THE FARM DROP ZONE SITES, EDWARDS AIR FORCE BASE, CALIFORNIA: IMPLICATIONS FOR REGIONAL SETTLEMENT PATTERN

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ABSTRACT

Testing of prehistoric sites in the Farm Drop Zone on Edwards Air Force Base focused on questions of site function, particularly the potential role of these sites in the regional settlement system. Large villages fitting the "Desert Village" pattern had been identified in the Antelope Valley, and previous research at the Farm Drop Zone sites suggested that they might also fit the pattern. Evidence from the testing indicates that the sites resulted from repeated low-intensity uses of the area over a long period of time, rather than from a village occupation. The implications of these findings are discussed.

INTRODUCTION

Archaeological sites in the immediate vicinity of the Farm Drop Zone on Edwards Air Force Base (Figures 1 and 2) were tested in the spring of 1988 as part of a program to determine the eligibility of these sites for inclusion on the National Register of Historic Places (Hector et al. 1988). Also included in this program was the survey of 1500 acres to determine site boundaries and locate additional resources. The focus of the investigations was on the nature of the sites and their role or roles in regional settlement patterns.

THE NATURAL SETTING

The Farm Drop Zone is on Edwards Air Force Base in the eastern Antelope Valley, an area which has both thick stands of mesquite and scattered stands of Joshua tree. Low shrubs dot the landscape between areas of hard pan and intermittent washes. Ten miles to the west, the western part of the Antelope Valley, along the Tehachapi foothills, is a much more hospitable environment.

The Farm Drop Zone is situated between the dry beds of Rogers Lake and Rosamond Lake. Numerous dunes, many currently partially stabalized with vegetation, occur in this area. Surface water is not currently available at the sites, but springs occur nearby, and water may have been more readily available before historic wells and agricultural practices lowered the water table.

