hearths may be present which may yield materials suitable for chronometric assays.

Regional Subsistence Systems. A significant amount (the most per square meter of the seven sites) of bone is present in the deposit. A significant quantity of that bone is small- to medium-sized mammals, including black-tailed hare (jackrabbit). This may suggest that hares were obtained in the San Joaquin Valley.

Some fish bone was recovered at the site (see Fenenga 1994; this volume), suggesting that riparian resources were exploited by the inhabitants of the site. While the presence of fish in the sample is not a surprise, the absence of fish in the sites associated with the Kern River is, and there may be a connection. Seasonality may be a factor.

Regional Settlement Patterns. As the CA-KER-2520 site is a large camp, it represents a portion of a larger settlement system associated with it. Linking CA-KER-2520 with other surrounding sites may provide a picture of regional settlement patterns, and how those patterns may have changed over time.

The faunal data (Fenenga 1994; this volume) suggest two possible connections: one with the San Joaquin Valley (the presence of hares and lake fish); and one with sites along the Kern River (the presence of fish at CA-KER-2520 and its absence along the river). Such questions are approachable with data from CA-KER-2520. Ecofactual data plus an understanding of the material culture (milling artifacts, see below) are important to this question.

Material Culture Studies. A detailed understanding of material culture and settlement-subsistence patterns is necessary to understand problems of ethnicity and changes over time. The artifactual materials in the site may provide an excellent base for documentation and comparison with other known and dated sites in the area.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-2521

This site consists of a large boulder (10 x 10 m.) with one mortar and six metate slicks on top (Fig. 24). The ceiling of the boulder has heavy smoke stains. Underneath the boulder are two separate caches (A and B) of manos. No midden was observed and no artifacts, other than the cached manos, were noted.

The site appears to have been heavily impacted during construction of Sierra Way, some five meters to the west. In addition, some terracing recently had been done above the site resulting in a number of smaller boulders being pushed into the vicinity of the large one. During occupation, the site would have been more open and the "caches" less hidden. The site is located within the Borel transmission line right-of-way.

FIELD METHODS

The milling features were mapped and measured and the cached manos were collected for analysis. No excavations were undertaken.

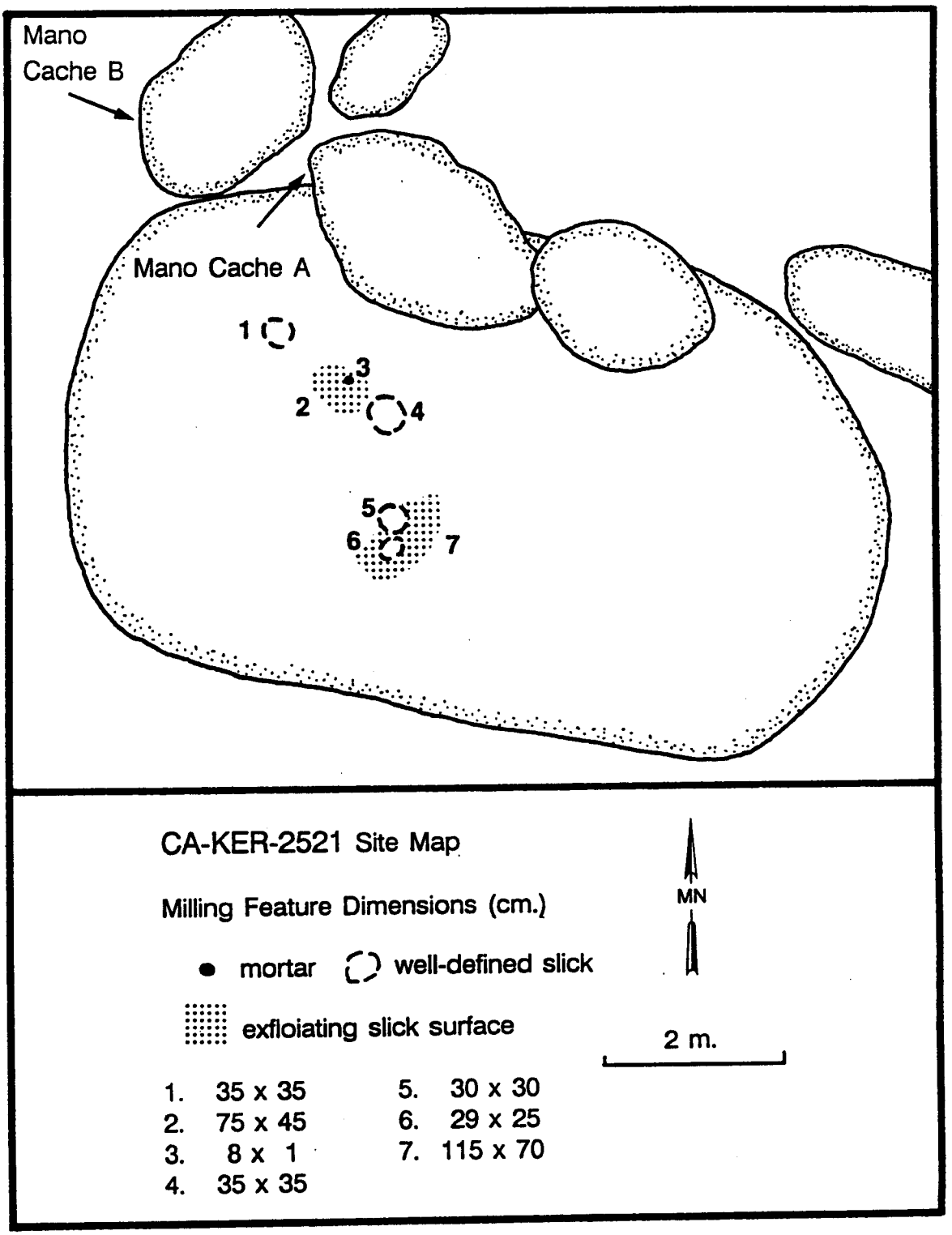


Fig. 24. Map of the CA-KER-2521 site.

MATERIAL CULTURE

Six granite manos were collected, three from each "cache." All three of the specimens from Cache A were complete, bifacially ground, and shaped (Fig. 25). All of the Cache B specimens, one complete and two fragments (Fig. 26), were bifacially ground and shaped. It is possible that Cache A was intended as a storage area for complete manos (although they were not found in direct proximity) while Cache B represented a discard pile. The metric attributes of each specimen are presented in Table 19. The specimens from Cache A are illustrated in Figure 27 and the specimens from Cache B are illustrated in Figure 28.

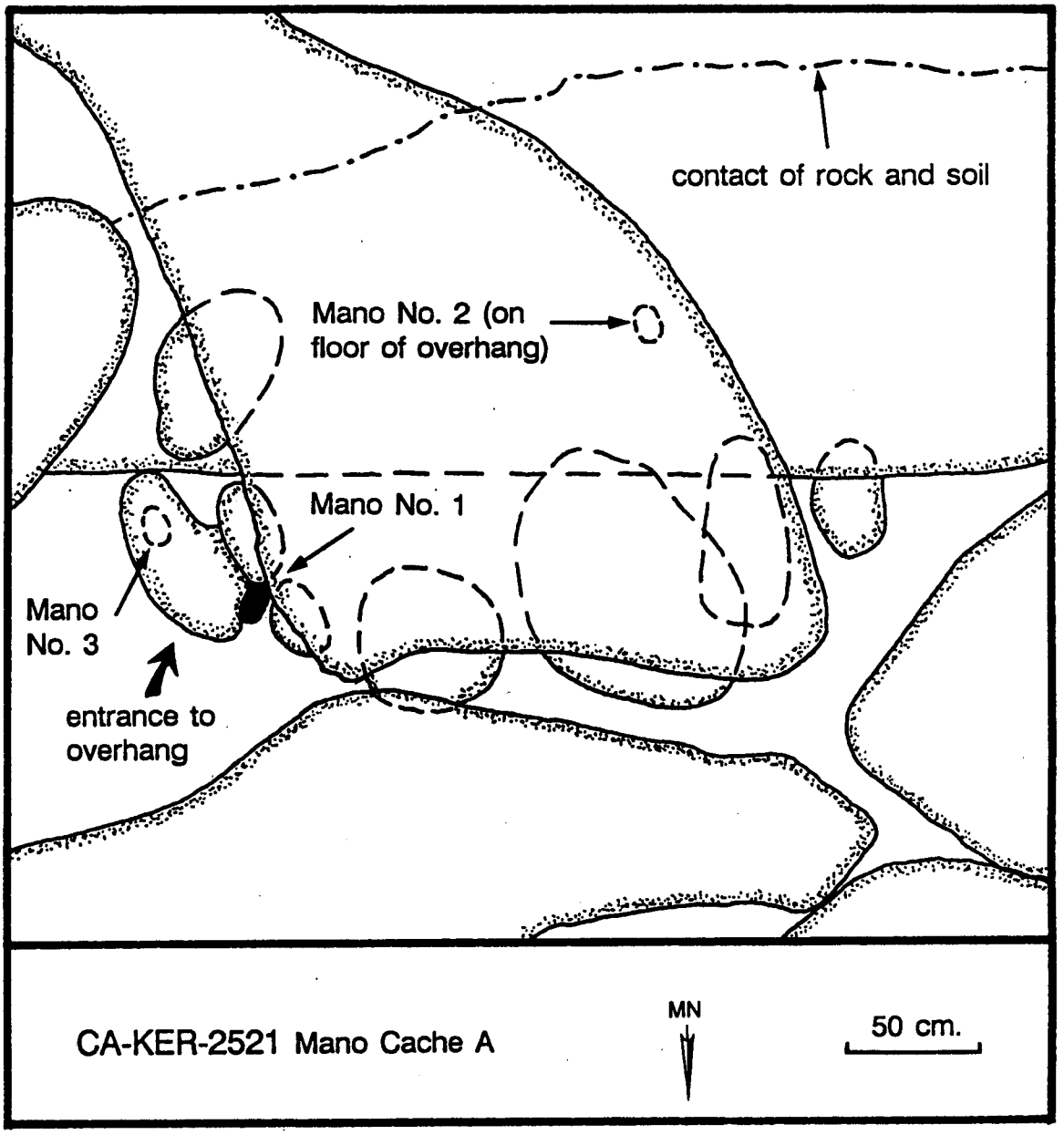


Fig. 25. Map of Cache A, CA-KER-2521.

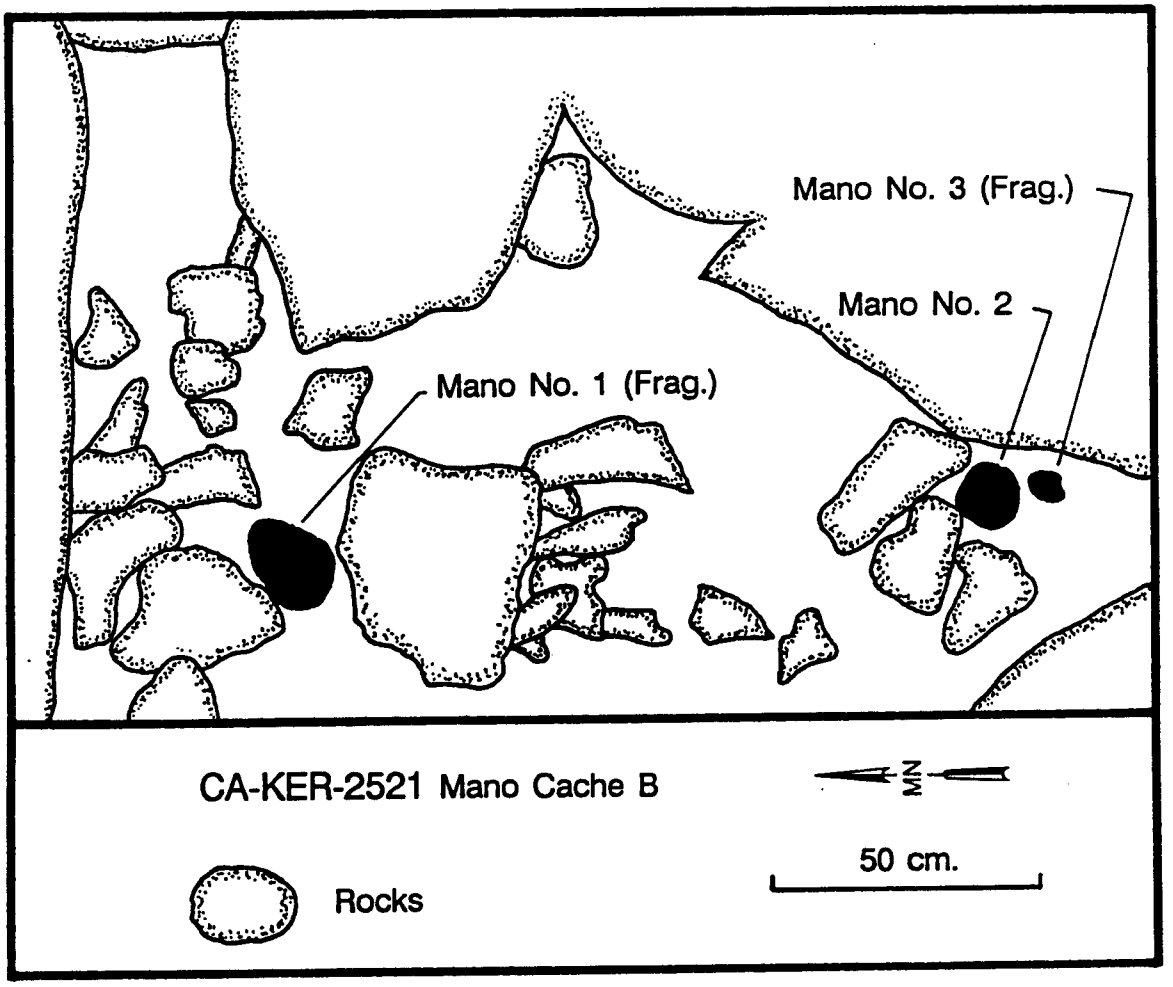


Fig. 26. Map of Cache B, CA-KER-2521.

Table 19
PROVENIENCE AND ATTRIBUTES OF MANOS, CA-KER-2521

Cat. No.	Provenience[1]	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
SC-001	A-1	granite	164.0	101.8	69.5	1,773.1	27a
SC-002	A-2	granite	98.9	73.9	52.5	1,502.5	27b
SC-003	A-3	granite	121.8	108.7	60.9	1,151.0	27c
SC-004[2]	B-1	granite	117.4	140.2	89.2	1,559.3	28a
SC-005	B-2	granite	130.4	128.4	74.5	1,853.0	28b
SC-006[2]	B-3	granite	68.9	100.6	59.3	612.1	28c

[1] cache and artifact designations
[2] fragmentary specimens

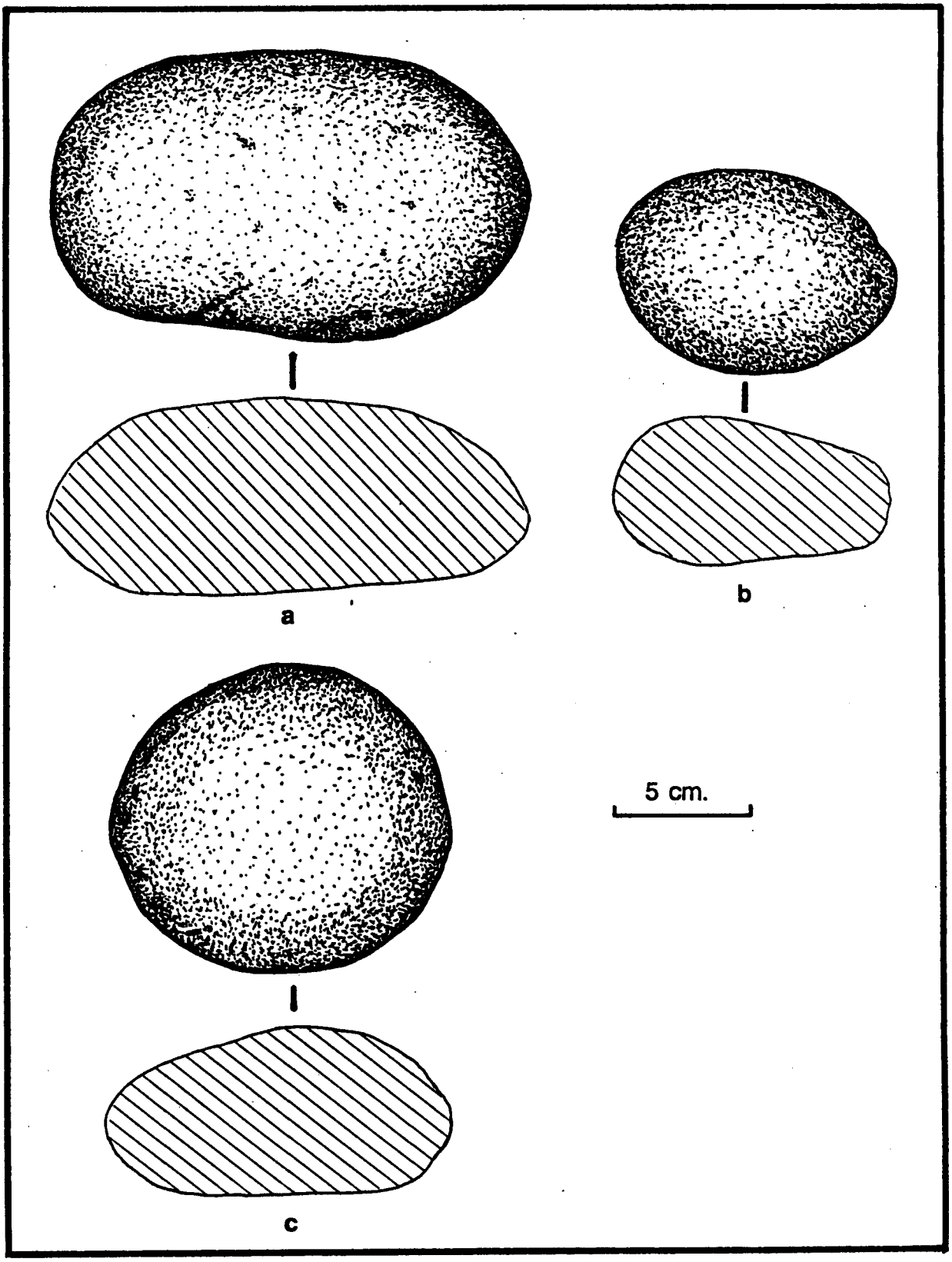


Fig. 27. Artifacts from Cache A, CA-KER-2521: a) SC-001; b) SC-002; c) SC-003.

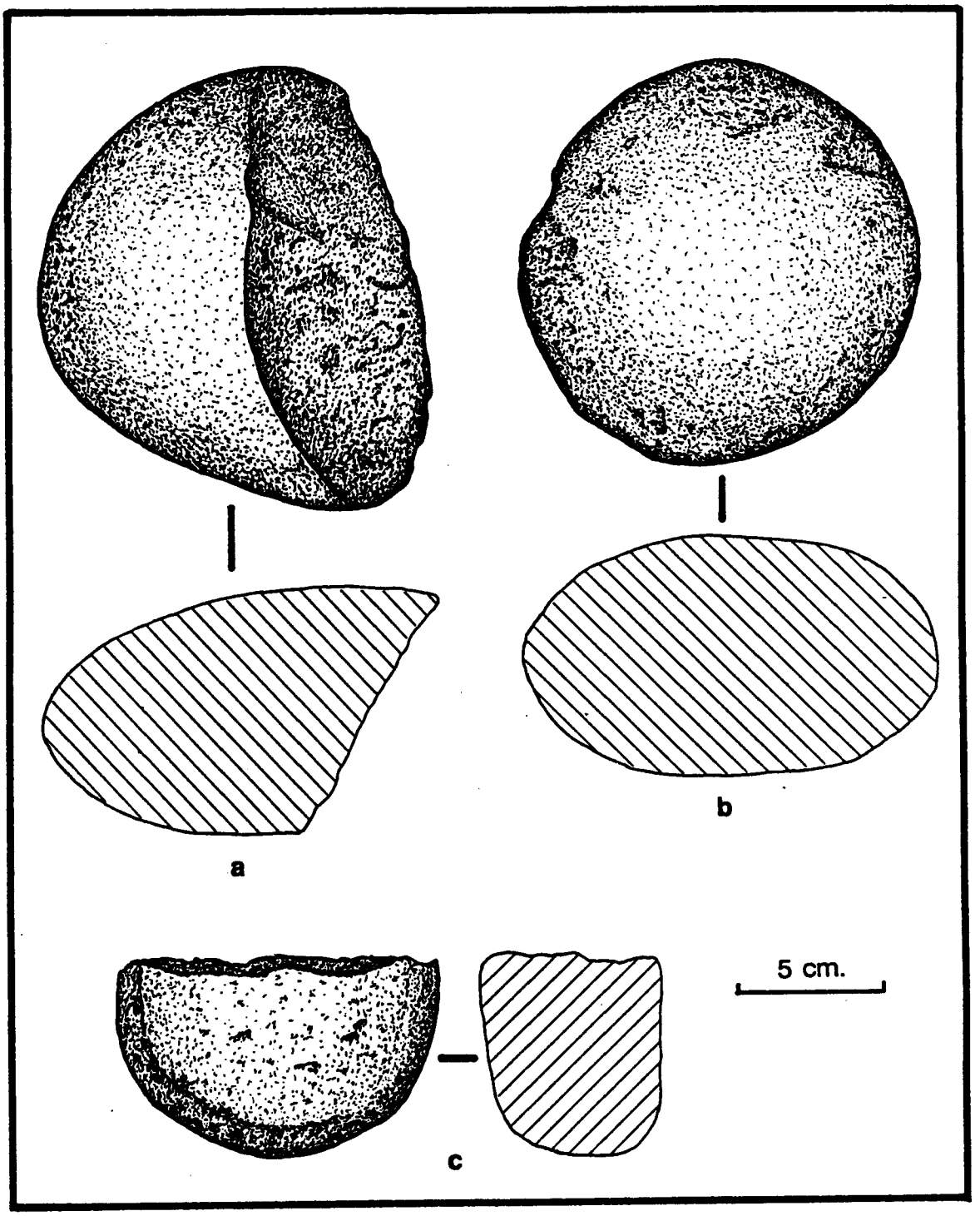


Fig. 28. Artifacts from Cache B, CA-KER-2521: a) SC-004; b) SC-005; c) SC-006.

DATING

There currently are no data from the site that would indicate the time period this site was used.

INTERPRETATIONS

The CA-KER-2521 site is viewed as a milling station, rather than a camp. The site may be associated with the nearby CA-KER-2517 site where more extensive milling activities, and short-term habitation, are indicated.

Research Questions

Identity and Location of Ethnographic Locations. It is possible that the CA-KER-2517 site is an ethnographically identified location (e.g., the study by McCarthy and Blount [1990]).

Regional Subsistence Systems. A large number of milling features and tools represents the processing of some unknown resource. The identity of that resource (perhaps possible through immunological studies) and the dating of the site would add important information toward an understanding of resource utilization.

Regional Settlement Patterns. As the CA-KER-2517 site is a milling locality, it represents a portion of a larger system associated with it. Linking CA-KER-2517 with other surrounding sites may provide a picture of regional settlement patterns, and how those patterns may have changed over time. Data important to this question would include material culture (milling items), trade items, and lithic sources.

Material Culture Studies. A detailed understanding of material culture and settlement-subsistence patterns is necessary to understand problems of ethnicity and changes over time. The presence of such a large sample of milling implements in one locality (although it is not known how closely they are associated temporally) provides an opportunity to examine a concentrated assemblage and attempt to determine if metric patterns exist that can be used to distinguish ethnicity. The sample collected so far is but a fraction of that present. As such, the remaining materials in the site may provide an excellent base for documentation and comparison (e.g., with that of CA-KER-2527, see below).

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-2522

The site consists of one bedrock milling feature containing five mortars (Figs. 29 and 30). One obsidian flake was observed on the trail near the milling station. The site is within a transmission line right-of-way, and a support for a power pole is anchored into the bedrock milling station. The site is directly adjacent to a paved road, houses, and other development, making it highly accessible to foot travel and other kinds of disturbance.

FIELD METHODS

One test unit was excavated to determine whether a midden deposit was present (Fig. 29). The unit was excavated to 20 cm.; the 10 to 20-cm. level did not contain cultural materials. The obsidian flake noted on the surface during the inventory phase of the project could not be relocated.

MATERIAL CULTURE

The material culture recovered included several historic artifacts and three obsidian flakes, all from the 0 to 10-cm. level. No cultural materials were found in the 10 to 20-cm. level and no faunal remains were located at the site.

Historic

Several historic artifacts, including a piece of glass, a bolt nut, and a .22 caliber shell casing, were found in the 0 to 10-cm. level of the test unit.

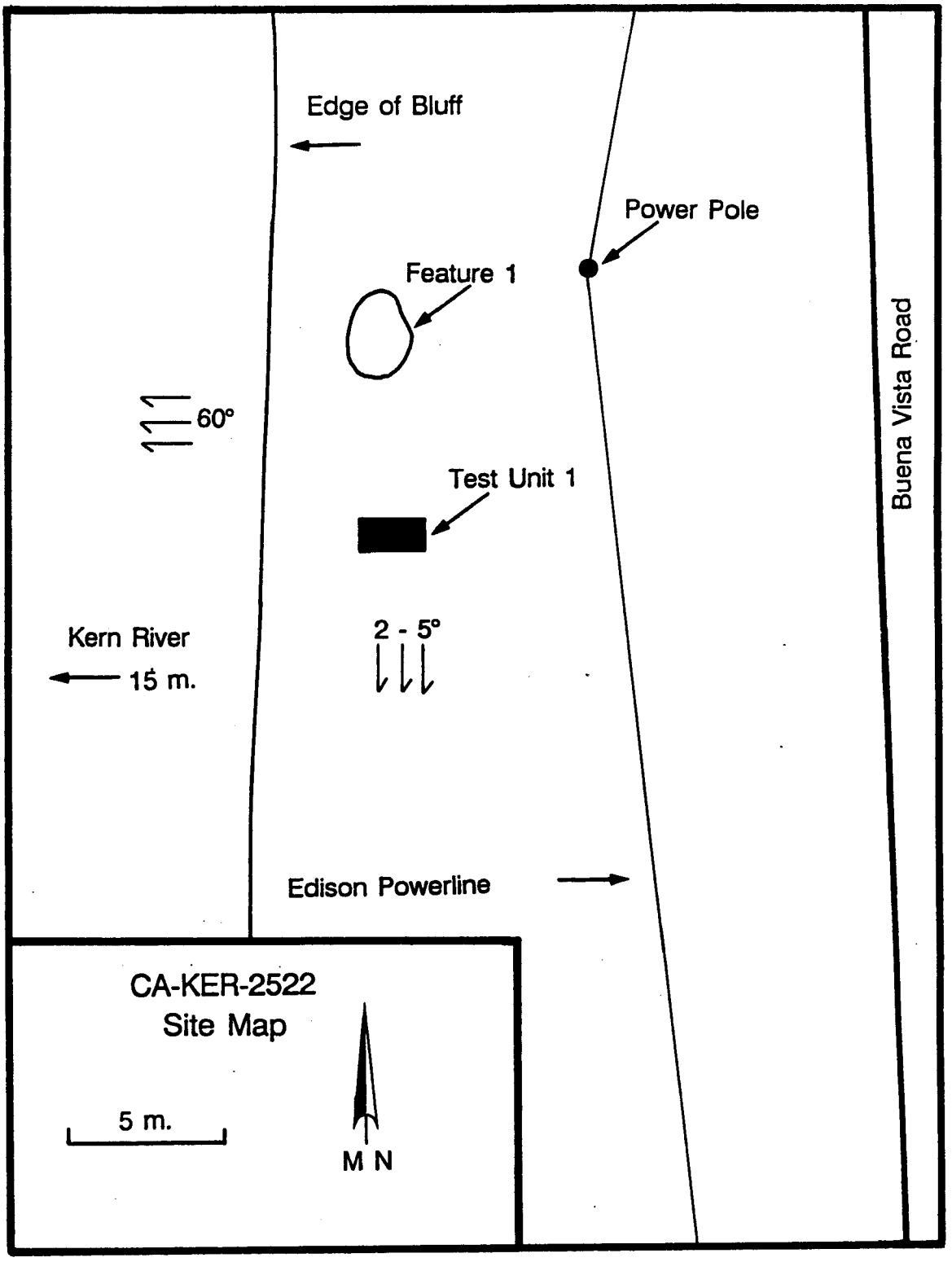


Fig. 29. Map of the CA-KER-2522 site.

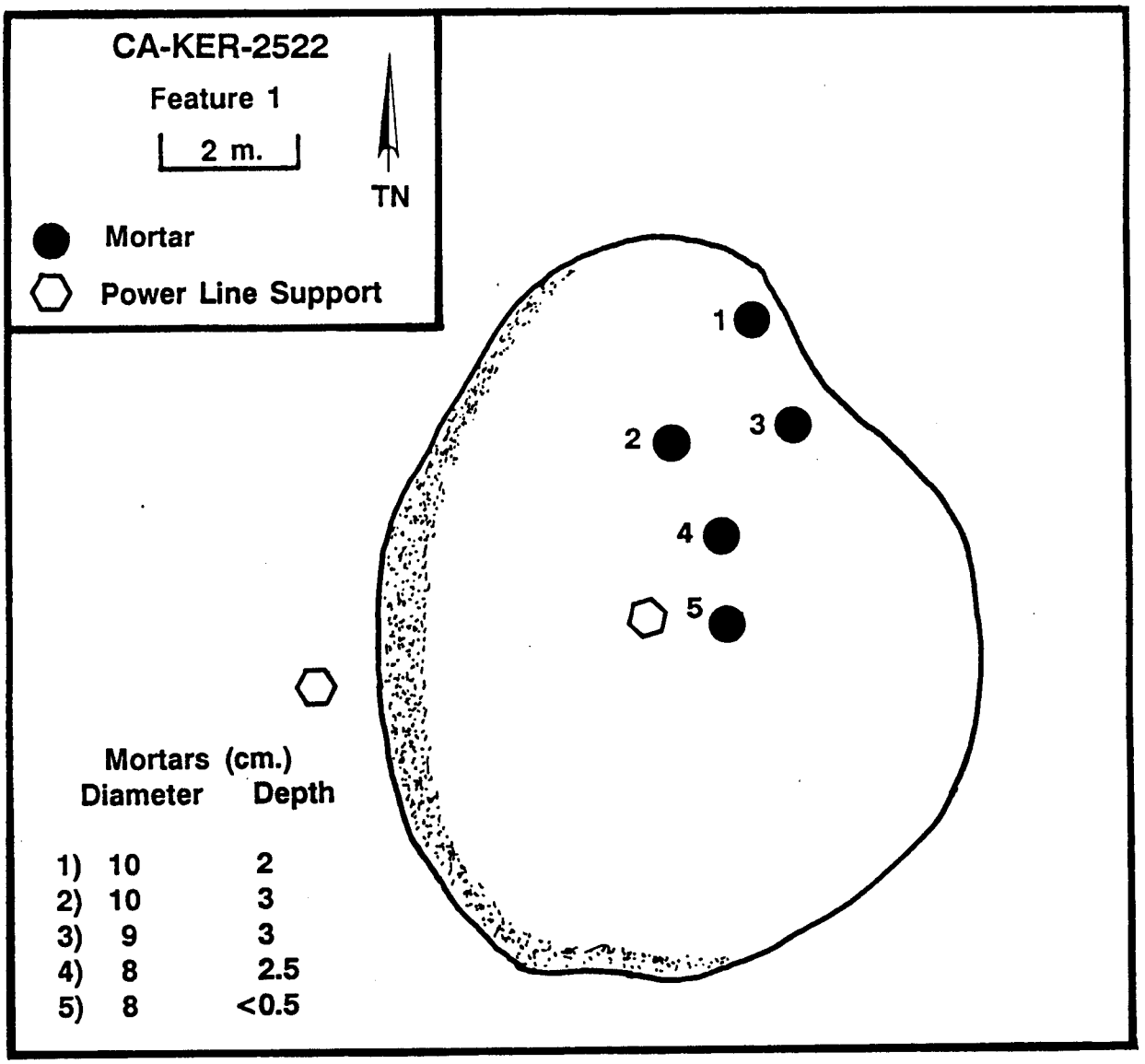


Fig. 30. Map of Feature 1, CA-KER-2522.

Prehistoric

A total of three obsidian flakes was recovered; all from the 0 to 10-cm. level. The flakes are all quite small, indicative of retouch activities.

Feature

A single bedrock milling feature (Feature 1) containing five mortars is located at the site (Fig. 29). A map of the feature is provided in Figure 30.

DATING

No materials suitable for chronometric dating were recovered from the site. The obsidian flakes are too small to conduct sourcing or hydration studies and no temporally diagnostic artifacts were discovered. Thus, the age of the site is unknown.

INTERPRETATIONS

The site is viewed as a small milling station, used to process an unknown resource. No habitation activities are evident at the site.

ARCHAEOLOGICAL INVESTIGATIONS AT CA-KER-2527

The CA-KER-2527 site consists of seven milling features (one discovered during test excavations) in a scatter of small boulders (Fig. 31). A total of 34 mortars and nine slicks was located. The site measures 90 by 50 m. An area of possible midden was noted in the southwestern portion of the site. The site has been disturbed by road construction. A sparse scatter of obsidian flakes and milling stones was observed and a blue hexagonal glass trade bead was found on the surface. The Vestal transmission line crosses the western portion of the site, but no poles are located on the site.

FIELD METHODS

Three test units were excavated. Test Unit 1 was located where the midden was recorded, TU-2 on the western edge of the site in the area of a bulldozer cut, and TU-3 just to the west of TU-1 to explore the midden deposit known to exist there.

During the excavation of the 0 to 10-cm. level of TU-1, a large bedrock milling feature was discovered just below the surface of the midden. The work continued in TU-1 but only the north one-third was excavated due to the presence of the feature (see Fig. 32). A series of one meter "squares" was laid out over the feature and excavated in a single level ("surface to feature"), a depth ranging from one to 10 cm. (see Fig. 32). The entire milling feature (Feature 7) was exposed, mapped, and recorded (Fig. 32).

SOILS AND STRATIGRAPHY

One basic soil stratum was identified within the site, consisting of a grey sandy silt (Fig. 33). This soil contained substantial cultural materials and overlies a base of decomposing granite. This soil differed from the natural soil outside the site boundary (Fig. 34) that contained a developed root zone and was devoid of cultural materials.

SUBSURFACE FEATURE

A concentration of milling stones (Feature A; Fig. 35) was located in the northern portion of TU-1, adjacent to Feature 7. Two manos (see Fig. 36), a mano fragment, a pestle (see Fig. 37), a pestle fragment, and a stone sphere were located within the concentration. This may represent a cache of millingstones (manos and pestles) that were to be used with the slicks and mortars on Feature 7.

MATERIAL CULTURE

A total of 380 prehistoric artifacts (including eight glass trade beads) was recovered from the site, including milling stones, projectile points, ornaments, and debitage (the historic materials are not included in this total). The recovered artifacts are summarized in Table 20.

Ground Stone

Manos. Six complete and 18 fragmentary manos were recovered. Twelve of the specimens were identified as being bifacially ground; five were unifacially ground; one was ground on three surfaces; and the others were unidentified. The provenience and attributes of the manos are presented in Table 21. Several are illustrated in Figure 36.

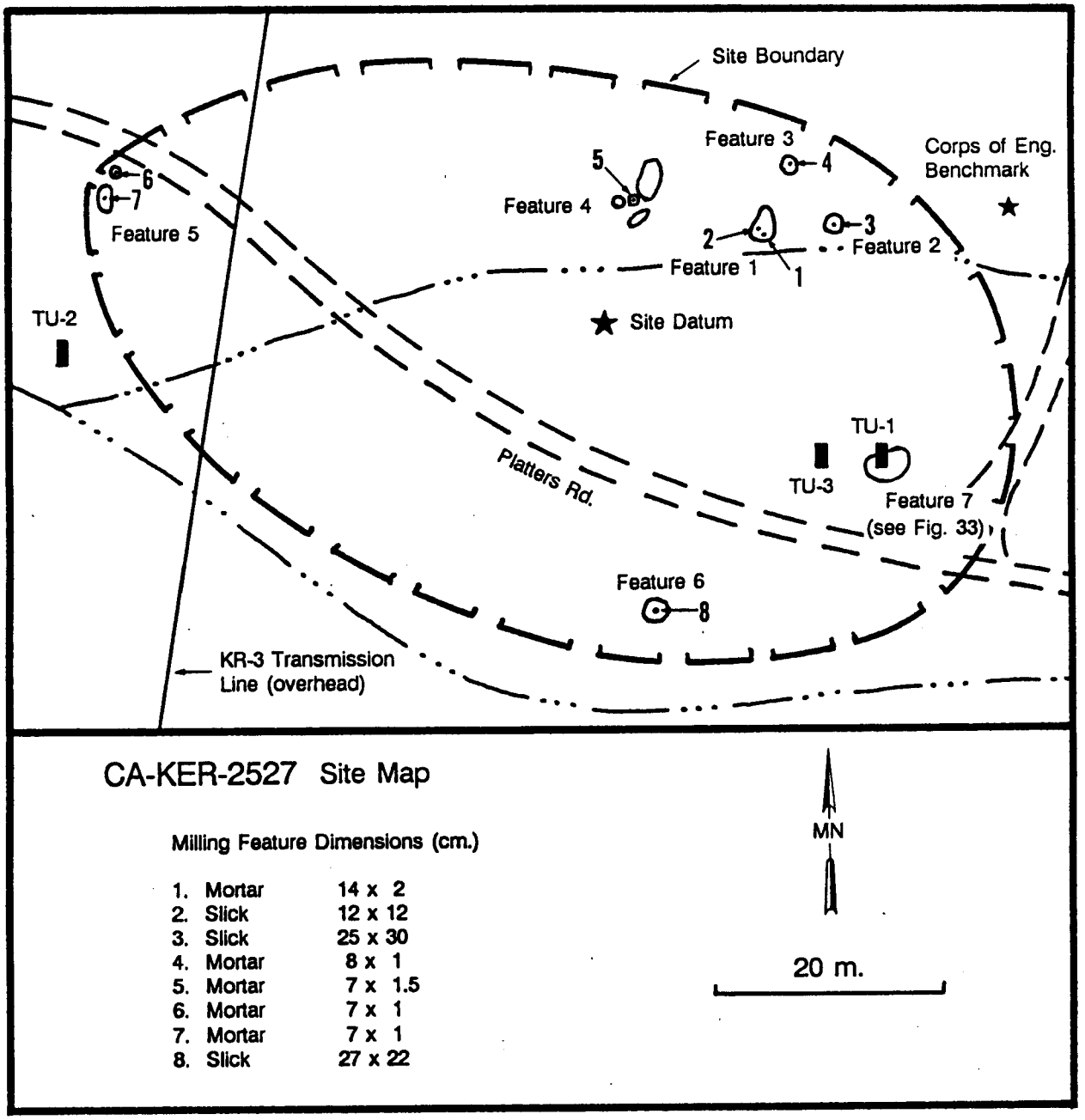


Fig. 31. Map of the CA-KER-2527 site.

Metate Fragment. A single granite metate fragment was found on the surface. The specimen (S-102) measures 126 x 111 x 58 mm. and weighs 1,219.4 g.

Pestles. Two complete and eight fragmentary pestles were recovered, all made of granite. Both complete pestles also had been used as manos. The provenience and attributes of the pestles are presented in Table 22. Two are illustrated in Figure 37.

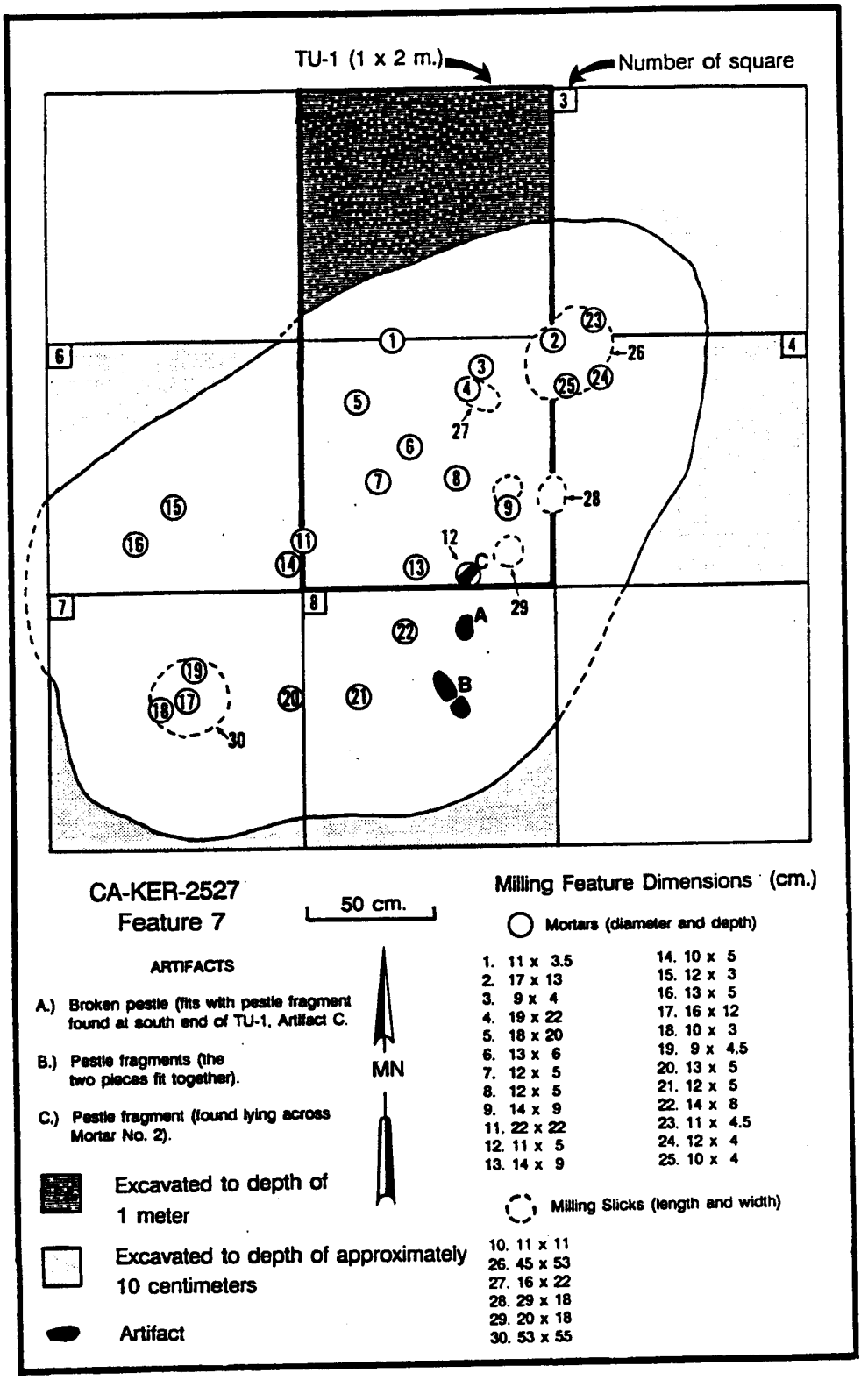


Fig. 32. Map of Feature 7 with associated excavations, CA-KER-2527.