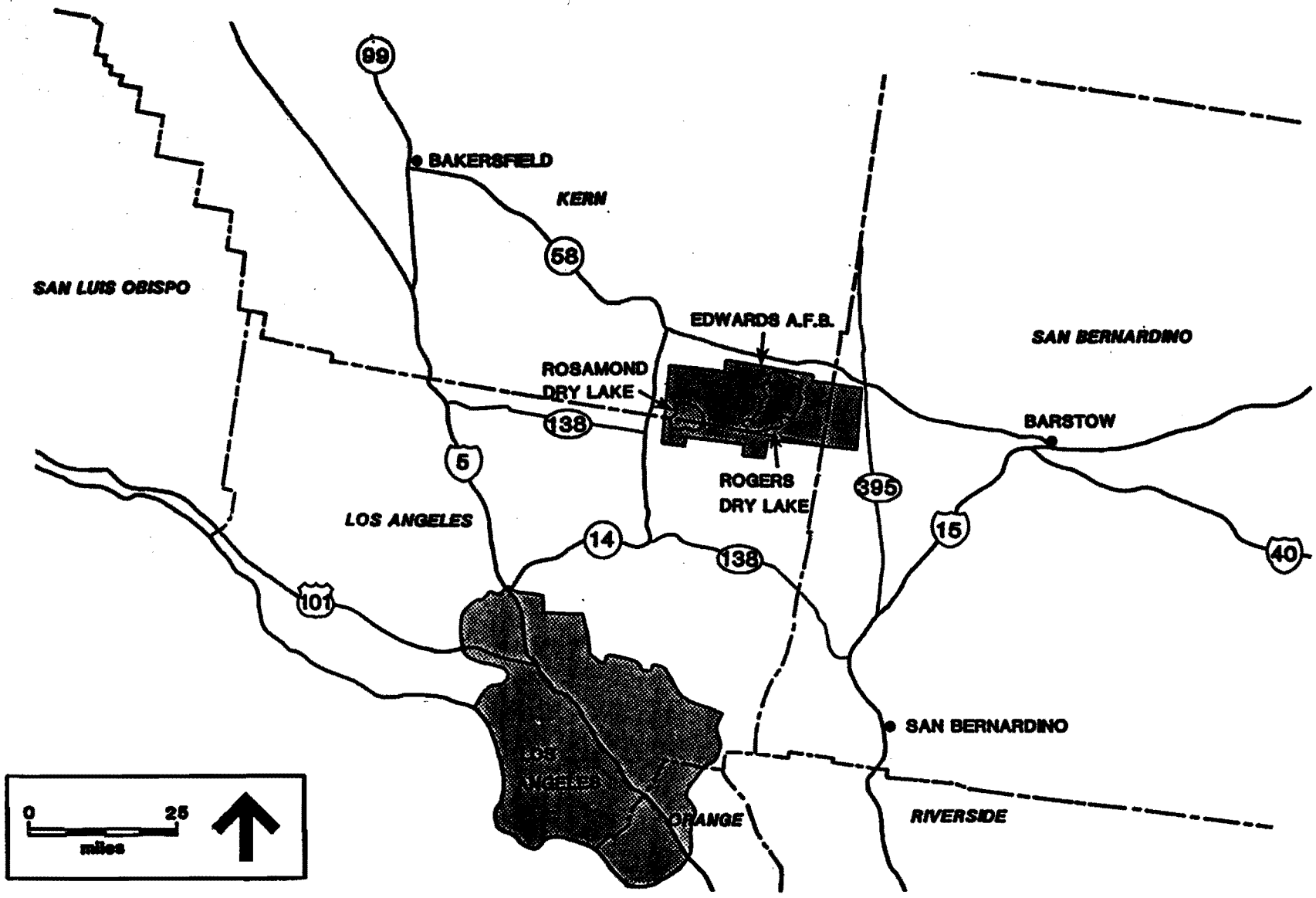

FIGURE 1. Project location.

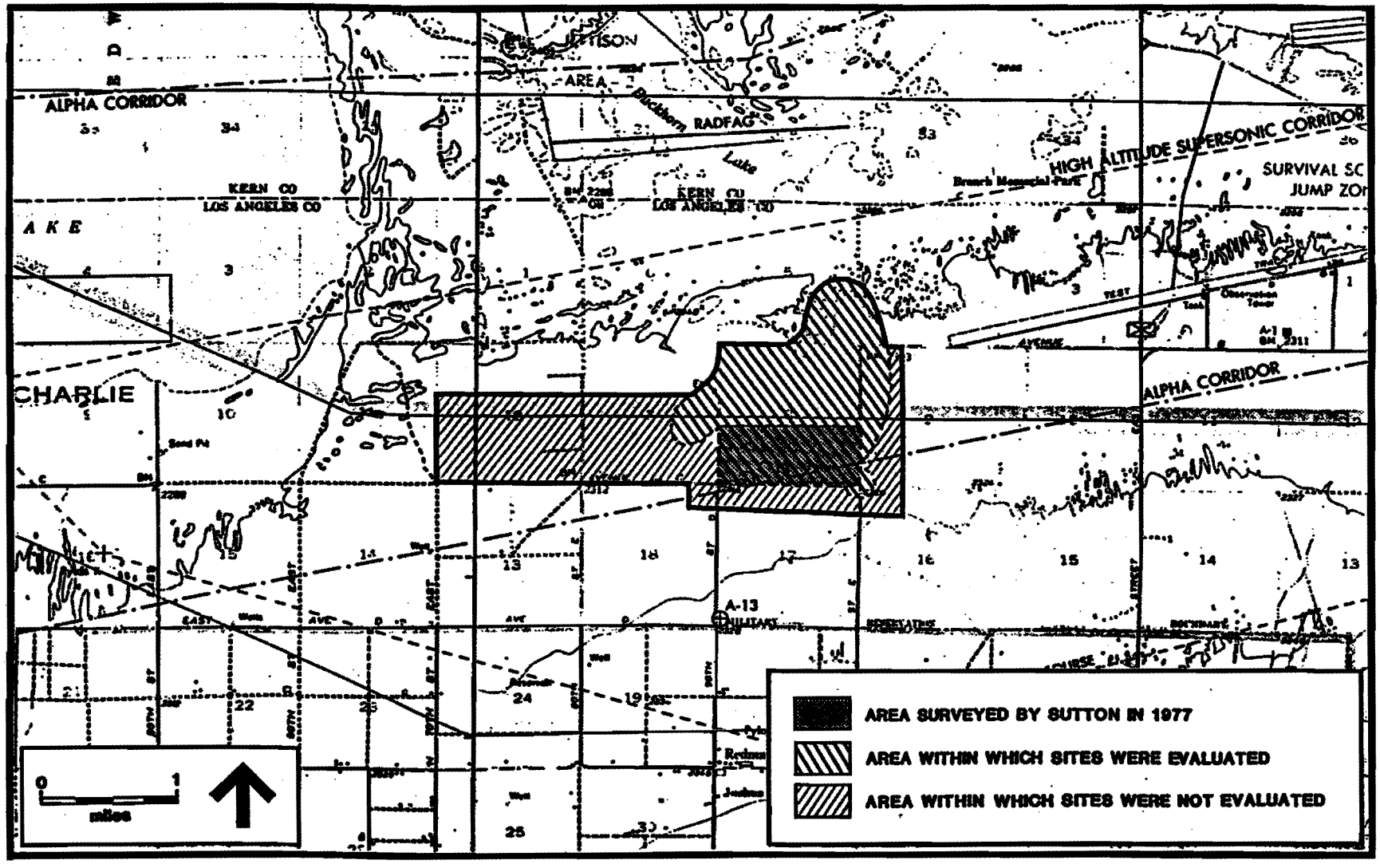

FIGURE 2. The Farm Drop Zone project area.