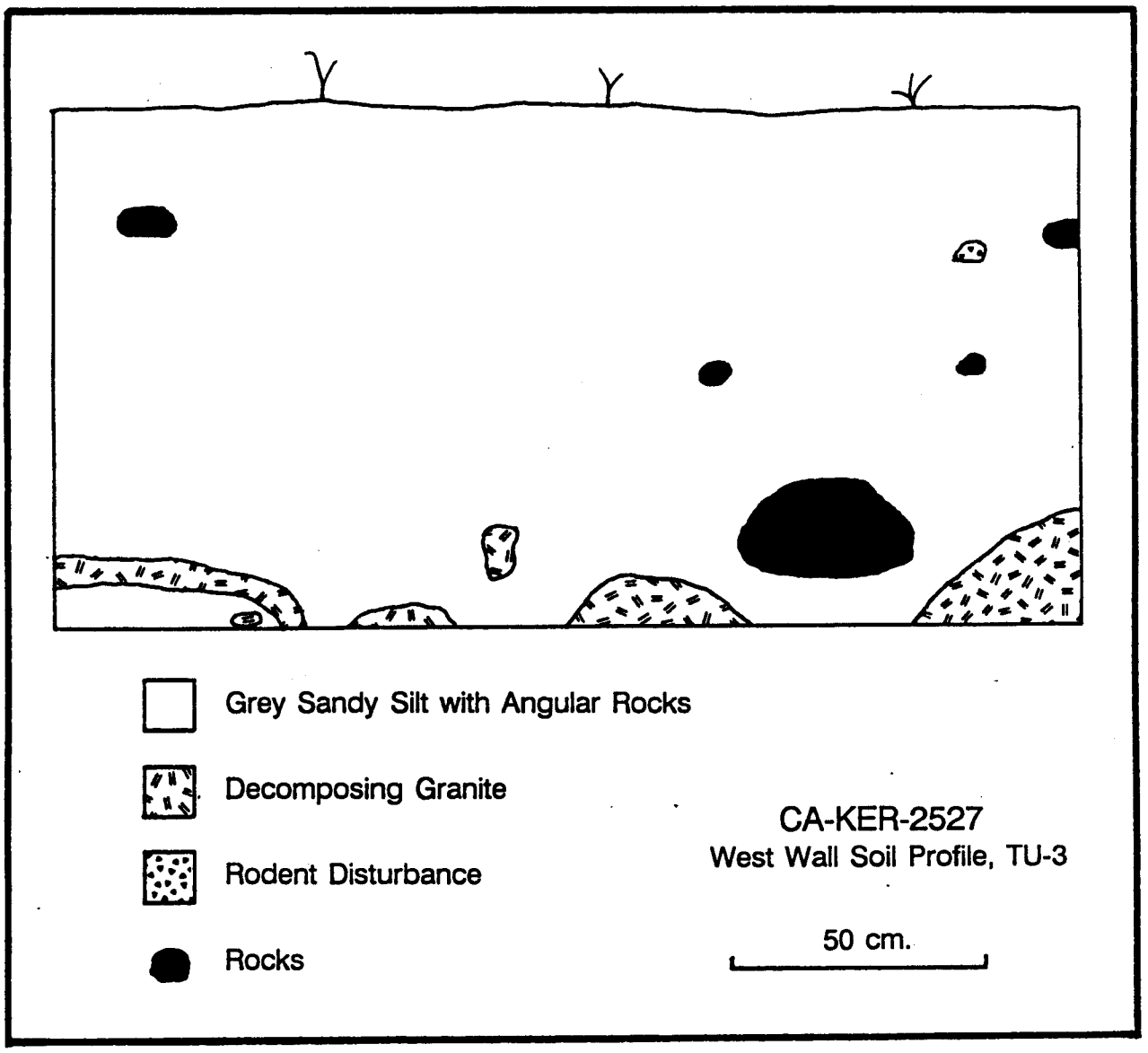


Fig. 33. Soil Profile of the West Wall of TU-3, CA-KER-2527.

Unidentified Ground Stone. Twenty fragments of ground stone that could not be identified as to form were recovered. The provenience and attributes of the unidentified ground stone are presented in Table 23.

Hammerstone. A single granitic hammerstone was found in the 40 to 50-cm. level of TU-1. The specimen (1-047) measures 79 x 57 x 47 mm. and weighs 283.5 g.

Flaked Stone

Rose Spring Series Projectile Point. An obsidian Rose Spring series projectile point (3-101; Fig. 38a) was found in the 90 to 100-cm. level of TU-3. It measures 21.5 x 18.2 x 3.7 mm. and weighs 1.43 g. The specimen is missing its tip. Rose Spring points date generally to the Sawtooth Phase.

Elko Series Projectile Point. An obsidian Elko series projectile point (3-066; Fig. 38b) was recovered from the 50 to 60-cm. level of TU-3. The specimen measures 49.4 x 36.2 x 6.4 mm. and weighs 7.92 g. Much of the base

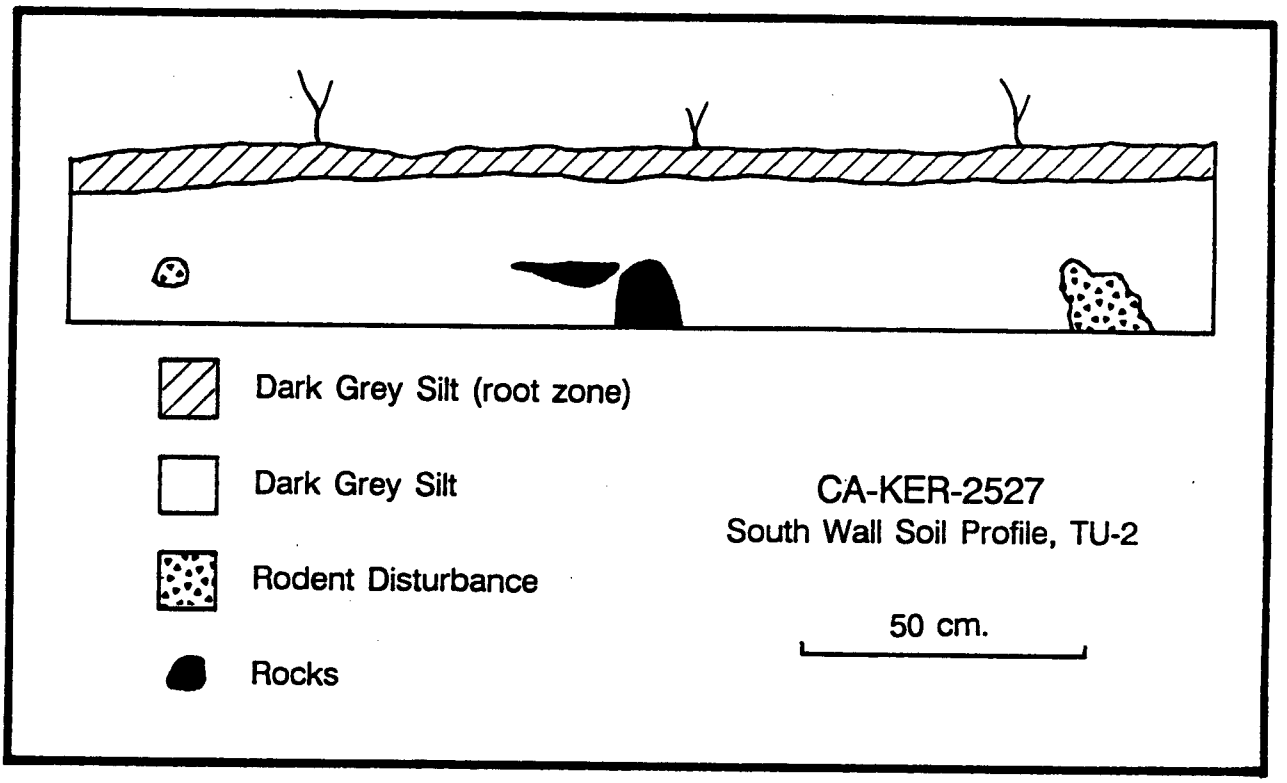


Fig. 34. Soil Profile of the South Wall of TU-2, CA-KER-2527.

is missing, likely broken during use. A portion of the tip had broken off, but the tip had been resharpened to make the point functional. Elko series points are temporal markers of the Canebrake Phase.

Biface Fragments. Three obsidian biface fragments were recovered, all in TU-3. Each appears to be a fragment of a projectile point but could not be classified with certainty. The first (3-026; 25.4 x 15.0 x 9.0 mm., 2,88 g.) came from the 20 to 30-cm. level. The second (3-048; Fig. 38c) measures 13.2 x 5.1 x 2.8 mm., weighs 0.60 g., and was found in the 40 to 50-cm. level. The third specimen (3-102; 13.0 x 13.5 x 6.9 mm., 0.80 g.) came from the 90 to 100-cm. level.

Debitage. A total of 311 pieces of debitage was recovered; 310 obsidian and one chalcedony. The chalcedony and 24 of the obsidian specimens came from the excavations above Feature 7 in the vicinity of TU-1. The remainder came from TU-1 and TU-3 (see Table 24). While the vast majority of the debitage from the test units came from TU-3, it is important to note that much of the volume of TU-1 was occupied by the presence of Feature 7.

Ornaments

Two classes of ornaments are represented at the site; incised slate and beads. Classification of the incised slate piece as an artifact is problematic. Three kinds of beads were found: glass, shell, and stone. Each category is discussed below.

Incised Slate. A fragment of slate was discovered in the 40 to 50-cm. level of TU-3 that contained a number of scratches or incisions on the surface. The specimen (3-052) measures 27.8 x 26.4 x 5.1 mm. and weighs 6.0 g. Although classified as incised slate, it is not certain that the piece is an artifact.

Glass Beads. Eight glass trade beads were found at the site, all within or near TU-1. The provenience and attributes of the glass beads are presented in Table 25 and several are illustrated in Figure 38. Each of the glass bead

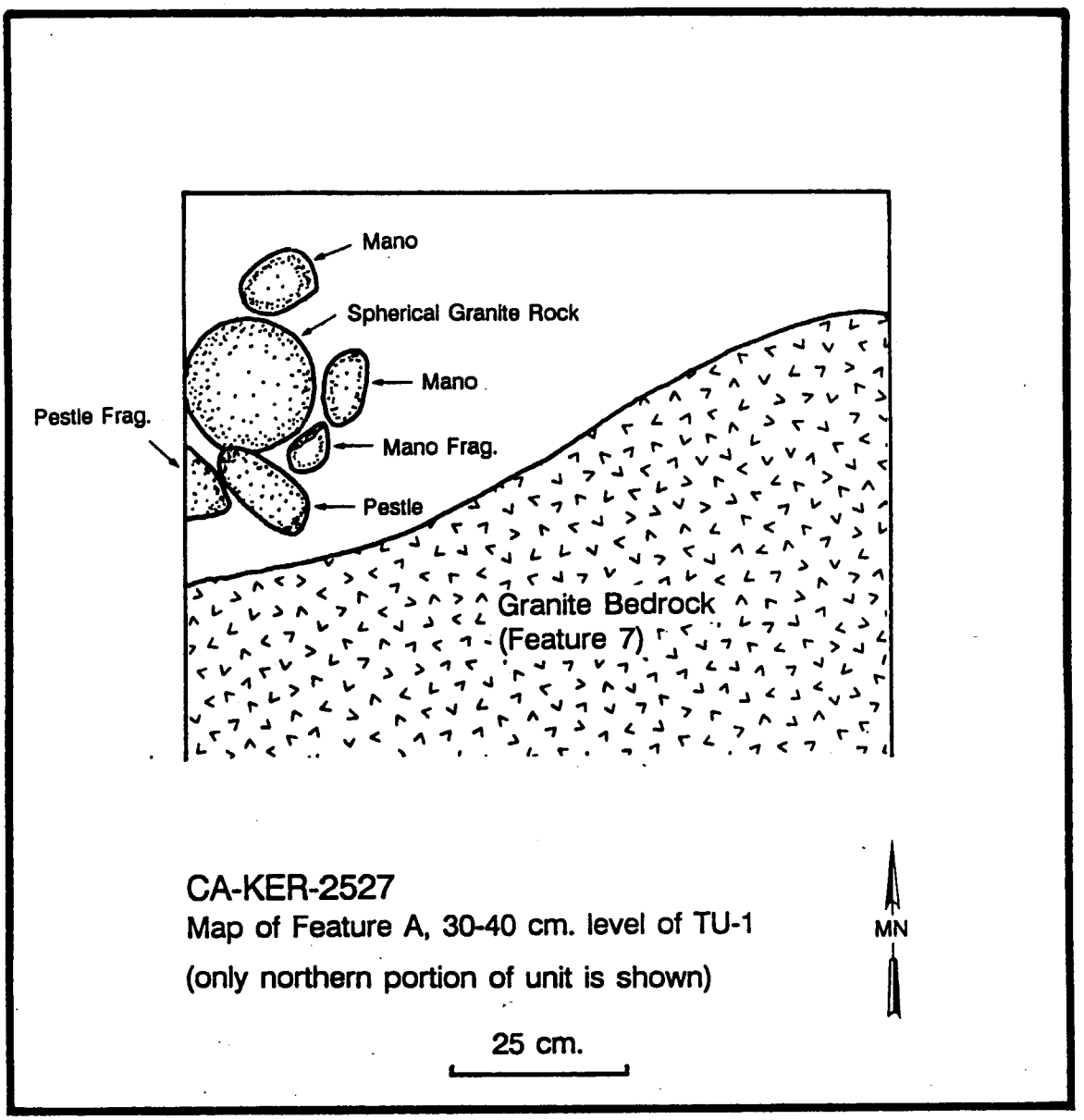


Fig. 35. Map of Feature A, 30-40 cm. level of TU-1, CA-KER-2527.

types described above date to the American Period, after 1840. This indicates the presence of a protohistoric component at the site.

Shell Bead. A single *Olivella biplicata* shell bead (3-050; Fig. 38f) was found in the 40 to 50-cm. level of TU-3. The bead is 11.5 mm. long, 10.9 mm. wide, 5.2 mm. thick, and has a punched perforation with a diameter of approximately 3.2 mm. This bead is classified as a D1a Shelved Punched bead following the typology of Bennyhoff and Hughes (1987:125). These beads are thought to date to the Middle/Late period transition (ca. 1,300 B.P.) in the San Joaquin Valley.

Stone Bead. One steatite bead (1-020) was found in the 10 to 20-cm. level of TU-1. It is 4.7 mm. in diameter, 2.8 mm. thick and has a perforation diameter of 2.7. The direction of the original hole drilling could not be

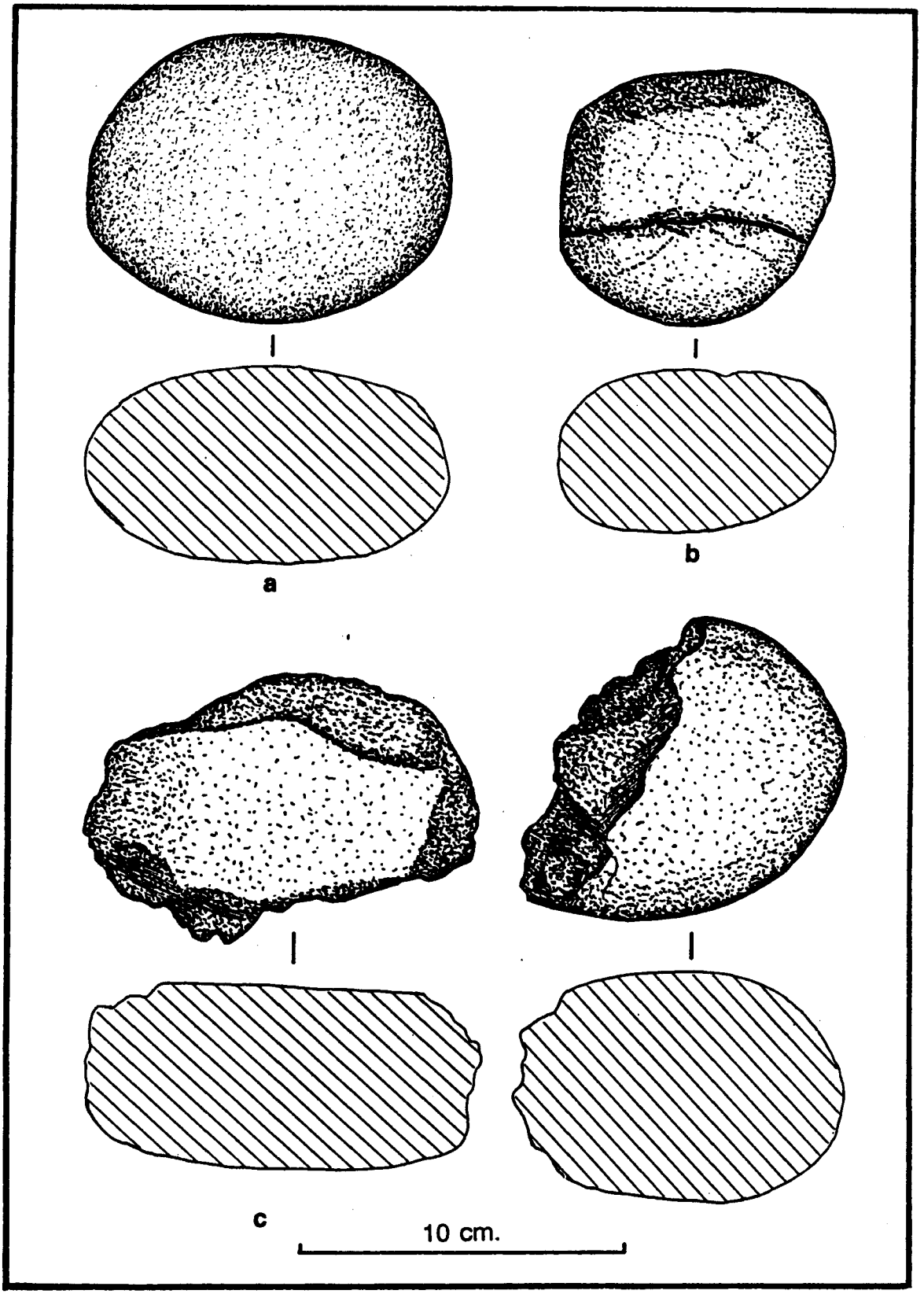


Fig. 36. Manos from CA-KER-2527: a) 1-052; b) 3-059; c) 1-101; d) 3-038.

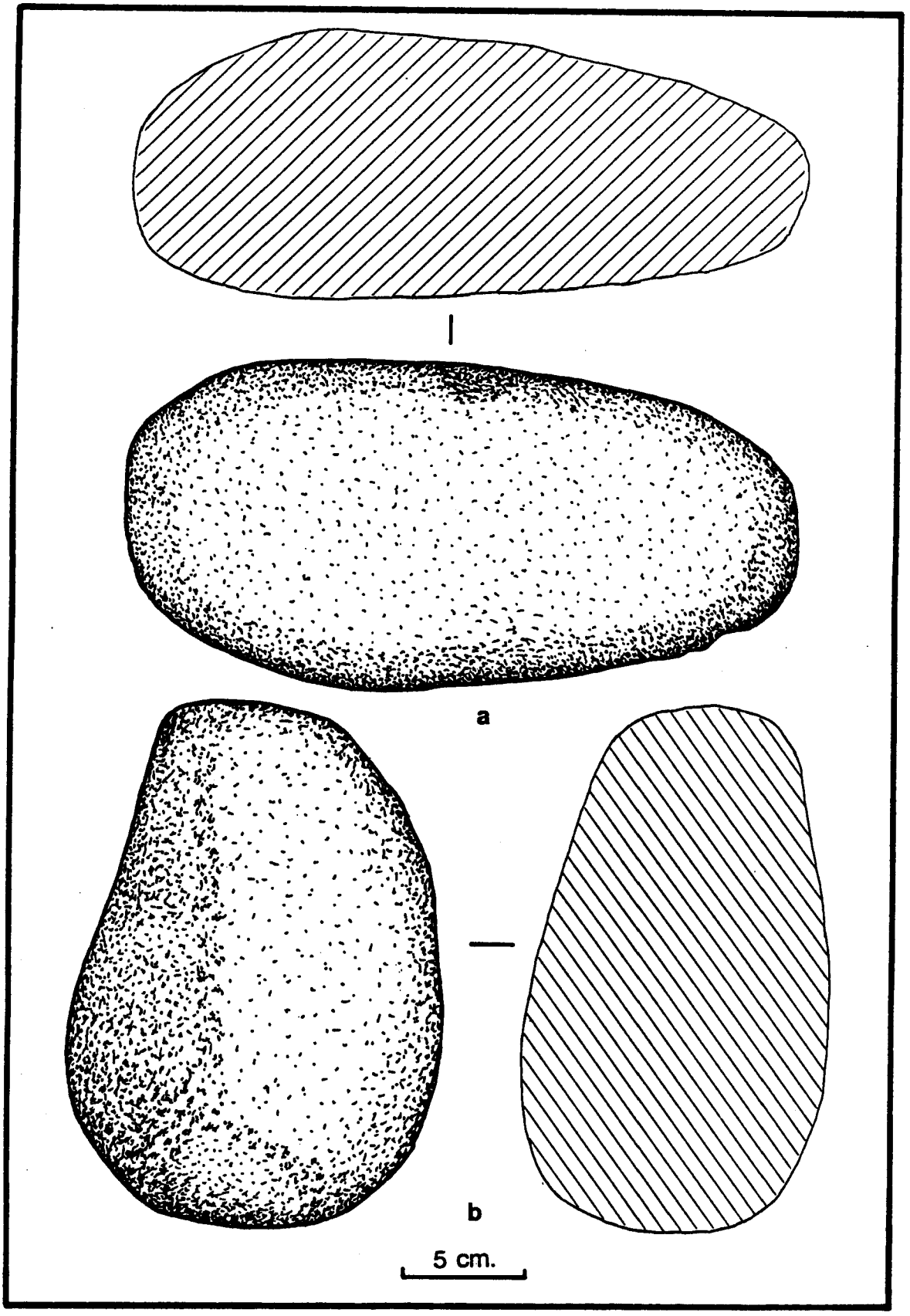


Fig. 37. Pestles from CA-KER-2527: a) 1-105; b) 3-084.

Table 20
SUMMARY OF ARTIFACTS RECOVERED FROM CA-KER-2527 (SURFACE AND ALL TEST UNITS)

Artifact	Depth (cm.)											
	Surf.	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Totals
manos	–	–	1	2	2	2	–	–	–	–	–	7
mano fragments	3	1	2	1	1	3	3	1	1	–	–	16
metate fragment	1	–	–	–	–	–	–	–	–	–	–	1
pestle	–	–	–	–	–	–	–	1	–	–	–	1
pestle fragments	1	1	–	2	2	–	1	–	–	–	–	7
unidentified ground stone	4	3	2	3	3	3	2	1	1	–	–	22
hammerstone	–	–	–	–	–	1	–	–	–	–	–	1
Rose Spring point	–	–	–	–	–	–	–	–	–	–	1	1
Elko point	–	–	–	–	–	–	1	–	–	–	–	1
biface fragments	–	–	1	–	–	1	–	–	–	1	–	3
debitage	25	57	37	12	21	26	53	20	33	17	10	311
incised slate	–	–	–	–	–	1	–	–	–	–	–	1
glass beads	7	1	–	–	–	–	–	–	–	–	–	8
shell bead	–	–	–	–	–	1	–	–	–	–	–	1
stone bead	–	–	1	–	–	–	–	–	–	–	–	1
Totals	41	63	44	20	29	38	60	23	35	18	11	382
historic[1]	[23	24	34	–	–	1	1	–	–	–	–	83]

[1] historic materials not included in totals

determined. One side of the perforation exhibited wear indicative of cordage rubbing against the stone. It is believed that this indicates a late date for the site.

FAUNAL REMAINS

The faunal materials recovered from the site consisted of 444 vertebrate specimens of six taxa, plus two taxa of shellfish (totaling 5.19 g.) An analysis of the recovered faunal remains is presented in Fenenga (1994; this volume).

OBSIDIAN STUDIES

Nine flakes were submitted for sourcing and hydration analyses (Table 26), however, three of the specimens were too small for hydration measurement. The hydration rinds range from 5.4 to 10.0 microns.

DATING

The site is dated on the basis of temporally sensitive artifacts and obsidian hydration measurements. The temporally sensitive artifacts include Elko (but see Flenniken and Wilke [1989] and Wilke and Flenniken [1990] for a cautionary note) and Rose Spring series projectile points, a D1a *Olivella* bead, glass trade beads, and (perhaps) the stone bead. These data indicate that the site was occupied from sometime in the Canebrake Phase (ca. 3,200 to 1,350 B.P.) to the protohistoric, after 1840. The obsidian data generally support this conclusion but some earlier occupation may be indicated (e.g., the 10.0 micron reading).

Table 21
PROVENIENCE AND ATTRIBUTES OF MANOS, CA-KER-2527

Cat. No.	Provenience	Material	Form[1]	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
COMPLETE								
1-103	TU-1, 30-40	granite	USh	108	76	58	653.2	
1-045	TU-1, 40-50	granite	U	116	91	71	992.2	
1-052	TU-1, 50-60	granite	BSh	100	89	56	491.1	36a
3-028	TU-3, 20-30	granite	T	105	79	58	583.0	
3-059	TU-3, 40-50	granite	B	86	74	51	504.8	36b
3-076	TU-3, 50-60	granite	U	89	71	51	431.4	
FRAGMENTS								
1-074	surface[2]	granite	B	88	58	33	214.3	
1-083	surface	granite	U	92	61	54	423.5	
1-101	surface	granite	B	113	70	50	624.8	36c
1-061	TU-1, 0-10[3]	granite	U	72	70	34	117.9	
1-015	TU-1, 10-20	granite	B	66	66	52	333.9	
1-029	TU-1, 20-30	granite	Sh	112	57	31	228.3	
1-030	TU-1, 20-30	granite	–	81	56	51	332.7	
1-046	TU-1, 40-50	granite	–	89	56	53	286.8	
1-051	TU-1, 50-60	granite	–	93	66	34	321.8	
1-057	TU-1, 60-70	granite	B	100	77	74	763.3	
3-021	TU-3, 10-20	granite	BSh	79	61	54	334.4	
3-027	TU-3, 20-30	granite	BSh	77	49	51	243.9	
3-038	TU-3, 30-40	granite	–	79	46	53	221.5	36d
3-055	TU-3, 40-50	granite	BSh	76	68	53	271.5	
3-058	TU-3, 40-50	granite	B	97	69	46	278.1	
3-068	TU-3, 50-60	granite	–	51	46	38	76.1	
3-073	TU-3, 50-60	granite	BSh	93	69	50	425.3	
3-091	TU-3, 70-80	granite	B	59	36	28	77.5	

[1] U = uniface; B = biface; T = triface; Sh = shaped
[2] surface in the vicinity of TU-1
[3] TU-1, Square 3

INTERPRETATIONS

Milling was an important function at the site, as evidenced by the numerous milling features and ground stone artifacts. In addition to the milling tools, a variety of other artifact types was recovered at the site indicative of additional activities, such as short-term habitation.

The CA-KER-2527 site is interpreted as a temporary camp associated with the processing (milling) of certain resources. At least two components are evident, a prehistoric and a protohistoric. Thus, the site is a part of at least one, and perhaps two, as-yet unknown settlement-subsistence systems.

Table 22
PROVENIENCE AND ATTRIBUTES[1] OF PESTLES, CA-KER-2527

Cat. No.	Provenience	Material	Form[1]	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)	Fig.
COMPLETE								
1-105	TU-1, 30-40	granite	B	240	124	101	4,835.0	37a
3-084	TU-3, 60-70	granite	B	186	140	101	4,000.5	37b
FRAGMENTS								
1-098	TU-1, Sq. 1, 0-10	granite	--	150	111	63	1,669.2	
1-099	TU-1, Sq. 1, 0-10	granite	--	155	125	77	1,754.1	
1-100	TU-1, Sq. 1, 0-10	granite	--	145	116	81	1,934.6	
1-001	TU-1, Sq. 1, 0-10	granite	--	144	83	66	1,098.1	
1-038	TU-1, 30-40	granite	--	106	89	63	905.5	
1-039	TU-1, 30-40	granite	--	101	68	48	362.7	
1-104	TU-1, 30-40	granite	--	71	51	60	303.1	
3-025	TU-3, 20-30	granite	--	74	84	51	368.6	

[1] B = mano-like wear on two surfaces

Research Questions

The Role of the Site in Trade. The presence of a number of known trade items (obsidian and glass beads) presents an opportunity to investigate the relationship between the CA-KER-2527 site and other sites in the region (e.g., CA-KER-405). Being located on the Kern River (and assuming this as a main trade route), the inhabitants of CA-KER-2527 may have been involved in a trade network serving peoples away from the river, on less active trade routes. In addition, there is the potential of investigating changing trade patterns, perhaps an effect of Euroamerican contact on those patterns.

Regional Settlement Patterns. If the CA-KER-2527 site is a camp, it likely is associated with a larger site, perhaps a village (perhaps even CA-KER-405). Linking CA-KER-2527 with other surrounding sites may provide a picture of regional settlement patterns, and how those patterns may have changed over time. Data important to this question would include trade items, ecofacts, lithic sources, and material culture.

Table 23
PROVENIENCE AND ATTRIBUTES OF UNIDENTIFIED GROUND STONE, CA-KER-2527

Cat. No.	Provenience	Material	Length (mm.)	Width (mm.)	Thickness (mm.)	Weight (g.)
1-077	surface[1]	granitic	48	39	27	48.6
1-062	TU-1, 0-10[2]	granitic	77	41	28	68.8
1-002	TU-1, 0-10	granitic	49	47	33	73.8
1-003	TU-1, 0-10	granitic	79	43	30	84.3
1-022	TU-1, 10-20	granitic	53	51	35	98.4
1-031	TU-1, 20-30	granitic	113	85	77	1,126.0
1-036	TU-1, 30-40	granitic	59	51	43	155.0
1-037	TU-1, 30-40	granitic	79	63	37	171.3
S-001	surface[3]	granitic	61	49	55	181.8
3-009	TU-3, 0-10	granitic	25	19	15	8.5
3-014	TU-3, 0-10	granitic	49	38	29	72.8
3-044	TU-3, 0-10	granitic	71	59	51	326.6
3-037	TU-3, 30-40	granitic	102	99	64	652.9
3-039	TU-3, 30-40	granitic	80	72	51	257.7
3-040	TU-3, 30-40	granitic	99	69	38	257.7
3-054	TU-3, 40-50	granitic	72	59	43	217.8
3-056	TU-3, 40-50	granitic	73	63	47	189.9
3-057	TU-3, 40-50	granitic	79	69	66	444.4
3-060	TU-3, 40-50	granitic	73	41	38	147.4
3-074	TU-3, 50-60	granitic	94	85	48	559.1

[1] surface, TU-1, Square 6; [2] TU-1, Square 3; [3] surface in the vicinity of TU-3

ACKNOWLEDGEMENTS

This paper is a revision of a report originally prepared under contract to Southern California Edison (SCE), and we thank Tom Taylor of SCE for his help in providing maps, information, understanding, and encouragement. Portions of the project transmission line crossed public lands administered by Sequoia National Forest and the Bureau of Land Management (BLM). We thank Linda Brett of the Sequoia National Forest and Duane Christian of the BLM for their assistance and cooperation.

The crew consisted of Greg Clift, Dorothy Fleagle, G. D. Everson, Juanita Garcia, Don McGeein, Robin Novickas, Missy Peterson, Catherine Lewis Pruett, Kathy Ptomey, Steven Ptomey, Jack Scott, Mark Q. Sutton, and Lori Wear. Francis A. Riddell and Scott Jackson served as crew chiefs. Ken Gobelet identified the fish bone and Gerrit Fenenga conducted the faunal analysis (Fenenga 1994; this volume). Robin Novickas produced Figures 9, 11, and 38; Greg Clift drew Figures 10, 18, 27, 36, and 37; and Missy Peterson drew Figures 19, 23, and 28. Paul Bouey conducted the obsidian sourcing and Janet Scalise did the obsidian hydration analyses. Gerrit Fenenga, Glenda Fenenga, Jill Gardner, Robert E. Parr, and Thomas T. Taylor provided useful comments on a draft of this paper.

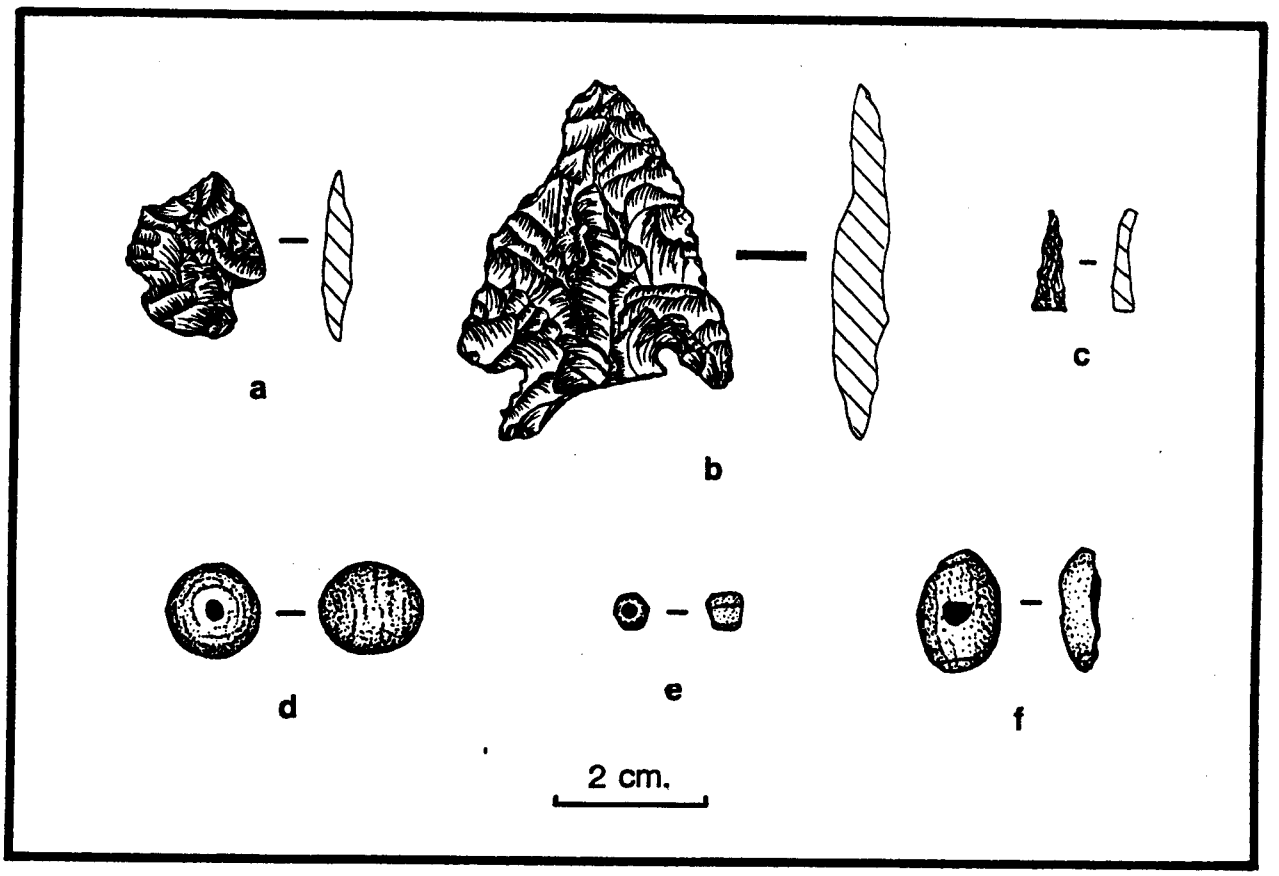


Fig. 38. Artifacts (flaked stone and beads) from CA-KER-2527: a) Rose Spring series projectile point (3-101); b) Elko series projectile point (3-066); c) obsidian biface tip (3-048); d) glass trade bead (1-065); e) glass trade bead (1-093); f) D1a *Olivella* shell bead (3-050).

Table 24
DISTRIBUTION OF OBSIDIAN DEBITAGE IN TUS 1 AND 3 BY LEVEL, CA-KER-2527

Level (cm.)	TU-1	TU-2	Totals
0-10	10	22	32
10-20	7	31	38
20-30	2	9	11
30-40	3	18	21
40-50	3	23	26
50-60	3	50	53
60-70	1	19	20
70-80	--	33	33
80-90	--	18	18
90-100	9	9	18
Totals	38	232	270

Table 25
PROVENIENCE AND ATTRIBUTES OF GLASS BEADS, CA-KER-2527

Cat. No.	Provenience	Length (mm.)	Diameter (mm.)	Perforation Diameter (mm.)	Description	Fig.
1-065	surface, near TU-1	14.0	13.0	2.5	spherical, creme-colored glass	38d
1-066	surface, near TU-1	14.0	13.0	2.9	spherical, creme-colored glass	
1-093	surface, near TU-1	4.0	5.0	2.0	blue hexagonal	38e
1-094	surface, near TU-1	3.0	4.0	2.5	blue hexagonal	
1-095	surface, near TU-1	4.0	4.5	2.0	blue hexagonal	
1-096	surface, near TU-1	3.1	4.8	1.0	red with white center	
S-002	surface, near TU-1	5.1	4.8	3.1	blue hexagonal	
1-001	TU-1, 0-10	4.0	4.0	2.8	blue hexagonal	

Table 26
RESULTS OF OBSIDIAN STUDIES, CA-KER-2527

Cat. No.	Provenience	Artifact Type	Lab No.[1]	Microns	Remarks	Source
1-005	TU-1, 0-10	flake	13859	7.5	--	Coso Volcanic Field
3-011	TU-3, 10-20	flake	13858	10.0	one side	Coso Volcanic Field
3-029	TU-3, 30-40	flake	13860	5.4	--	Coso Volcanic Field
3-070	TU-3, 50-60	flake	13861	6.3	--	Coso Volcanic Field
3-089	TU-3, 70-80	flake	13862	7.6	--	Coso Volcanic Field
3-100	TU-3, 90-100	flake	13863	6.6	--	Coso Volcanic Field

[1] UCLA Obsidian Hydration Lab Number

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FAUNAL REMAINS FROM FOUR ARCHAEOLOGICAL SITES IN THE SOUTHERN SIERRA FOOTHILLS OF KERN COUNTY, CALIFORNIA

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INTRODUCTION

This report describes the faunal remains recovered from test excavations at a series of sites in the foothills of the southern Sierra Nevada. This work was done as part of an environmental assessment and is reported by (Sutton et al. 1994; this volume). Faunal remains were collected from four of the seven tested archaeological sites. Test excavations were conducted in one by two meter square units and ten centimeter deep arbitrary levels. All soil was screened through 1/8-in. mesh hardware cloth. The collection includes 1,764 animal bones and fragments of shell from three different species of mollusk.

The present study represents only a preliminary assessment of the faunal assemblages found in these sites. It is intended to present quantified data concerning the occurrence and distribution of faunal remains within each of the sites. This information may be used in subsequent interpretive studies of these or other regional archaeological sites.

ANALYTICAL METHODS

The fauna were generally analyzed using conventional methods (Chaplin 1971; Klein and Cruz-Uribe 1985; Ziegler 1973). Bone and shell were quantified by number and/or weight for each excavation unit and level. Faunal taxa were identified using comparative collections and accepted species descriptions (Hall and Kelson 1959; Ingles 1965; Jameson and Peeters 1988). Identified species were quantified using standardized techniques for calculating minimum numbers of individuals (MNI) and number of identified specimens (NISP; cf. Klein and Cruz-Uribe 1985).

The procedure followed in the quantification of bone included sorting and tabulating the total pieces of bone present, the total weight of bone, the total pieces and the total weight of burned bone, and the number of identified pieces for each level. The only departure from this was in the case of one unit from one site (CA-KER-2520) in which the burned bone was counted but not weighed. Shell was quantified by weight only for each site due to the fact it fragments so easily and much of it was represented by many small pieces. No attempt was made to identify numbers of individual mollusks, although this could have been done with the bivalves by counting numbers of hinges and dividing the total in half. Shellfish remains, although present in each site, constitute only a minor fraction of the fauna and no more than one to a few individuals are represented in any instance. Fish bone was identified to the nearest taxon by Ken Gobalet.

RESULTS

The faunal sample for each of the sites is relatively small and represents only one or two localized areas within each of the studied sites. For this reason, the resulting data are limited in their applications. Although not statistically meaningful for many important theoretical research problems, they are useful for some purposes. These data provide a minimal baseline for understanding the nature of fauna as a constituent of the archaeological record of each of the sites in question. The species list for each site may not entirely represent the site as a whole, but does tell us something about the range and kinds of species present in the tested area. The mere presence of osteological remains or shellfish may provide some information about site usage and/or site formation processes. These, and other classes of data, can be interrelated to judge the relative importance of each site for further research.

Kern County Archaeological Society Journal 5:86-104 (1994).

Study of the faunal data was primarily directed toward resolving several fundamental questions about each of the sites. These involved how much bone and shell are present and what is the nature of this material in terms of condition and species representation. Analytical techniques included measuring the relative magnitude or quantity of fauna represented in each of the samples, assessing the amount of that quantity that could be identified, determining the relative amounts of burned to unburned bone, and identifying and quantifying faunal species. The results of the analyses are summarized in tables 1 through 24.

FAUNAL REMAINS FROM CA-KER-405

Three test units were excavated at CA-KER-405. Depth of the cultural deposits varied from 40 cm. to 140 cm. below surface. Both bones and shell occurred throughout the tested areas. A total of 188 pieces of bone was recovered from 4.80 cubic meters of soil excavated at this site. In addition, 40.45 grams of shell were collected. Faunal data relating to CA-KER-405 are summarized in tables 2-9.