THE NATURE OF THE SITES

The Farm Drop Zone sites are a series of loci, many of which were originally recorded under different site numbers. The site referred to here as LAn-1296, was recorded as two separate sites, LAn-828 and LAn-771. Important archaeological investigations were conducted at these sites by the Antelope Valley Archaeological Society and by the Air Force. An extensive surface collection of one area of the Farm Drop site was conducted by Van Eggers and the Antelope Valley Archaeological Society (Sutton 1977). Mark Sutton drew some preliminary conclusions about the site based on this work, and indicated that cremations were present. This appears to have been based on the presence of both burned human bone and burned Olivella shell beads. Chester King's analysis of the beads from this work suggested dates for the site of from ca. 200 B.C. to A. D. 600.

During his tenure as Base Archaeologist, Sutton made surface collections and excavated test units in the western portion of what was then LAn-771. A ceramic piece from this work was described by Sutton (1979a) as a figurine fragment that was probably only a portion of a larger piece.

In discussing the prehistory of the Antelope Valley, Sutton (1987) points to three site complexes in the valley as being particularly important: LAn-488, Ker-303, and LAn-828/771 (now designated LAn-1296). He considers these sites to represent the Desert Village pattern described by Bettinger (1978), although he suggests that the sites near the Farm Drop zone may represent a very intensively occupied seasonal site complex. The other two site complexes are on the western edge of the valley and have been investigated by Antelope Valley College. Both Ker-303 and LAn-488 are described as large, complex sites with developed midden areas and cemeteries. The burial pattern represented at both is inhumation (Sutton 1987:75-76). Three structures were encountered at Ker-303 in a sample of approximately 2.5 percent of the site, and numerous trade items were encountered, including shell ornaments, steatite, and obsidian, that indicated widespread trade connections (Sutton 1987:76). The excavations at LAn-488 produced shell beads, as well, with over 5,000 being reported from one child burial (Robinson 1987). Sutton proposes that the presence of extensive grave goods reflects great wealth and social stratification.

The Desert Village Pattern, as described by Bettinger (1978), implies permanent settlements with relatively specialized subsistence practices. The population was organized into political units headed by chieftains whose positions were hereditary. Sutton (1988:25) suggests that trade may have been important and that the village sites may have been supported in part by their position as middlemen in the trade of obsidian from the Coso area to other parts of southern California. The Desert Village pattern is contrasted with the widely held notion of the Desert Culture that suggests that most of the Great Basin was inhabited by

small, autonomous, and highly mobile social groups (Bettinger 1978:42).

RESEARCH DESIGN

The primary orientation of the investigations is an adaptationalist paradigm which views culture as an adaptive mechanism. This perspective focuses on the interaction of human systems with the environments in which they occur and is particularly well suited to the study of archaeological groups in desert areas where the environmental change has major impacts on the indigeneous cultures (Barich 1987:190). Because this approach examines the interaction of cultural systems with environmental systems, control of chronology, particularly the ability to assess the degree of contemporaneity (or lack of it) of sites, settlement types, technologies, and environmental conditions, is critical.

The general characteristics of deserts, including aridity, extreme temperatures, low relative humidity, and irregular rainfall (c.f., Kirmiz 1962:2-3), are factors in the adaptation of all desert-dwelling organisms. Yellen (1977), in discussing adaptations of hunter-gatherers to such environments, stressed three environmental attributes that have significance for human subsistence and settlement patterns. These attributes are:

1. A "relatively poor" environment--low in species diversity and biomass;

2. Scarcity of water;

3. Erratic patterns of precipitation--rainfall is not dependable and can very both from place to place and from year to year.

Although humans make some minor physiological adjustments to heat stress, their adaptation to deserts can be characterized as a response to the problems of scarce resources and environmental predictability (Gross 1980:100).

In arid environments such as the Mohave Desert, water is a resource that is critical to survival because of its scarcity (Kirmiz 1962; Yellen 1977). The record of habitation of such areas is often the history of the availability of water (cf., Lee 1963). Yellen (1977) suggests that traditional energy flow models can be replaced with water flow models when dealing with desert environments.

One aspect of adaptation receiving considerable attention currently is the nature of mobility patterns practiced by cultural groups. Binford (1980) contrasted groups that exhibit residential mobility with those that use a logistical strategy. Groups that practice residential mobility move the population to the resources that are to be consumed. People are in residence at any given place for only a short time, determined by the availability of resources, and food is not stored. In a logisti-

cal strategy, on the other hand, resources are brought to the consumers. Task groups move out from a residential base to exploit specific resources, which are returned to the residential base and may be stored. The locations of consumption are generally removed from the locations of procurement and processing. These two strategies can be combined in varying degrees, as, for example, in groups that travel about in small groups during the greatest part of the year exploiting various resources as they are available, but also accumulating some sort of material in storage for winter when they come together in larger groups that depend on logistically procured food for their subsistence.