Eleven different species of vertebrate fauna and three species of shellfish are present in the identified portion of the faunal remains (see tables 2, 5, and 7). Only 36 of the bones were identified to taxon, but this amounts to about 19% of the recovered bone. This figure is higher than that for any of the other sites and may be related to the presence of several nonindigenous taxa. At least three domesticated species and an introduced species of shellfish are included. These probably are derived from historic mining activities in the immediate vicinity. Although there is documented evidence the Yokuts had chickens (*Gallus gallus*) at least as early as 1819 (Gayton 1936:75-76), the cross-sawn cowbone (*Bos taurus*) and house cat (*Felis cattus*) remains found at this site undoubtedly date to relatively modern times.

The animal most abundantly represented in terms of numbers of identified elements at CA-KER-405 is the Pacific pond turtle (*Clemmys marmorata*). Curiously, this taxon is absent from each of the other sampled sites. Rodents make up the largest portion (41%) of the identified vertebrate remains in terms of minimum numbers of individuals. Data pertaining to the frequencies of other taxa are presented in Table 2.

This site has the highest proportion of burned bone of any of the sites investigated in this study. Approximately 32% of the bone by count and 21% of the bone by weight has been burned. These figures greatly exceed those of other sites, except CA-KER-2527 that has a comparable amount of burned bone by weight but not by count. The reasons for this pattern are unclear. CA-KER-405 has the second smallest bone frequency index of the tested sites, with only 39.17 pieces per cubic meter. It has the lowest proportion of identified osteological remains per cubic meter, only 7.29. On the other hand, it tends to have the largest pieces of bone on average. This can be determined by dividing the weight of bone recovered per cubic meter by the total of pieces per cubic meter. At CA-KER-405, this produces an index of 0.91, nearly three times the figure determined for any other site.

Three test units were excavated at CA-KER-405 and a certain amount of internal variability can be seen in comparing unit samples. Test Unit 3 produced only five pieces of bone, none of which were either burned or identifiable. It has the lowest frequency of bone pieces per cubic meter (4.17), but the second highest in weight per cubic meter (13.75 g.). Test Unit 1 produced the most bone by count (97 pieces) yet had the lowest amount of bone by weight per cubic meter (7.12 g.). Test Unit 2 had the highest frequencies of bone by count (107.50) and by weight (168.51 g.) per cubic meter, although it produced only the second highest amount of bone by absolute count (86 pieces). It did have the most bone by weight, however, with a total of 134.81 grams recovered. The magnitude of difference seen in bone weight between TU-2 and the other units is largely due to the presence of domesticated species including several large steak bones.

Proportions of identified remains were comparable between TU-1 (18% of total) and TU-2 (21% of total). However, TU-1 had more than twice as much burned bone with 44% by count compared to 20% and 49% by weight compared to 19%. Overall, 19% of the bone at CA-KER-405 was identified, 32% of the total count was burned, and 21% of the bone by weight was burned.

Table 1
INTER-SITE BONE FREQUENCY COMPARISONS

	KER-405	KER-2517	KER-2520	KER-2527
Total Pieces of Bone	188	26	1,497	444
Total Weight of Bone	171.25	9.89	209.25	80.74
Frequency Index[1]	39.17	26	748.50	111
Concentration Index[2]	35.68	9.89	104.63	40.37
Size Index[3]	0.91	0.38	0.14	0.35
% of Bone Total Burned	32	8	14	19
% of Bone Weight Burned	21	3	0	20
Total Identified Bones	36	3	140	35
% of Bone Identified	19	12	9	8

[1] total pieces divided by unit volume; [2] total weight divided by unit volume; [3] bone concentration index divided by bone frequency index

Table 2
VERTEBRATE SPECIES REPRESENTED AT CA-KER-405

Taxon	NISP[1]	%of Toal NISP	MNI[2]	%of Total MNI
CLASS OSTEICHTHYES				
Centarchidae				
Archoplites interruptus[3]	1	2.77	1	5.88
CLASS REPTILIA				
Order Testudines				
Clemmys marmorata	8	22.22	1+	5.88
CLASS AVES				
Order Galliformes				
Gallus gallus	3	8.33	2	11.11
CLASS MAMMAILA				
Order Lagomorpha				
Sylvilagus audubonii	4	11.11	1	5.88
Lepus californicus	1	2.77	1	5.88
Order Rodentia				
Spermophilus beechyii	4	11.11	2	11.11
Neotoma sp.	3	8.33	1	5.88
unident. rodent	4	11.11	4	23.52
Order Carnivora				
Taxidea taxis	1	2.77	1	5.88
Felis cattus	1	2.77	1	5.88
Lynx rufus	2	5.55	1	5.88
Order Artiodactyla				
Bos taurus	4	11.11	1+	5.88
Totals	36	100	17+	100

[1] number of identified specimens; [2] minimum number of individuals; [3] if prehistoric

Table 3
BONE FREQUENCY IN TU-1, CA-KER-405

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%	Weight Burned (g.)	%
0-10	1	1.08	0.10	0.50	0	0.00	1	2.33	0.10	1.02
10-20	12	12.90	1.31	6.67	1	5.88	8	18.60	0.80	8.12
20-30	8	8.60	0.71	3.56	1	5.88	4	9.30	0.31	3.15
30-40	6	6.45	1.91	9.58	0	0.00	3	6.98	0.84	8.53
40-50	11	11.83	3.22	16.15	1	5.88	4	9.30	0.88	8.93
50-60	14	15.05	4.70	23.57	5	29.41	6	13.95	2.37	24.06
60-70	8	8.60	1.21	6.07	1	5.88	5	11.63	0.83	8.43
70-80	14	15.05	3.90	19.56	2	11.76	6	13.95	2.48	25.18
80-90	5	8.60	1.56	7.82	1	5.88	2	4.65	0.54	5.48
90-100	2	2.15	0.12	0.60	1	5.88	0	0.00	0.00	0.00
100-110	4	4.30	0.55	2.76	2	11.76	2	4.65	0.24	2.34
110-120	3	3.23	0.06	0.30	1	5.88	0	0.00	0.00	0.00
120-130	5	5.38	0.59	2.96	1	5.88	2	4.65	0.24	4.77
Total	93	100	19.94	100	17	100	43	100	9.85	100

Table 4
BONE FREQUENCY IN TU-2, CA-KER-405

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%	Weight Burned (g.)	%
0-10	29	33.72	70.14	52.03	8	50.00	4	23.53	16.75	65.92
10-20	19	22.09	3.63	2.69	2	12.50	3	17.65	1.09	4.29
20-30	31	36.05	53.76	39.88	6	37.50	4	23.53	1.47	5.79
30-40	7	8.14	7.28	5.40	0	0.00	6	35.29	6.10	24.01
Total	86	100	134.81	100	16	100	17	100	25.41	100

Table 5
SHELL FREQUENCY IN TU-2, CA-KER-405

Level (cm.)	Taxon	Total Weight (g.)	% of Total
0-10	*Corbicula*	6.12	43.19
0-10	*Helmineglypha*	0.26	1.83
0-10	*Margaratifera*	0.12	0.85
10-20	*Margaratifera*	0.64	4.52
20-30	*Margaratifera*	0.34	2.40
30-40	*Margaratifera*	0.19	1.34
Totals		14.17	100

Table 6
BONE FREQUENCY IN TU-3, CA-KER-405

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%
0-10	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-20	2	40.00	13.25	80.03	0.00	0.00	0.00	0.00
20-30	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30-40	1	20.00	0.65	3.94	0.00	0.00	0.00	0.00
40-50	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-60	2	40.00	2.60	15.76	0.00	0.00	0.00	0.00
Total	5	100	16.50	100	0.00	0.00	0.00	0.00

Table 7
SHELL FREQUENCY IN TU-3, CA-KER-405

Level (cm.)	Taxon	Total Weight (g.)	% of Total
0-10	–	–	–
10-20	*Margaratifera*	0.11	4.14
20-30	*Margaratifera*	0.57	21.43
30-40	*Margaratifera*	1.35	50.75
40-50	–	–	–
50-60	*Margaratifera*	0.10	3.76
60-70	*Margaratifera*	0.53	19.92
Totals		2.66	100

Table 8
IDENTIFIED ELEMENTS IN TU-1, CA-KER-405

Level (cm.)	Element	Portion	Side	Taxon	Remarks
10-20	carapace/plastron	–	–	*Clemmys*	–
20-30	calcaneous	caudal	right	*Sylvilagus*	–
40-50	carapace/plastron	–	–	*Clemmys*	–
50-60	carapace/plastron	–	–	*Clemmys*	–
	carapace/plastron	–	–	*Clemmys*	burned
	carapace/plastron	–	–	*Clemmys*	burned
	mandible	mid-section	left	*Neotoma*	with M/1
	auditory bulla	whole	right	*Spermophilus*	–
60-70	carapace/plastron	–	right	*Clemmys*	at rear leg
70-80	mandible	mid-section	right	*Sylvilagus*	–
	tibia	mid-section	right ?	*Lepus*	burned
80-90	carapace/plastron	–	–	*Clemmys*	–
90-100	humerus	distal mid-section	right	unident. rodent	immature
100-110	maxilla	mid-section	left	*Spermophilus*	–
	2nd metatarsal	proximal	right	*Sylvilagus*	–
110-120	humerus	distal	right	unident. rodent	–
120-130	humerus	distal	right	unident. rodent	–

Table 9
IDENTIFIED ELEMENTS IN TU-2, CA-KER-405

Level (cm.)	Element	Portion	Side	Taxon	Remarks
0-10	femur	mid-section	?	*Bos taurus*	6 pieces, cross-cut "round steak"
	femur	mid-section	right	cf. *G. gallus*	ends chewed off
	femur	mid-section	right	cf. *G. gallus*	ends chewed off
	femur	mid-section	right	cf. *G. gallus*	ends chewed off
	femur	distal ephysis	right	cf. *G. gallus*	ends chewed off
	innominate	mid-section	right	*Sylvilagus*	burned
	frontal	rostrum	both	*Spermophilus*	--
	cleithrum	whole	--	*Archoplites*	if prehistoric
10-20	innominate	mid-section	left	*Spermophilus*	--
	I/2	whole	left	cf. *Taxidea*	--
20-30	femur	mid-section	?	*Bos taurus*	5 pieces, beef "round steak"
	femur	distal	left	cf. *Lynx rufus*	--
	thorasic vert.	spinous process	--	cf. *Lynx rufus*	--
	carapace/plastron	fragment	right	*Clemmys*	burned
	tibia	distal	right	unident. rodent	*Dipotomys* ?
	M1/	whole	left	*Neotoma*	--

Three species of mollusks were found at CA-KER-405. These included the freshwater mussel (*Margaratifera margaratifera)*, a land snail (*Helminthaglyptha* sp.), and an introduced freshwater clam (*Corbicula* sp.). *Margaratifera* occurred in each test unit. The others were discovered only in TU-2. Shell was most abundant by weight in TU-1 (23.32 g.) and least abundant in TU-3 (2.66 g.). Test Unit 2 contained 14.17 grams. However, when factored by excavated unit volume, TU-2 produced the most shell (17.71 g. per cubic meter), TU-1 the next most (8.33 g.), and TU-3 the least amount (2.22 g.).

Given the small sample and potential interpretive complexities associated with segregating the prehistoric from historic and cultural from naturally occurring bone at CA-KER-405, it is difficult to make any conclusive statements regarding aboriginal dietary practices, butchery patterns, or other behavioral inferences. The use of small mammals, especially rabbits, hares, and ground squirrels, does seem to be suggested by the available data. It also seems evident that riverine resources were important including turtles and shellfish. This pattern is not unexpected in a site located adjacent to the Kern River. Curiously, the fish remains from this site were identified as Sacramento perch (*Archoplites interruptus*), a species preferring lacustrine habitats. This implies that the specimen was obtained in the valley and transported here, perhaps in dried form.

It is apparent that this site contains at least two different temporal and cultural components. The age and nature of the historic use of the site are not precisely known. The presence of nearby mining activities may very likely account for the presence of domesticated fauna at CA-KER-405. Possibly the site was used as a campsite by miners since it was adjacent to the Kern River that provided water for cooking and bathing and so on.

FAUNAL REMAINS FROM CA-KER-2517

A single excavation unit was excavated at this site. It was 50-cm. in depth and amounted to a sample of 1.00 cubic meter of the cultural deposit. A total of 26 bones and 72.0 grams of shell was recovered. Data relating to the fauna recovered from CA-KER-2517 are presented in tables 10-13.

Only three of the bones were identifiable to taxon and three species are represented. The freshwater mussel Margaratifera margaratifera is the only shellfish species present in the sample. Vertebrate taxa include deer (*Odocoileus hemionus*), jackrabbit (*Lepus californicus*), and the pocket gopher (*Thomomys bottae*). The overall sample is so small that these three identified bones account for 12% of the total.

Table 10
VERTEBRATE SPECIES REPRESENTED AT CA-KER-2517

Taxon	NISP[1]	%of Toal NISP	MNI[2]	%of Total MNI
CLASS MAMMAILA				
Order Lagomorpha				
Lepus californicus	1	33.33	1	33.33
Order Rodentia				
Thyomomys bottae	1	33.33	1	33.33
Order Artiodactyla				
Odocoileus hemionus	1	33.33	1	33.33
Totals	3	100	3	100

[1] number of identified specimens
[2] minimum number of individuals

Table 11
BONE FREQUENCY IN TU-1, CA-KER-2517

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%	Weight Burned (g.)	%
0-10	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
10-20	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
20-30	4	15.38	0.92	15.38	0.90	9.30	0	0.00	0.00	0.00
30-40	18	69.23	7.42	69.23	7.42	75.03	2	100	0.31	100
40-50	4	15.38	1.55	15.38	1.55	15.67	0	0.00	0.00	0.00
Total	26	100	9.89	100	9.89	100	2	100	0.31	100

Table 12
SHELL FREQUENCY IN TU-1, CA-KER-2517

Level (cm.)	Taxon	Total Weight (g.)	% of Total
0-10	*Margaratifera*	0.38	52.78
10-20	--	--	--
20-30	--	--	--
30-40	*Margaratifera*	0.12	16.67
40-50	*Margaratifera*	0.22	30.56
Totals		0.72	100

Table 13
IDENTIFIED ELEMENTS IN TU-1, CA-KER-2517

Level (cm.)	Element	Portion	Side	Taxon	Remarks
20-30	humerus	distal	left	*Lepus*	--
30-40	mandible	mid-section	left	*Thomomys*	--
	metapodial ?	proximal	?	*Odocoileus* ?	frag. of prox. end

CA-KER-2517 contained the lowest frequency of burned bone of any of the tested sites. In terms of numbers, 8% of the bone was burned. By weight, only 3% was burned. Bone concentration indices for this site are also the lowest of any of the sampled sites. These were calculated to be 26 pieces of bone per cubic meter or 9.89 grams of bone per cubic meter. The average size of bone from this site was the second largest of the tested sites, although thisfigure (0.38 g.) falls into the middle of the range expressed by all four sites and is quite close to that calculated for CA-KER-2527 (0.35 g.).

The small sample of fauna recovered from this site precludes any assessment of aboriginal behavioral patterns relating to diet, land use, or other aspects of the procurement and utilization of animals.

FAUNAL REMAINS FROM CA-KER-2520

A single one meter deep test unit was excavated at CA-KER-2520. This constituted a sample of two cubic meters of the deposit. A total of 1,497 pieces of bone and 4.41 grams of shell was collected. The faunal data from CA-KER-2520 are summarized in tables 14-17.

Thirteen vertebrate and two invertebrate species are represented in the identified sample (see Table 14). This represents the greatest amount of species diversity observed in any of the tested sites. Rodents made up the majority (59.40%) of the identified assemblage as measured by minimum numbers of individuals. Lagomorphs were next in frequency comprising another 12.51%. Together these small mammals accounted for about 72% of the identified fauna. Carnivore remains (*Canis* sp.) amounted to 9.38% and bird and identified fish species each represented 3.13% of the MNIs. In absolute numbers, the most common species was the California ground squirrel (*Spermophilus beecheyii*) that comprised about 33% of the NISPs. Next, most abundant were brush rabbit remains (21.43% of the NISPs). All other species are represented by figures of less than 9% of the total.

A total of 140 of the 1,497 bones from this site was identified. This amounts to roughly 9% of the sample. This figure is comparable to that derived for CA-KER-2527 (8%) but is considerably lower than identified percentages noted at the other two investigated sites (19% at CA-KER-405 and 12% at CA-KER-2517). This is probably related to the relative size of the samples involved and to the absence of domesticated species.

Approximately 14% of the bone from CA-KER-2520 was burned. This was measured by total pieces of bone only at this site. This figure is close to that of CA-KER-2527 (19%) and falls between the 32% noted for CA-KER-405 and 8% at CA-KER-2517.

In addition to having the largest number of bones (N = 1,497), the greatest amount of bone by weight (209.25 g.), the largest number of identified elements in terms of NISPs (140) and MNIs (32), this site also had the most bone recovered per cubic meter. Bone concentration indices calculated for CA-KER-2520 were 748 pieces and 104.63 grams of bone per cubic meter. Identified remains also occurred in high frequencies with a total of 61.50 identified bones per cubic meter. This figure compares to numbers falling between seven and nine at other tested sites. None of the other sites is close to CA-KER-2520 in terms of the amount of bone factored by excavated volume. The closest is CA-KER-2527 which produced 111 pieces of bone per cubic meter. None of the other sites had more than 40 pieces. CA-KER-2527 is also closest when bone weight is measured with 40.37 grams per cubic meter. Again, however, this figure is quite far from the 104.63 grams recorded for CA-KER-2520.

The bone frequency and concentration figures are quite interesting from CA-KER-2520. Clearly this site is different from the other investigated sites, or that portion of this site that was tested is functionally distinct from areas sampled in the other sites. One additional measurement that distinguishes CA-KER-2520 from the other sites considered in this study is the relative size of bones or bone fragments. Calculations derived by dividing the bone concentration index by the bone frequency index produced a figure of 0.14 for this site. This means that bone occurs in relatively smaller pieces than at the other sites where this index ranges from 0.35 at CA-KER-2527 to 0.91 at CA-KER-405. These differences may be accounted for by various mechanisms including length of occupation, the presence of specialized activity areas within sites, food processing activities, the occurrence of natural (i.e. noncultural)

Table 14
VERTEBRATE SPECIES REPRESENTED AT CA-KER-2520

Taxon	NISP[1]	%of Total NISP	MNI[2]	%of Total MNI
CLASS OSTEICHTHYES				
Catostomus occidentalis	1	0.71	1	3.13
Family Cyprinidae				
cf. *Orthodon microlepidotus*	1	0.71	1	3.13
cf. *Lavinia exilicauda*	1	0.71	1	3.13
cf. *Pyycochelis grandis*	1	0.71	1	3.13
cf. *Mylopharodon conocephalus*	1	0.71	1	3.13
CLASS AVES				
Order Falconiformes				
species indeterminate	9	6.43	1	3.13
CLASS MAMMALIA				
Order Lagomorpha				
Sylvilagus audubonii	30	21.43	3	9.38
Lepus californicus	9	6.43	1	3.13
Order Rodentia				
Spermophilus beechyii	47	33.57	9	28.13
Thomomys bottae	12	8.57	3	9.38
Perognathus sp.	10	7.14	1	3.13
Neotoma sp.	1	0.71	1	3.13
Tamis sp.	4	2.86	2	6.45
unident. rodent	6	4.29	3	9.38
Order Carnivora				
Canis sp.	6	4.29	3	9.38
Totals	140	99.98	32	99.28

[1] number of identified specimens; [2] minimum number of individuals

Table 15
BONE FREQUENCY IN TU-1, CA-KER-2520

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%
0-10	2	0.13	0.69	0.33	0	0.00	2	0.94
10-20	30	2.00	4.22	2.02	0	0.00	3	1.41
20-30	73	4.88	17.56	8.39	18	14.63	29	13.62
30-40	320	21.38	34.60	16.54	25	20.33	34	15.96
40-50	206	13.76	29.65	14.17	17	13.82	35	16.43
50-60	184	12.29	35.25	16.85	13	10.85	18	8.45
60-70	123	8.22	26.05	12.45	12	9.76	19	8.92
70-80	216	14.43	29.14	13.93	17	13.82	41	19.25
80-90	215	14.36	22.48	10.74	21	17.07	20	9.39
90-100	128	8.53	9.61	4.59	0	0.00	12	5.63
Total	1,497	100	209.25	100	123	100	213	100

Table 16
SHELL FREQUENCY IN TU-1, CA-KER-2520

Level (cm.)	Taxon	Total Weight (g.)	% of Total
0-10	–	–	–
10-20	*Helmintheglypha*	1.50	34.01
20-30	*Helmintheglypha*	0.03	0.68
30-40	–	–	–
40-50	*Helmintheglypha*	0.10	2.27
50-60	–	–	–
60-70	*Margaratifera*	2.40	54.42
70-80	*Margaratifera*	0.22	4.99
80-90	*Helmintheglypha*	0.16	3.63
90-100	–	–	–
Totals		4.41	100

accumulations of micro-fauna, or other factors. Obviously this issue can not be resolved with the data at hand, but is relevant to future research at this or other sites in this region.

Two species of mullusks were recovered from CA-KER-2520. These include the freshwater mussel (*Margaratifera margaratifera*) and the land snail (*Helminthaglyptha* sp.). It is worth noting that *Margaratifera* was limited to levels below 60 cm. in depth in TU-1. The land snails, on the other hand, primarily occurred in the upper 50 cm. of the deposit (see Table 16).

One of the interesting aspects of the faunal assemblage at this site was the occurrence of a series of large bird talons. Nine of these were found and all except one are burned. These are from a large raptor, possibly a red tail hawk (*Buteo jamaicensis*), and were found distributed between 20 and 80 cm. in depth in TU-1. Assuming they are all from a single individual, their distribution suggests a considerable amount of disturbance has occurred in the area of the site in which they were discovered.

Since this type of animal is seldom considered to be of dietary significance, its presence may indicate a specialized form of cultural activity once took place in this area of the site. Many birds of prey, along with certain other species of animals, are known to have had ritualistic significance to native Californians. Their feathers and other body parts were used for various ritualistic and other purposes. Perhaps the occurrence of the avian elements at CA-KER-2520 is related to this form of behavior.

Another intriguing pattern evident in the faunal data from this site is seen in the occurrence of burned faunal specimens. Burning was noted on bone from each of the studied sites, however, the sample from CA-KER-2520 was larger than the others and certain patterns are evident. Excluding the burned avian phalanges just discussed, burning was observed on bones identified from gophers, ground squirrels, rabbits, and hares. This was most apparent with ground squirrels where 20 of 47 identified elements, or roughly 43%, were burned. Burned brush rabbit bones amounted to about 27% of the total identified (8 of 30), jackrabbit about 22% (2 of 9), and gopher only 8.3% (1 of 12). These data are important since they clearly indicate the dietary significance of ground squirrels (*Spermophilus beecheyii*), a species that is often thought to represent a noncultural element in archaeological faunal collections.

The pattern of burned elements is also noteworthy at this site, particularly in the case of ground squirrels and brush rabbits. Thirteen of the 20 burned squirrel elements are from the distal portions of appendages. These figures suggest ground squirrels were skewered and roasted over open fires, or that they were placed directly onto coals. Burned brush rabbit bones include six elements from the feet and the distal ends of two forelimbs. Again, the pattern is indicative of open fire roasting. Burning patterns for other species are less conclusive.

Table 17
IDENTIFIED ELEMENTS IN TU-1, CA-KER-2520

Level (cm.)	Element	Portion	Side	Taxon	Remarks
20-30	humerus	distal	right	*Sylvilagus*	--
	mandible	whole	right	*Sylvilagus*	--
	scapula	proximal	right	cf. *Sylvilagus*	--
	humerus	mid-section	right	*Thomomys*	--
	tibia	distal	right	*Spermophilus*	--
	humerus	mid. & distal	right	unident. rodent	--
	calcaneus	distal/dorsal	left	*Spermophilus*	--
	calcaneus	distal/dorsal	right	*Spermophilus*	burned
	ulna	proximal	right	*Thomomys*	--
	term. phalanx	proximal	?	Aves	Red Tail Hawk-sized, burned
	2nd phlanx	proximal	?	Aves	Red Tail Hawk-sized, burned
	radius	distal	right	*Canis* (?)	--
	3rd metatarsal	proximal	right	*Spermophilus*	--
	tibia	distal	right	*Thomomys*	burned
	4th metatarsal	proximal	left	*Spermophilus*	--
	4th metatarsal	whole	left	cf. *Tamias*	--
	scapula	proximal	right	*Spermophilus*	--
	atlas vertebra	ventral	-	cf. *Tamias*	--
30-40	atlas vertebra	whole	-	cf. *Orthodon*	--
	mandible	mid-section	right	*Thomomys*	--
	calcaneus	whole	right	*Spermophilus*	--
	calcaneus	mid-section	left	*Sylvilagus*	--
	scapula	proximal	right	*Spermophilus*	--
	scapula	proximal	left	*Spermophilus*	--
	tibia	distal	left	*Spermophilus*	burned
	rib	proximal	?	*Lepus*	burned
	radius	proximal	right	*Spermophilus*	burned
	3rd metatarsal	proximal	right	*Sylvilagus*	--
	tibia	distal	right	*Spermophilus*	--
	tibia	distal	left	*Spermophilus*	burned
	tibia	distal	left	*Spermophilus*	burned
	humerus	mid-section	right	*Thomomys*	--
	femur	proximal	left	cf. *Tamias*	--
	humerus	proximal	right	unident. rodent	*Peromyscus* ?, burned
	P/3	whole	right	*Sylvilagus*	--
	distal phalanx	proximal	?	Aves	Red-Tailed Hawk?, burned

Table 17 (continued)
IDENTIFIED ELEMENTS IN TU-1, CA-KER-2520

Level (cm.)	Element	Portion	Side	Taxon	Remarks
30-40	medial phalanx	whole	?	Aves	burned
	medial phalanx	proximal, split	?	Aves	burned
	3rd metatarsal	whole	left	unident. rodent	--
	medial phalanx	whole	?	cf. *Neotoma*	--
	metatarsal	distal	?	cf. *Sylvilagus*	--
	4th metatarsal	proximal	right	*Spermophilus*	--
	4th metatarsal	proximal	left	*Spermophilus*	--
40-50	tibia	distal	right	*Sylvilagus*	--
	calcaneus	caudal	right	*Sylvilagus*	--
	calcaneus	whole	right	*Spermophilus*	--
	ulna	proximal	left	*Spermophilus*	--
	scapula	proximal	right	*Spermophilus*	burned
	P/3	whole	right	*Sylvilagus*	--
	mandible	proximal	left	*Thomomys*	--
	femur	proximal	right	*Spermophilus*	--
	distal phalanx	whole	?	Aves	Red-Tailed Hawk?, burned
	scapula	aproximal	right	?	*Lepus* ?
	1st rib	proximal	right	cf. *Felis cattus*	--
	radius	distal	right	*Sylvilagus*	--
	radius	distal	left	*Sylvilagus*	different size than above
	radius	proximal	left	*Sylvilagus*	--
	fibula	distal	left	*Spermophilus*	burned
	fibula	distal	left	*Spermophilus*	burned
	fibula	proximal	left	Aves	Red-Tailed Hawk?, burned
50-60	calcaneus	whole	right	*Sylvilagus*	--
	tibia	distal	left	*Spermophilus*	burned
	ulna	proximal	right	*Sylvilagus*	--
	ulna	proximal	left	*Spermophilus*	--
	calcaneus	caudal	right	*Spermophilus* ?	--
	innominate	mid-section	left	*Canis* sp. ?	--
	radius	distal	right	*Sylvilagus*	--
	radius	distal	left	*Spermophilus*	burned
	radius	proximal	left	*Spermophilus*	--
	femur	proximal	right	*Tamias*	--
	mandible	distal	left	*Thomomys*	--
	mandible	distal	right	*Thomomys*	--

Table 17 (continued)
IDENTIFIED ELEMENTS IN TU-1, CA-KER-2520

Level (cm.)	Element	Portion	Side	Taxon	Remarks
60-70	mandible	distal	left	*Canis* cf. *latrans*	with P/3, P/3, P/4 (roots)
	mandible	mid-section	right	*Canis*	with alveoli for P/4, M/1, burned
	mandible	mid-section	left	*Canis* sp.?	with alveoli for P/2, P/3, congenital absess of P/1?
	tibia	distal	right	*Lepus*	--
	tibia	distal	right	*Spermophilus*	burned
	tibia	distal	right	*Spermophilus*	burned
	tibia	distal	right	*Spermophilus*	--
	calcaneus	caudal	right	*Sylvilagus*	burned
	ulna	proximal	left	*Spermophilus*	--
	ulna	proximal	left	*Spermophilus*	burned
	precaudal vert.	whole	--	*Catostomus*	--
	distal phalanx	whole	--	Aves	Red-Tailed Hawk ?, burned
70-80	tibia	distal	right	*Spermophilus*	--
	tibia	distal	left	*Spermophilus*	burned
	tibia	distal	left	?	Mustelid ?
	femur	proximal	left	*Spermophilus*	--
	femur	distal	left	*Tamias*	--
	radius	distal	left	*Spermophilus*	--
	radius	proximal	right	*Spermophilus*	--
	ulna	proximal	legt	*Spermophilus*	--
	calcaneus	whole	right	unident. rodent	*Dipodomys* ?
	calcaneus	caudal	right	*Spermophilus*	--
	mandible	condyle	left	*Sylvilagus*	--
	mandible	condyle	right	*Spermophilus*	burned
	cranium	maxilla, etc.	-	*Spermophilus*	6 pieces from one cranium
	mandible	mid-section	left	*Thomomys*	2 pieces
	phalanx	whole	-	cf. *Canis* sp.	intermediate phalanx
	phalanx	proximal	-	Aves	Red-Tailed Hawk?, intermediate phalanx
	caudal vertebra	whole	-	Cyprinidae	--
	caudal vertebra	whole	-	cf. *Lavinia*	--
	caudal vertebra	whole	-	cf. *Ptyocheilus*	--
80-90	innominate	mid-section	right	*Lepus*	--
	ulna	proximal	left	*Lepus*	burned
	ulna	mid-section	right	*Lepus* ?	--
	ulna	proximal	left	*Spermophilus*	burned
	ulna	proximal	left	*Spermophilus*	--
	tibia	distal	right	*Sylvilagus*	--
	humerus	distal	right	*Sylvilagus*	--

Table 17 (continued)
IDENTIFIED ELEMENTS IN TU-1, CA-KER-2520

Level (cm.)	Element	Portion	Side	Taxon	Remarks
80-90	tibia	distal	right	*Spermophilus*	burned
	scapula	proximal	left	*Spermophilus*	--
	radius	distal	right	*Sylvilagus*	burned
	radius	distal	left	*Sylvilagus*	burned
	temporal	whole	right	*Spermophilus*	--
	P/3	whole	right	*Lepus*	--
	M3/	whole	left	*Sylvilagus*	--
	maxilla	alveolar	right	*Spermophilus*	alveolus for M3/
	mandible	mid-section	right	*Thomomys*	--
	3rd metatarsal	proximal	right	*Sylvilagus*	--
	3rd metatarsal	proximal	right	*Sylvilagus*	burned
	2nd metatarsal	proximal	left	*Sylvilagus*	burned
	precaudal vert.	whole	-	cf. *Mylopharodon*	--
	most of individual			*Perognathus*	burrow death
90-100	tibia	proximal	right	*Sylvilagus*	--
	tibia	proximal	right	*Thomomys*	--
	ulna	mid-section	right	*Sylvilagus*	--
	scapula	proximal	left	*Spermophilus*	--
	maxilla	alveolar	left	*Spermophilus*	burned
	maxilla	alveolar	right	*Spermophilus*	--
	tibia	distal	right	*Spermophilus*	burned
	mandible	condyle	left	*Spermophilus*	burned

The faunal remains from CA-KER-2520 clearly emphasize the importance of small mammals to the inhabitants of this site. They are not by themselves, however, particularly useful for determining the function of this site or the seasons(s) of its use. It is intriguing that this site produced the greatest amount of fish bone of any of the tested sites, especially since it is the only site situated away from the Kern River. Today the site is located near an intermittent drainage that likely contains no fish population. It is not known what the circumstances were in the past. The fish may simply have been transported here from somewhere else. The identified taxa include one lacustrine-dwelling species (*Orthodon microlepidotus*) that probably was obtained somewhere on the valley floor, perhaps at Kern or Buena Vista lake. The remaining three species are riverine or at least prefer moving water habitats. These may have been caught in the Kern River. Perhaps the more important issue is why fish remains are virtually absent from the other sites in question.

FAUNAL REMAINS FROM CA-KER-2527

Three test units were excavated at this site. Faunal remains were found in only two of these, TU-1 and TU-3. These units were each one meter in depth and a total of 4.00 cubic meters is represented in the sample considered here. A total of 444 pieces of bone and 5.19 grams of shell was collected from this site. The faunal data from CA-KER-2527 are summarized in tables 18-24.

Identified fauna include six different vertebrate taxa and two species of shellfish (see tables 18, 20, and 22). Lagomorphs were the most abundant animals found in the faunal samples from this site. These made up about 45% of

Table 18
VERTEBRATE SPECIES REPRESENTED AT CA-KER-2527

Taxon	NISP[1]	%of Toal NISP	MNI[2]	%of Total MNI
CLASS MAMMALIA				
Order Lagomorpha				
Sylvilagus audubonii	17	50.00	4	36.37
Lepus californicus	4	11.76	1	9.09
Order Rodentia				
Spermophilus beechyii	1	2.94	1	9.09
Thomomys bottae	3	8.83	1	9.09
Neotoma sp.	1	2.94	1	9.09
Tamis sp.	3	8.83	1	9.09
Order Carnivora				
Canis sp.	1	2.94	1	9.09
Order Artiodactyla				
Odocoileus hemionus	4	11.76	1	9.09
Totals	34	100	11	100

[1] number of identified specimens
[2] minimum number of individuals

Table 19
BONE FREQUENCY IN TU-1, CA-KER-2527

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%	Weight Burned (g.)	%
Surface	1	1.89	0.34	4.03	0	0.00	1	4.00	0.34	11.93
Surface (4)	2	3.77	0.63	7.47	0	0.00	0	0.00	0.00	0.00
Surface (7)	1	1.89	0.12	1.42	0	0.00	0	0.00	0.00	0.00
0-10	10	18.87	1.38	16.37	0	0.00	5	20.00	0.52	18.25
10-20	0	0.00	0.00	0.00	0	0.00	0	0.00	0.00	0.00
20-30	14	26.42	0.77	9.13	0	0.00	10	40.00	0.10	3.51
30-40	7	13.21	1.36	16.13	1	50.00	3	12.00	0.57	20.00
40-50	5	9.43	1.43	16.96	0	0.00	2	8.00	0.33	11.58
50-60	1	1.89	0.09	1.07	0	0.00	0	0.00	0.00	0.00
60-70	3	5.66	0.92	10.91	0	0.00	1	4.00	0.17	5.96
70-80	3	5.66	1.11	13.17	1	50.00	2	8.00	0.69	24.21
80-90	2	3.77	0.25	2.97	0	0.00	1	4.00	0.13	4.56
90-100	4	7.55	0.03	0.36	0	0.00	0	0.00	0.00	0.00
Total	53	100	8.43	100	2	100	25	100	2.85	100

the minimum number of identified individuals. Various rodents accounted for another 36%. Together these small mammals comprised nearly 82% of the identified inventory. Artiodactyl and carnivore remains constitute the remaining identified bone. These include deer (*Odocoileus hemionus*) and dog or coyote (*Canis* sp.), each represented by roughly 9% of the MNIs. In numbers of identified elements, the pattern is similar although rabbits make up about 52% and deer about 12% of the total. Brush rabbits (*Syvilagus* sp.) alone account for 50% of the identified elements at CA-KER-2527.

Table 20
SHELL FREQUENCY IN TU-1, CA-KER-2527

Level (cm.)	Taxon	Total Weight (g.)	% of Total
0-10	*Margaratifera*	1.24	83.22
10-20	–	–	–
20-30	*Margaratifera*	0.02	1.34
30-40	*Margaratifera*	0.23	15.44
40-50	–	–	–
50-60	–	–	–
60-70	–	–	–
70-80	–	–	–
80-90	–	–	–
90-100	–	–	–
Totals		1.49	100

Table 21
BONE FREQUENCY IN TU-3, CA-KER-2527

Level (cm.)	Total Pieces	%	Total Weight (g.)	%	Total Ident.	%	Total Burned	%	Weight Burned (g.)	%
0-10	2	0.51	0.18	0.25	0	0.00	1	1.35	0.12	0.86
10-20	9	2.30	2.21	3.06	0	0.00	2	2.70	0.30	2.16
20-30	9	2.30	3.44	4.76	2	6.06	5	6.76	0.87	6.25
30-40	42	10.74	9.12	12.61	4	12.12	9	12.16	1.69	12.15
40-50	114	29.16	15.72	21.74	5	15.15	13	17.57	1.95	14.02
50-60	82	20.97	16.09	22.25	7	21.21	5	6.76	0.85	6.11
60-70	37	9.46	6.26	8.66	6	18.18	8	10.81	1.72	12.37
70-80	64	16.37	10.80	14.94	6	18.18	22	29.73	4.67	33.57
80-90	18	4.60	5.87	8.12	2	6.06	5	6.76	1.18	8.48
90-100	14	3.58	2.62	3.62	1	3.03	4	5.41	0.56	4.03
Total	391	100	72.31	100	33	100	74	100	13.91	100

Only 35 of the 444 pieces of bone, or about 8%, of the bone was identified from this site. This figure compares to that of CA-KER-2520 (9%), and probably reflects the fact that both sites are represented by reasonably large quantities of bone relative to the other sites. Data on burned bone frequencies are similar. At CA-KER-2527 about 19% of the bone by count and 20% by weight was burned. Burned bone amounted to roughly 14% of the bone by count from CA-KER-2520. Only 8% of the bone from the small sample at CA-KER-2517 was burned or 3% by weight. At CA-KER-405, 32% of the total was burned. However, this amounted to 21% by weight, a figure approximating the 20% observed at CA-KER-2527.

Indices of bone frequency and bone concentration at CA-KER-2527 were calculated at 111 pieces of bone per cubic meter and 40.37 grams of bone per cubic meter. The first of these figures is the second largest index recorded for any of the tested sites. As previously mentioned, however, this is still considerably below the figure of 748.5 reported for CA-KER-2520. Conversely, it is considerably larger than figures derived for CA-KER-2517 (26 pieces of bone per cubic meter) or CA-KER-405 (39.17 pieces per cubic meter). In terms of bone weight, the concentration index calculated for CA-KER-2527 (40.37 g. per cubic meter) is comparable to that of CA-KER-405 (35.68 g.). It is,

Table 22
SHELL FREQUENCY IN TU-3, CA-KER-2527

Level (cm.)	Taxon	Total Weight (g.)	% of Total
0-10	*Margaratifera*	0.44	11.89
10-20	--	--	--
20-30	*Margaratifera*	0.83	22.43
30-40	*Margaratifera*	0.81	21.89
40-50	*Margaratifera*	0.66	17.64
50-60	*Margaratifera*	0.33	8.92
50-60	*Helmintheglypha* (burned)	0.05	1.35
60-70	--	--	--
70-80	*Margaratifera*	0.56	15.14
80-90	--	--	--
90-100	--	--	--
Totals		3.70	100

Table 23
IDENTIFIED ELEMENTS IN TU-2, CA-KER-2527

Level (cm.)	Element	Portion	Side	Taxon	Remarks
30-40	phalange	distal	?	*Odocoileus*	--
70-80	tibia	mid-section	right	*Sylvilagus* ?	*Lepus* ?

however, distinct from the other two sites. CA-KER-2517 produced only 9.89 grams of bone per cubic meter while CA-KER-2520 produced 104.63 grams.

The size of bone found at CA-KER-2527 was factored as for the other sites and resulted in a relative size index of 0.35. This is closest to CA-KER-2517 (0.38) and discordant from CA-KER-405 (0.91) and CA-KER-2520 (0.14). Thus, this assemblage falls into the middle of the size ranges represented in the samples from these four sites.

Freshwater mussel (*Margaratifera margaratifera*) was the only shellfish found at CA-KER-2527. It occurred in both of the test units that produced faunal remains. Unlike at CA-KER-2520, pieces of shell occurred throughout the vertical dimension of the deposit. A total of 5.19 grams of shell was recovered. Of this total, 3.70 grams came from TU-3 and 1.49 grams from TU-1. The distribution of this material by depth is presented in tables 20 and 22.

Since two of the three units excavated at CA-KER-2527 produced faunal remains, these can provide some information about internal variability within the cultural deposit at this site. Test Unit 1 contained 53 pieces of bone weighing a total of 8.43 grams (see Table 19). Test Unit 3 produced 391 pieces of bone weighing a total of 72.31 grams (see Table 21). Obviously, there is a sizable difference in bone frequency within different areas of the site. Test Unit 1 contained 26.50 pieces of bone per cubic meter and 4.2 grams of bone by weight per cubic meter of excavated volume. Test Unit 3 contained 195.50 pieces of bone per cubic meter, amounting to 36.1 grams of bone per cubic meter.

Approximately 4% of the bone from TU-1 was identified to taxon compared to about 8% from TU-3. A much higher proportion of the bone was burned in TU-1 than in TU-3. In TU-1 this amounted to 47% by count and 34% by weight. Analysis of TU-3 produced figures of 19% burned by count and 20% by weight.

As in the case of each of the other studied sites, the faunal assemblage at CA-KER-2527 is dominated by the remains of small mammals. These must have been of considerable nutritional importance to the native inhabitants of

Table 24
IDENTIFIED ELEMENTS IN TU-3, CA-KER-2527

Level (cm.)	Element	Portion	Side	Taxon	Remarks
20-30	mandible	anterior half	right	*Sylvilagus*	teeth absent, all aveoli present
	scapula	mid-section	left	cf. *Sylvilagus*	--
30-40	mandible	mid-section	right	*Sylvilagus*	--
	ulna	proximal	right	*Sylvilagus*	--
	tibia	mid-section	right	*Sylvilagus*	--
	femur	proximal	right	*Sylvilagus*	--
40-50	femur	mid-section	left	*Odocoileus*	--
	tibia	distal	left	*Lepus*	--
	humerus	distal	right	*Tamias*	--
	metapodial	proximal	?	*Lepus* ?	deformed ?, metatarsal ?
	P/3	whole	right	*Sylvilagus*	--
50-60	femur	proximal	right	*Tamias* ?	--
	maxilla	mid-section	?	*Spermophilus*	small alveolar piece of maxilla
	inter. phalange	whole	?	*Canis* ?	pathological ?
	3rd metatarsal	proximal	right	*Sylvilagus*	--
	tooth	indet. frag.	--	*Odocoileus* ?	small fragment of cervid (?) tooth
	calcaneus	caudal 1/2	left	cf. *Tamias*	--
	humerus	distal	left	*Sylvilagus*	--
60-70	mandible	anterior 1/3	left	*Neotoma* ?	M/1 present
	tibia	mid-section	right	*Sylvilagus*	--
	P4/	whole	left	*Sylvilagus*	--
	2nd metatarsal	proximal	right	*Sylvilagus*	burned
	2nd metatarsal	proximal	right	*Lepus calif.*	--
	femur	proximal	left	*Lepus calif.* ?	burned
70-80	mandible	anterior 1/3	right	*Thomomys*	alveolar portion
	navicular	mid-section	right	*Lepus calif.*	--
	P4/	lingual 1/2	left	*Sylvilagus*	--
	3rd metatarsal	proximal	right	*Sylvilagus*	burned
	4th metatarsal	proximal	right	*Sylvilagus*	burned
	humerus	distal	right	*Thomomys*	--
90-100	phalange ?	proximal	?	*Odocoileus* ?	split
	M3/	occlusal 1/2	left	*Sylvilagus*	--
100-110	mandible	anterior 1/2	right	*Sylvilagus*	--

sites in this area. This site produced the second largest amount of bone of the tested sites. Therefore, it could be considered among the more significant of the sampled sites.

SUMMARY AND CONCLUSIONS

This study has presented and summarized a variety of data pertaining to the faunal remains recovered from test excavations at CA-KER-405, CA-KER-2517, CA-KER-2520, and CA-KER-2527. The samples collected from these sites are relatively small and acquired from highly localized places within each of the investigated sites. By themselves,

they are not particularly useful for addressing significant research problems important to the archaeology of the southern Sierra Nevada or other regions. They are, however, meaningful in the comparative interpretation of the sites in question. These data provide some insight into the nature of species representation and abundance in these sites, as well as to the manner in which bone and shell occur and are distributed within them. Their primary utility will be in assessing the relative value of these, and perhaps other regional sites, for investigating certain topics of scientific importance to archaeological researchers. Specifically these might include, but not be limited to, studies of aboriginal human and cultural ecology, the nature of aboriginal land use, and aspects of archaeological site formation processes in this area of California.

The results of this study, although preliminary and perhaps statistically not entirely representative, indicate some sites contain sizable quantities of faunal remains. Those remains that have been identified suggest that small mammals particularly rodents and rabbits were especially important to the inhabitants of these sites. Since there are considerable amounts of unidentified small and splintered fragments of larger mammals also in the osteological inventories, it is quite likely that the importance of some larger species such as artiodactyls might have been overlooked in this study due to the nature of the samples involved. It is widely recognized by zooarchaeologists that small samples will produce significant distortions in faunal records so this effect is not unanticipated in the present analysis. Only with additional research will we be able to evaluate the reality of the statistical tendencies expressed in this comparative study. Therefore, this should stand as a threshold analysis which may be initially used to compare and evaluate the sites in question and to help formulate ideas and methods in the event of further investigations.

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ALTERNATIVE INTERPRETATIONS OF LATE PLEISTOCENE PALEOECOLOGY IN THE TULARE LAKE BASIN, SAN JOAQUIN VALLEY, CALIFORNIA

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INTRODUCTION

The Tulare Lake Basin is a major physiographic unit located within the central portion of the San Joaquin Valley of central California (Fig. 1). At the time of European entry into this region, the basin contained a large freshwater lake known historically as "Tache Lake" after a local Yokuts Indian tribelet, or as "Tule Lake" or "Tulare Lake" in reference to the dense growth of tule marshes that surrounded it (Fig. 2). This lake was a dominant feature of the valley floor, encompassing some 760 square miles in area at its maximum extent. The lake was an important source of biotic resources and supported an extensive population of Native Americans (Kroeber 1925; Latta 1949; Gayton 1948; Cook 1955; and others).

For the past several years, I have been involved with a consortium of researchers who share an interest in the prehistory of the Tulare Lake region. The Tulare Lake Archaeological Research Group (TULARG) includes over 50 members from various scientific disciplines and other walks of life. Together, we are attempting to reconstruct the archaeological record of this important area of California. My role has primarily been to deal with the osteological remains collected over the years from several significant localities along the western shoreline of the lake. In particular, I have been working with mineralized faunal remains found in an area of the shoreline that has produced large numbers of fluted projectile points and other diagnostic Paleo-Indian artifacts. These materials have come from the surface of a stretch of old shoreline that measures roughly two miles in length and a half a mile in width. Within this area there are some concentrations of materials, and literally thousand of artifacts. Probably hundreds of pounds of mineralized bone have been collected from here over the course of the last fifty years. Most of the work here has been by avocational collectors, many of whom are now contributing members of TULARG and have made their collections available for scientific study. This important archaeological area first became known to the scientific community when Riddell and Olsen (1969) described some fluted points and other materials collected there by a Donald Witt. The site subsequently became known as the "Witt Site" (CA-Kin-32). Recently there have been several reportings of various aspects of this locality (Moratto 1984:81-81; Rondeau 1985; Wallace and Riddell 1988; Fenenga 1993). In April of 1990, TULARG presented a symposium on research in the lake basin, including some studies relating to the early materials, at the annual meetings of the Society for California Archaeology. The results of that symposium were published in 1991.

The present paper is a direct product of that symposium in that it represents a more detailed evaluation of ideas which then emerged regarding the precise nature of Late Pleistocene and early Holocene paleoecology within the lake basin. Specifically, data from palynological studies of lake sediments presented a somewhat different picture of vegetative conditions then did the faunal evidence. The palynologists suggested the Tulare Lake Basin at this time was characterized by an extensive cover of juniper woodlands mixed with sagebrush (*Artemisia* sp.) and greasewood (*Sarcobatus* sp.). They interpreted the regional vegetation as "Great Basin-like," not unlike that present in areas of northern Nevada today (Davis 1990; West 1990). The faunal data, on the other hand, were dominated by large grazing herbivores including bison, horses, mammoth, and ground sloth. These were interpreted as evidence for grasslands comprising a significant portion of the valley floor adjacent to the margins of the lake (Fenenga 1991).

The paleoenvironmental reconstructions that have been suggested are clearly not compatible models. It is the intent of this paper to address this topic more closely.

Kern County Archaeological Society Journal 5:105-117 (1994).

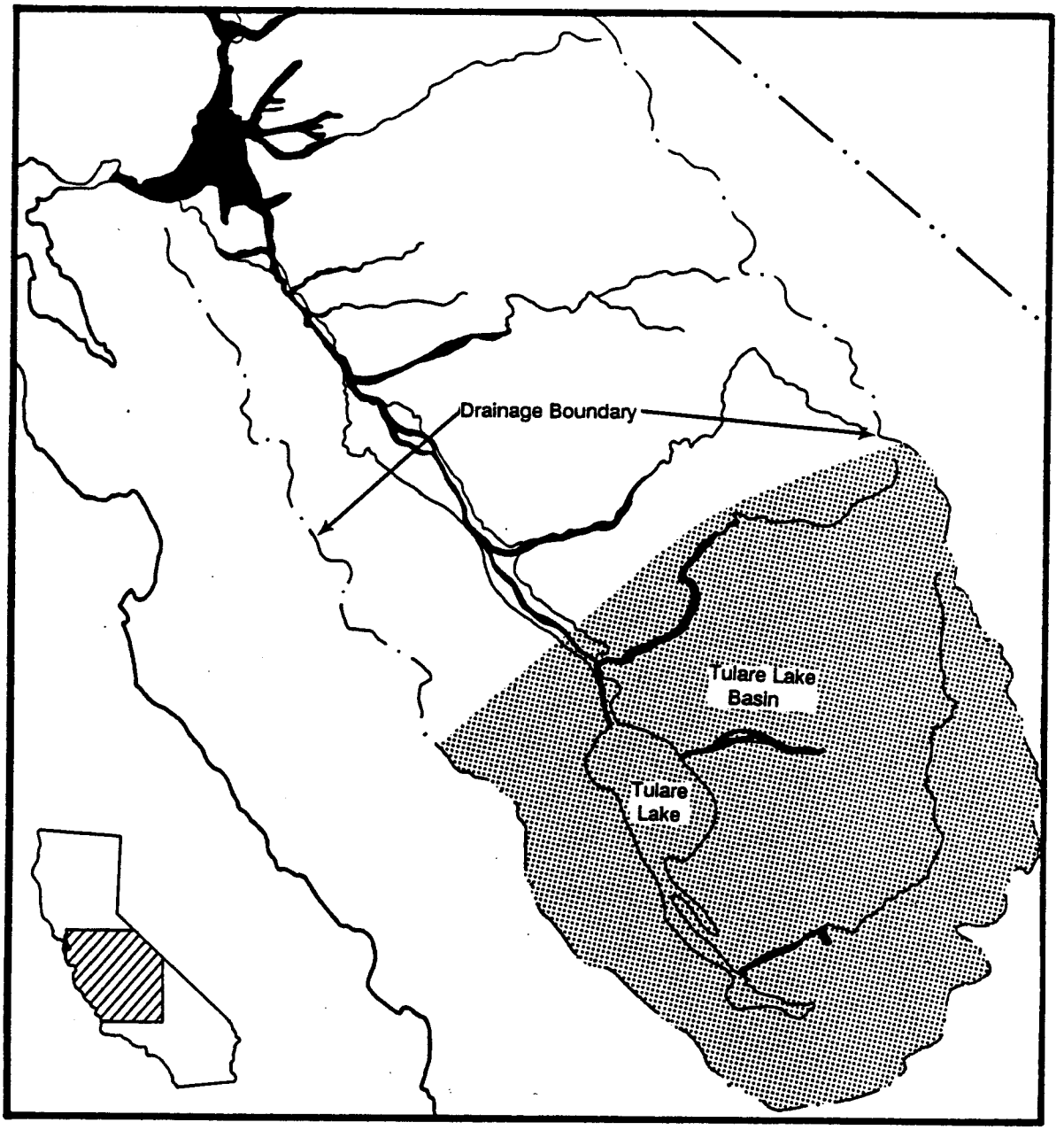

Fig. 1. The Tulare Lake Basin (adpted from Poland and Evenson 1966:Fig. 1).

MATERIALS AND METHODS

The Tulare Lake Basin today bears little resemblance to its appearance in former times. The lake itself is today essentially nonexistent, although a man-made rectangular-shaped drainage basin still holds some runoff from irrigation and occasional precipitation. Vegetation consists largely of cotton, barley, or other types of agricultural row crops. Fallow fields sprout almost entirely with introduced European annual weeds. The few stands of trees are invariably eucalyptus or tamarisk, both native to other areas of the world. It is indeed difficult to conceptualize today what this region must have looked like under natural conditions in the past.

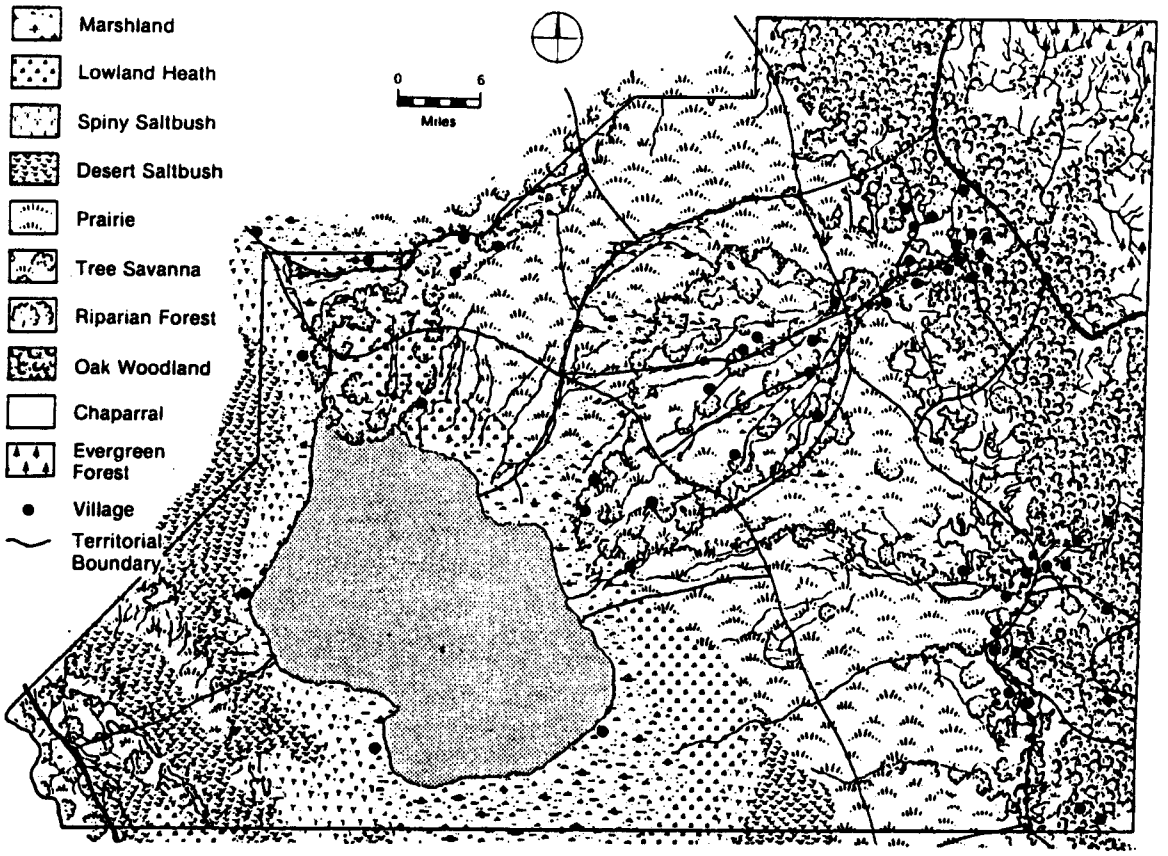

Fig. 2. Environmental Reconstruction of the Tulare Lake Basin circa. 1770 (from Preston 1981:Fig. 12).

There are a variety of sources of information about previous environmental conditions in this region. Historical records provide a glimpse of the recent past. Early explorers and other individuals recorded some data which are useful for understanding the environmental setting that was probably characteristic of the last several thousand years. These data can be supplemented with additional information from other sources including those provided by archaeology, geology, meteorology, and other records.

Currently, the best attempt to reconcile these data has been by Preston (1981), a geographer with a personal interest in the history of this region. He presented a wide variety of information about the Tulare Lake Basin, including an in-depth accounting of aboriginal and early historic conditions. Based upon analysis of various historic and other records, he has reconstructed hydrologic and floristic conditions at the time of European contact, or roughly around A.D. 1770 (Fig. 2). In his interpretation, the valley was covered with a diversity of vegetation communities, each a product of specific local conditions including water availability, soil type, elevation, and so on. Important plant communities around the lake were marshlands, alkali-tolerant saltbush scrub, saltbush heath, and prairie steppe. Rivers and streams feeding into the lake basin were bordered by rich riparian woodlands comprised of oaks, poplar, willows, cottonwood, and a variety of other plants.

It is only in the past several years that research has begun to focus on earlier paleoenvironmental conditions in the basin. One of the first studies to consider this problem was an interesting analysis of the lake basin as a source of knowledge about the Wisconsin glacial history of the Sierra Nevada (Atwater et al. 1986). This was an interdisciplinary study of the geomorphology of the lake basin and certain aspects of its lacustrial history. The basin itself is a structural depression formed by tectonic movement associated with the orogenesis of the Sierra Nevada to the

east and later the Temblor Range to the west. The lake was formed by the development of coalescing alluvial fan "dams" created by the Kings River on the Sierrian side of the valley and Los Gatos Creek on the west side. The formation of these geomorphological features created a ridge some thirty to forty feet higher than the deepest part of the basin, which in turn trapped water flowing into the basin from various rivers and streams. Most of the water that filled the lake was derived from the streams along the west slope of the Sierra Nevada. The Kings River accounts for at least half of the surface water and alluvial load brought into the basin each year. The Kaweah River is the second most important drainage in this system, followed by several nonperennial streams including the Tule River, Deer Creek, and the White River. All of these drainages are fed largely by annual snowpack in the upper elevations of the Sierras and to a lesser extent by seasonal precipitation in the region.

The Atwater et al. (1986) study of Tulare Lake incorporated a variety of data including surface hydrological information, lithostratigraphic analysis of cores taken from the lake deposits, paleoclimatic analysis based on palynological and other evidence, studies of lacustrial microfossils including diatoms and ostracodes, and analysis of fish remains. This research provided many important clues to the nature of the ecological history of the lake basin. Perhaps the most revealing of these is unequivocal evidence illustrating the dynamic character of this portion of the valley floor throughout the Pleistocene and Holocene epochs. Clearly, the lake has undergone a considerable amount of fluctuation in duration, extent, depth, and other characteristics during the course of its history. The authors concluded that a variety of factors contributed to the complex series of changes that are evident in their data. These include sedimentary filling of the basin, tectonic subsidence, cycles of deposition and incision of the alluvial fan that forms the spillway of the dam creating the lake, paleoclimatic events influencing the water budget within the basin, and possibly other factors (Atwater et al. 1986:105-109).

This discussion is concerned with the period of time associated with the very end of the Pleistocene and the beginning of the Holocene. This was apparently the time the lake shore was first inhabited by humans and presumably is represented by the preponderance of the faunal remains collected from the earliest archaeological sites. Atwater et al. (1986:101) suggested this period was represented by a depositional cycle that produced a stratigraphic unit they have informally referred to as the Blakeley Canal silt. This was deposited between about 11,000-13,000 and 8,200 years ago. In their interpretation, the Blakeley Canal silt probably represents a period of fluctuations in lake depth which included occasional desiccation analogous to drought conditions recorded historically in the basin. Sedimentation rates during the deposition of the Blakeley Canal silt were estimated at 0.3-0.4 m/1,000 yr, and the relative abundances of ostrocodes and diatoms imply a general shallowing of the lake at this time.

There have been several palynological studies from cores taken from Tulare Lake (Owen 1990; West 1990; Adam 1985; Atwater et al. 1986). Each of these have been limited to relatively brief descriptions and cursory interpretations of the pollen records. Together, the existing pollen research might best be characterized as preliminary in nature and extent. The most comprehensive presentation of the palynological data to date is an analysis by Davis (1990). The results of this analysis are presented in Figure 3. Davis's general conclusions are the same as those reached by other researchers (West 1990; Adam 1985; Atwater et al. 1986), although he provided some additional details. The consensus of opinion of the various pollen specialists is that the Tulare Lake Basin was dominated by juniper (*Juniperus* sp.), greasewood (*Sarcobatus* sp.), and sagebrush (*Artemisia* sp.) during the interval between 13,000 and 8,600 years ago. Davis (1990:2) made clear reference to this vegetation as being an open, "Great Basin-like" sagebrush-dominated plant community.

The Davis study provides some other insights into paleoecological conditions within the lake basin. The presence of rooted aquatic plants like pond weed (*Potomogeton* sp.) indicate the lake was relatively clear and shallow between about 18,000 and 10,000 years ago. Sedimentation evidently increased substantially in response to glacial runoff from about 10,100 to 9,100 years ago. During this 1,000 year interval, sedimentation rates are estimated at one centimeter per 3.6 years. This figure contrasts with estimates of one centimeter per 60 years during the late Pleistocene and one centimeter per 22-34 years during the Holocene. Interestingly, neither tule (Cyperaceae) nor cattail (*Typha-Sparganium* sp.) were as abundant as during the Holocene. This implies the lake margins may not have been as marsh-like as they were historically. The relative abundance of a dung fungus (*Sporomiellia*) in the pollen diagram suggests large herbivores were abundant near the lake at this time (Davis 1990 and Fig. 3 herein; Davis 1987). Davis

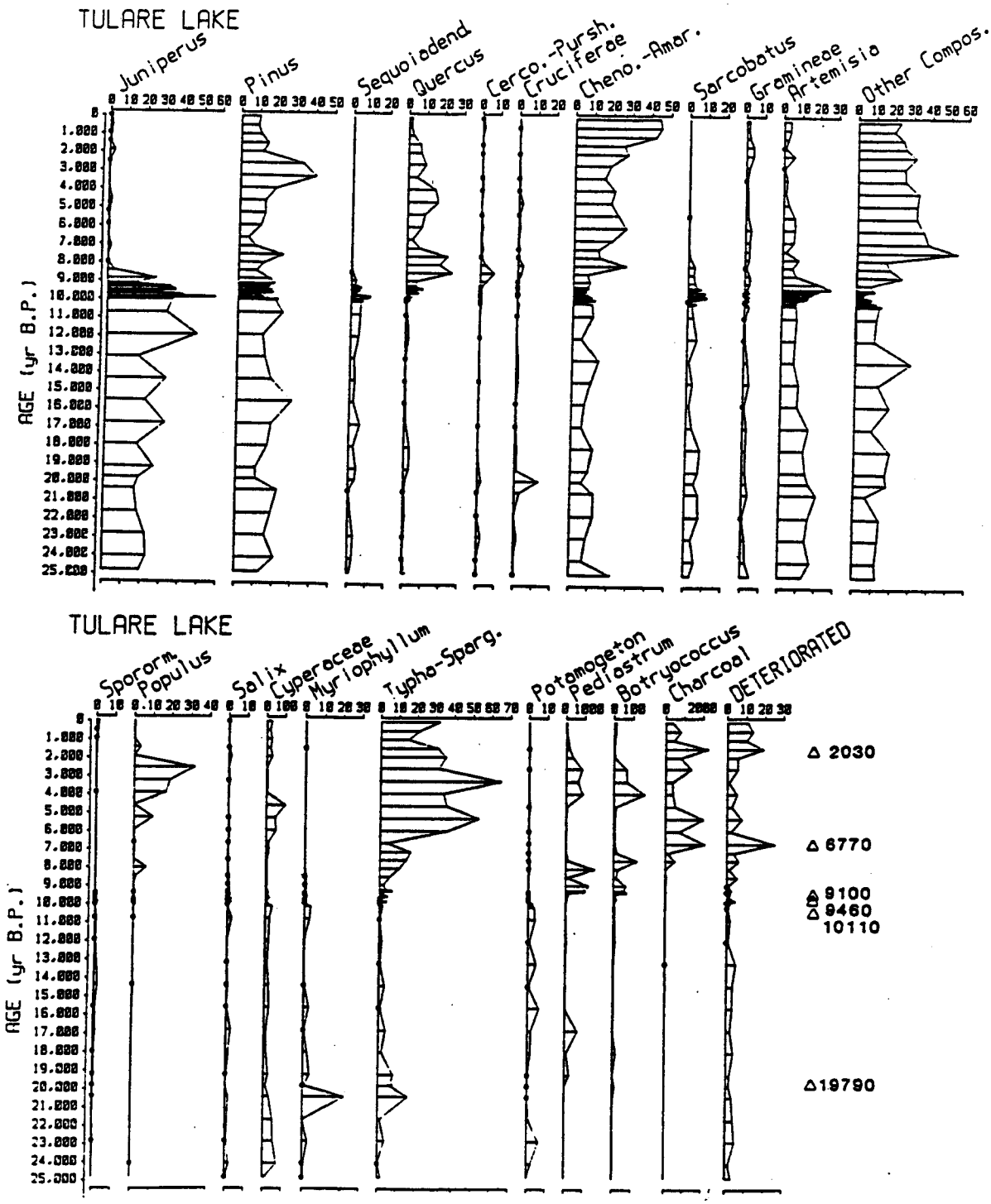

Fig. 3. Pollen Diagram from Tulare Lake (from Davis 1990:4).

(1990:3) also noted the abundance of pollen from giant sequoia (*Sequoiadendron* sp.) before 8,600 years B.P. indicating the range of this taxon was more expansive at that time. Finally, the presence of charcoal in the sequence increases significantly after about 7,500 years ago which Davis (1990:2) attributed to the initial settlement of the lake basin by humans.

The remains of animals that once inhabited the Tulare Lake Basin provide another perspective on the paleoecology of this region during the latest part of the Pleistocene. These occur in some quantity in the restricted area along the west shoreline that has become recognized as the Witt Site. Many of the remains are from species of animals that became extinct at the end of the Pleistocene. All of the osseous material from this location is heavily mineralized. Attempts to date pieces of bone using conventional radiocarbon dating methods have failed due to a lack of sufficient remaining organic components in the bone. There have been several uranium series (230Th) dates obtained, including several on human remains (Taylor et al. 1984). These determinations vary in age and with one exception, all fall within the range between 11,380 and 18,779 yrbp.

It should be noted that these faunal remains have only been collected from areas which also are producing diagnostic Paleo-Indian artifacts. Although it is possible these represent purely paleontological assemblages that are fortuitously occurring with cultural materials, one does not get this impression when observing their distribution in the field. As a rule, if you find mineralized bone in this area, you also will discover artifactual remains. Conversely, neither appear to occur along other places of the old shoreline of the lake. A second important point to be made is the fact that a considerable amount of human bone has been found here, and this also is heavily mineralized. The degree of mineralization of the human remains is indistinguishable from that of the extinct species of fauna. In the most parsimonious scenario, some portion of the associated fauna must be assigned to cultural activity. Exploratory excavations to address the issue of contemporaneity between the cultural materials and the Rancholabrean fauna indicate these are stratigraphically and spatially associated (Fenenga 1993).

Preliminary analysis of a sample of faunal remains from this locality provided some interesting insight into the nature of mammalian species representation in the basin at the end of the Pleistocene. The methodology and results of that study are presented elsewhere (Fenenga 1990). In this paper, I want to focus on specific aspects of the reported fauna and discuss their implications. Excluding *Homo sapiens*, 16 different mammalian species have been identified in the Tulare Lake fauna (Table 1). Ten of these are extinct Rancholabrean species. The taxa includes three genera of carnivores, one lagomorph, two rodents, one edentate, one proboscidian, two species of perissiodactyls, and six genera of artiodactyls. With additional research, this list will certainly be expanded since there are a number of taxa that are not represented, yet should be expected since they occur either in local historic records or in the Rancholabrean fauna at the nearby McKittrick tar seeps (Schultz 1938). In addition, there are remains of birds, reptiles, fish, and mollusks.

In considering the paleoecological record of the lake basin, attention will be directed to the large herbivores. These comprise about 87% of the number of identified specimens (NISP) of mammalian fauna and about 66% of the identified taxa in terms of minimum numbers of individuals (MNI). The list of identified large herbivores includes the big tongued ground sloth (*Glossotherium harlani*), mammoth (*Mammuthus columbi*), two forms of horse (*Equus occidentalis* and *E. conversidens*), Pleistocene camel (*Camelops hesternus*), tule elk (*Cervus elaphus nannodes*), California mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), shrub ox, (*Euceratherium collinum*), and bison (*Bison antiquis*). Together, this group of animals represents a late Pleistocene biocenosis that provides ecological habitat information entirely independent from the pollen data or other sources of knowledge.

Looking at the herbivore data (Table 1 and Fig. 4), it is immediately apparent that the fauna is dominated by grazing species. Animals in this population who would primarily be classified as grazers include bison, horses, mammoth, and probably the sloth and shrub oxen. This group makes up approximately 70% of the large herbivores. Dietary information on the tule elk is difficult to assess since detailed studies have been made on herds removed from their native habitat (McCullough 1971). This is the only species of elk adapted to open range, however, and its prehistoric dietary behavior may have been quite different than that of modern herds under controlled conditions. The big tongued sloth is thought to have been a grazer primarily because it is usually found in association with other grazing species, usually mammoth, horse, and bison. The latter were undoubtedly grazers as evidenced by stomach contents acquired from mummified specimens of each from arctic regions and other data (Guthrie 1990; and others).

The large herbivores from Tulare Lake that can be classified as browsers include the camel, the pronghorn, and the mule deer. Pleistocene camels are problematic, however, since we cannot be certain about extrapolating their

Table 1
Frequencies of Large Herbivores at Tulare Lake

Taxon	NISP	% NISP	MNI	% MNI	Dietary Strategy
† Glossotherium harlani	9	8.18	2	9.52	Grazing Species
† Mammuthus columbi	6	5.45	1	4.76	Grazing Species
† Equus occidentalis	16	14.54	1	4.76	Grazing Species
† Equus conversidens	4	3.63	1	4.76	Grazing Species
† Camelops hesternus	22	20	3	14.28	Browsing (?) Species
Cervus e. nannodes	2	1.81	2	9.52	Browsing (?) Species
Odocoileus hemionus	4	3.63	2	9.52	Browsing Species
Antilocapra americana	6	5.45	4	19.04	Browsing Species
† Euceratherium collinum	5	4.54	1	4.76	Grazing (?) Species
† Bison antiquis	36	32.72	4	19.04	Grazing Species
Totals	110	99.5	21	99.96	

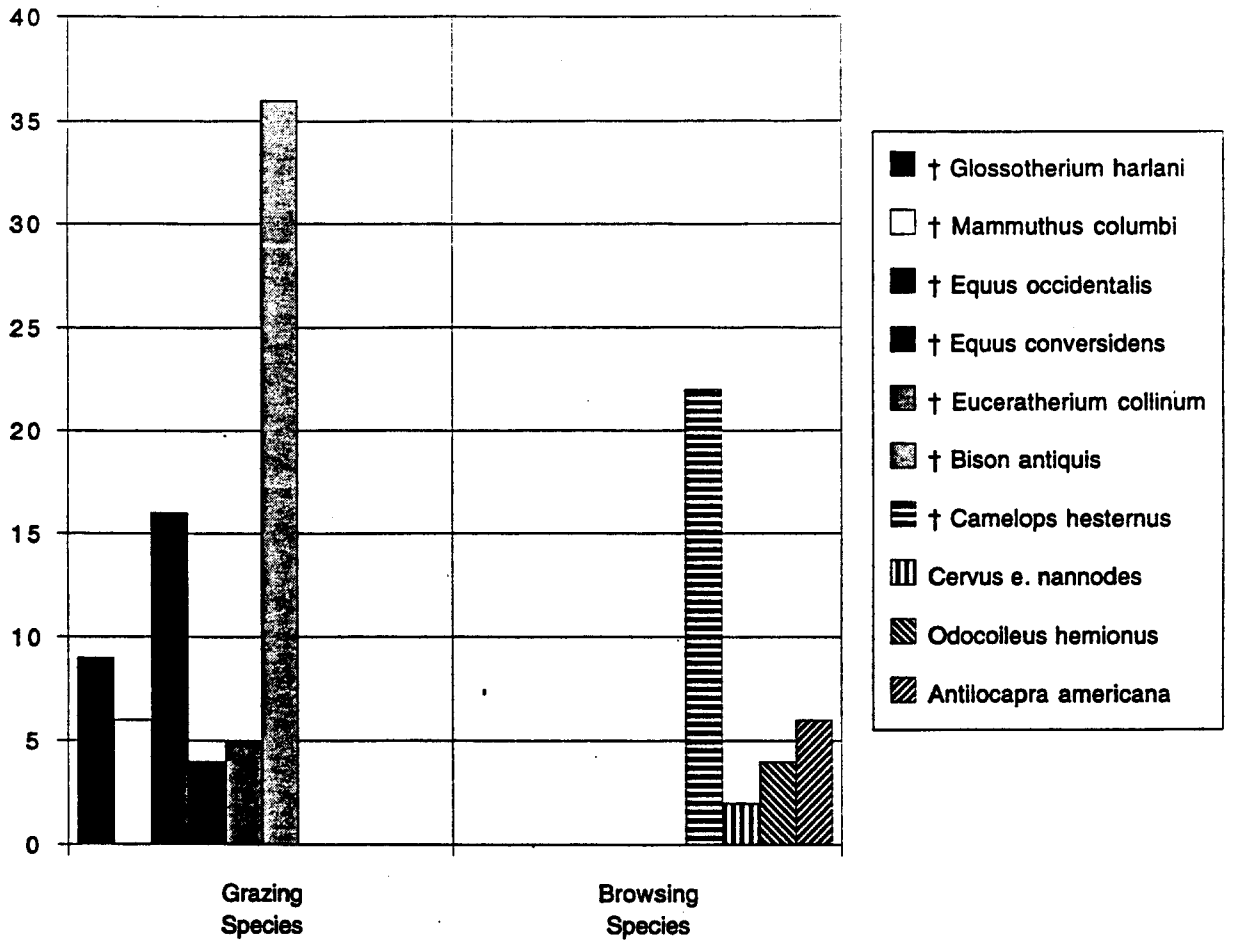

Fig. 4. Relative Frequency (NISP) of Browsing and Grazing Herbivores at Tulare Lake.

behavior from that of their living relatives in the Old World or from those of specialized Andean species in South America. The dromedary in Africa consumes a wide variety of plant foods (Gauthier-Pilters and Dagg 1981). These vary from area to area and seasonally, but certainly include an appreciable amount of scrub and thorny plants that would be considered browse. African camels do eat some grasses, although not in sufficient and regular quantities to classify them as grazing ungulates. The American pronghorn also feeds primarily on shrubs and forbes. Some herds, such as those in Kansas, incorporate more grasses into their diet, although this still amounts to less than 25% of the plants consumed (Hlavachick 1967). Pronghorns vary their foraging habits seasonally, but sagebrush (*Artemisia* sp.) is clearly the single most important component in their diet (Yoakum and Spalinger 1979). Where it occurs, Juniper (*Juniperus* sp.) is also an important food for these animals. In Saskatchewan, for example, pronghorn eat primarily juniper during the winter months and sagebrush and other forage during the remainder of the year (Dirschl 1962). California mule deer are also a browsing ungulate species. These animals, unlike the others discussed here, are adapted to more closed environmental settings. Their presence may be related to the existence of wooded habitats in the vicinity of the lake which are not indicated by the occurrence of other taxa.

DISCUSSION

The remains of large herbivores from Tulare Lake provide evidence which is independent of, and substantially different from, that provided by the palynological records from the lake basin. The pollen specialists have concluded from their data that the region was dominated by a few plant species, notably juniper, sagebrush, and greasewood.

Although other flora are represented in their pollen diagrams, these have essentially been ignored in current interpretations. It would seem the occurrence of species such a *Sarcobatus*, a plant no longer present to the west of the crest of the Sierra Nevada, and the statistical abundance of *Juniperus* and *Artemisia* have captured their attention to the exclusion of other interpretations. Vertebrate faunal data generally provide a considerably more coarse record of paleoenvironmental conditions than do pollen or other more sensitive indicators. This is probably the case at Tulare Lake as well. The faunal evidence, however, does suggest the pollen specialists may perhaps be guilty of over simplification and subsequent misrepresentation of Pleistocene flora in the lake basin. The preponderance of large grazing herbivores in the faunal record cannot be ignored. These fauna indicates grasses must have comprised a relatively important component of the valley flora. The fact they are under-represented in the microfloral record suggests these data must be reevaluated.

There are two prominent problems with the way the palynologists have interpreted the data from Tulare Lake. First, they have given little thought to the formation processes that have produced the microfloral record in the Tulare Lake Basin. Second, they have mistakenly assumed one can infer Pleistocene conditions in this region by simple analogy with existing ecosystems elsewhere in North America. Both of these issues will be discussed.

The Tulare Lake Basin is a major geophysical landform. The size of the area involved, and the fact it is basically a giant sediment trap, means the record contained in the lake sediments will be different than a local record such as might be recovered from a small marsh deposit. The potential source area for pollen and other microfossils in this case is enormous. Juniper pollen found in the lake sediments may well have come from trees located many miles from the lake itself. The same may be said for other wind-pollinated species represented in the pollen sequence. These would include all the taxa considered important by the palynologists. *Artemisia* and *Sarcobatus* are both wind-pollinated, and like other such plants, produce profuse quantities of pollen. The pollen record at Tulare Lake is dominated by wind-pollinated species. Meteorological data from this region indicate winds blow from all directions, although generally they trend from northwest to southeast. At times, wind speed is quite high, although during about 36% of the year it is relatively calm. There is a growing body of paleoclimatic evidence to suggest Pacific-generated storms were somewhat more intense during the late Pleistocene and early Holocene in western North America.

In addition to the potential for long distance pollen travel by air, it is conceivable pollen may have been transported considerable distances by streams feeding into the lake basin. Dating of lake sediments indicates the time interval in question was a period of substantially increased sedimentation rates. This implies an increase in stream discharge and load at this time. Presumably, sediments carried downstream could contain pollen or other microfossils indigenous to their place of origin.

Together, these pieces of information may be helpful in understanding possible distortions in the pollen record at Tulare Lake. It is likely the lake contains two different floral records. One of these is a local record reflecting conditions adjacent to the lake itself. The other is a regional record reflecting conditions in central California in general. The palynologists may have over emphasized the regional record and ignored the local record in their "Great Basin" model of early lake ecology.

The relatively low frequencies of grass pollen in the Tulare Lake record at first glance appear to refute any claim for the presence of grasslands in the vicinity. However, when one considers the fact that the local environmental record is perhaps being masked by regional factors, the relative abundance of Gramineae pollen may be proportionally larger than suggested by Davis (1990) and his colleagues. It is important to note that grasses are not abundant pollen producers. Grasses also have the ability to reproduce vegetatively under conditions of over grazing by herbivores. If herbivore populations were large in the vicinity of the lake, as implied by the faunal data and the relative abundance of dung fungus (*Sporormiella*) spores (Davis 1987, 1990), it is possible local grasses were simply not producing much pollen.

The second major problem with the pollen-generated paleoenvironmental reconstruction of the Tulare Lake Basin is with the use of modern environmental analogy to specifically model past conditions. This method of interpretation has a long history of use and abuse in various fields of inquiry interested in the past. In recent years , as paleoecologists

have become more aware and paleoecology itself more sophisticated, there has been increased recognition that the past was perhaps much different then the present. Pleistocene paleoecologists in the Arctic, for instance, have recently come to terms with the realization that there probably are no modern analogs for the "mammoth steppe" ecosystem that once characterized much of the Northern Hemisphere. Modern tundra is a unique and recently developed ecosystem quite unlike any which preceded it.

I believe the same case may be made for California. It is difficult to imagine that the diversity of large herbivores characteristic of Rancholabrean times were not involved in some sort of co-evolutionary relationship with then-existing valley flora that was unlike that of modern times. Ungulate diversity during the Holocene in the Central Valley was limited to pronghorn, tule elk, and mule deer. Pleistocene diversity was two to three times this magnitude. Certainly this degree of diversity must have resulted in different patterns of habitat partitioning and niche use than anything we can create using contemporary environments as models.

Palynologists have suggested the Great Basin is a suitable analog for reconstructing Pleistocene conditions in the Tulare Lake Basin. This is primarily because of the domination of the pollen record by flora now characteristic of the Great Basin. Interestingly, under natural conditions in the Great Basin, the sagebrush zone is not dominated by *Artemisia* but instead by grass, especially by bunchgrasses. When overgrazing by livestock occurs, the sagebrush expands and dominates the plant community. Experimental studies in the Great Basin have shown that protected ungrazed parcels in the sagebrush community will have bunch grass making up as much as 92% of the total cover while adjacent grazed parcels will be almost exclusively sagebrush (Mozingo 1987:280). If the Tulare Lake Basin was "Great Basin-like," was it like conditions subject to livestock grazing or otherwise? If it was otherwise, grasses should have been an important constituent of the flora.

It is evident that Pleistocene and early Holocene paleoenvironmental conditions were probably more complicated that depicted by any researchers to date. The reconstructions of early historic conditions by Preston (1981) are probably most representative of past conditions, not in the specific identity of plant communities, but in recognizing the complexity of community relationships. The Tulare Lake Basin was probably never a uniform homogeneous environment blanketed with a covering of greasewood, sagebrush, and juniper trees. Instead, it was a mosaic of different plant communities each adapted to localized conditions within the different areas of the basin.

SUMMARY AND CONCLUSIONS

Paleoenvironmental clues to late Pleistocene conditions in the Tulare Lake Basin come from a variety of sources. Pollen records derived from cores removed from the lake deposits have been interpreted as evidence for a Great Basin-like flora within the basin (Atwater et al. 1987; Davis 1990). This flora was dominated by sagebrush, (*Artemisia* sp.), greasewood (*Sarcobatus* sp.), and juniper (*Juniperus* sp.). Faunal remains recovered from early archaeological and paleontological site include significant numbers of large herbivores. Represented in order of abundance are bison (*Bison antiquis*), camel (*Camelops hesternus*), horses (*Equus occidentalis* and *E. conversidens*), big-tongued ground sloth (*Glossotherium harlani*), mammoth (*Mammuthus columbi*), pronghorn (*Antilocapra americana*), shrub ox (*Euceritherium collinum*), mule deer (*Odocoileus hemionus*), and tule elk (*Cervus elaphus nannodes*). The faunal record is dominated by species identified as grazers. This record suggests grasses must have been an important component of the basin flora.

Interpretation of the faunal and floral data have led to two discordant models of late Pleistocene paleoecology for the Tulare Lake Basin. It is suggested here that both hypotheses represent over-simplifications of prehistoric conditions. Regional ecology was probably more diverse than implied by the palynologists and grasses probably were an important component of the valley flora. On the other hand, reconciliation of the two models does not require the presence of extensive savannah-like grasslands as originally suggested by the fauna (Fenenga 1991). Perennial bunchgrasses are characteristic of sagebrush communities in the Great Basin that have not been overgrazed by livestock. It is conceivable the situation in the San Joaquin Valley was similar.

Palynologists have used the Great Basin as a modern analog for past conditions in the Tulare Lake Basin. It is suggested this is unwise as conditions in the past were probably quite unlike those of the present anywhere in North America. Mammalian species diversity alone cannot be accounted for in any modern ecological setting. Accurate paleoenvironmental reconstruction of this region will require considerable more work before we will fully understand its range of variability and other aspects of its inherent complexity.

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A SUPPLEMENTAL BIBLIOGRAPHY FOR THE YOKUTS AND RELATED TOPICS

Complied by

Mary Gorden, Lemon Cove, California

INTRODUCTION

The following references are supplemental to the Yokuts bibliography (published in the 1992 KCAS *Journal*) and the supplement published in the last KCAS *Journal* (1993). These references are presented here with the hope that it will be useful to others studying Yokuts culture. It is by no means a complete source listing, rather, it is intended to provide a foundation upon which to build. Readers with additional references are encouraged to contact the editor. This will facilitate the continued updating of the Yokuts bibliography.

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All illustrative materials (maps, photos, drawings, etc.) should be labeled as FIGURES, numbered consecutively and referenced in the text. A list of figure captions should be placed at the end of the text.

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