Fluctuations in resource yield can be extreme in desert environments (Kirmiz 1963). This extreme fluctuation can be dealt with by having a very broad resource base so that when some resources are underproductive, others can be exploited in their place. Fluctuations can also be buffered by the development of exchange relationships that allow nonsubsistence resources to be traded for subsistence resources in times of food shortage (Lipe 1984:254-255). In such a strategy trading relationships are established and these are used to move food when necessary. The strategy is viable only if it is unlikely that low yields will affect both parties at the same time so that one has the food to supply the other.

Another method of buffering food shortages is through storage of material beyond anticipated needs as a hedge against low harvests. Such strategies can be very effective in agricultural societies (Burns 1983), but they can also be employed by hunter-gatherers (Ingold 1983). The use of storage as a buffer depends on a storable crop that is available in sufficient quantities that it can be harvested and an amount over that needed for regular consumption can be set aside. Such storage is usually done in facilities of some sort and accumulation of any great amount of material in storage tends to limit group mobility, since large quantities of stored food are difficult to transport.

Viewing the complex archaeological record of the Farm Drop Zone in this perspective, the nature of the occupation or occupations that created the loci is a critical question. Three alternative hypotheses were developed to account for the formation of the sites.

Hypothesis 1

Hypothesis 1 is that the site represents a village in a Desert Village adaptation as described by Bettinger (1978). This would imply a relatively large population and at least seasonal sedentism. The loci would represent the locations of individual households or clusters of households, food preparation areas, and discard areas. Interhousehold activity areas such as cemeteries, ceremonial areas, and social gathering areas might also be expected. Implications of this hypothesis are that many of the loci should be contemporaneous with one another. Because villages should have had at least seasonally sedentary populations,

large quantities of refuse should have been produced at these locations. Household use areas should be marked by localized refuse middens containing large amounts of materials. Further, there should be differences between household use areas (the area occupied by a household) and inter-household use areas (areas used by members of several households) in terms of both types and quantities of items present.

Hypothesis 2

Hypothesis 2 is that the various discrete loci recorded in the vicinity of the Farm Drop Zone are the result of repeated use of the area as a campsite over an extended period of time by people who were visiting the area to exploit specific resources such as mesquite. The separate loci would result if subsequent camping events were in different locations. The implications of this hypothesis are that the loci should not be contemporaneous and that some time depth should be evident when loci are compared. In addition, each locus should contain roughly similar assemblages resulting from the performance of a similar range of activities at the camps. Differences between loci could be evident if resource collection locations have specialized artifact assemblages. Such assemblages would differ from those expected at the inter-household use areas suggested in hypothesis 1 in that collection and processing equipment would be major components. There should not be inter-household or inter-camp use areas that would have functionally distinct assemblages from those occurring at camp loci. Because camps would have been used for short periods of time, the amount of refuse discarded during any particular use is expected to be small relative to that expected for even a single seasonal use of a household locus at a village site.

Hypothesis 3

Hypothesis 3 is that the concentration of loci results from the use of the area as a temporary camp by people passing through the area rather than visiting it to collect specific resources. An implication of this hypothesis is that there should be some evidence of nonlocal materials at the loci and there should be little evidence of resource processing or resource collecting equipment. The refuse generated by such camps should be very limited. Loci should not be contemporaneous to any great degree under this hypothesis, and inter-household use areas should be lacking, as well.

INVESTIGATIONS

Our work at the Farm Drop Zone included survey of over 1500 acres to determine site boundaries in the area and to locate previously unrecorded sites, in addition to surface collection and test excavation. Sixty-nine 10- by 10-m units were surface-collected and 1- by 1-m units were excavated in the northeast corner of each surface collection unit. Most surface units were collected by hand, but where artifacts were particularly dense, the surface was scraped up and screened. Excavation progressed

in 10-cm contour levels and all sediment was screened through 1/8-in (0.3-cm) mesh hardware cloth screens.

Loci were chosen at random for investigation and the number of units excavated at a chosen locus were proportional to its size. Within loci, unit placement was judgmental. Additional units were placed judgmentally to investigate particular loci of interest and to expand the sample where necessary (Table 1). Investigating the range of interlocus and intralocus variability was a major theme in designing the sampling strategy.

TABLE 1

ALLOCATION OF SURFACE COLLECTION AND EXCAVATION UNITS AT THE FARM DROP ZONE SITES

Site	Number of randomly selected units	Number of judgmentally placed units
LAn-1296D (formerly LAn-771)	10	3
LAn-1296B, C, E (formerly LAn-828)	18	4
LAn-1158	12	3
LAn-1240	2	
Additional judgmental units		19

Adapted from Hector et al. 1988:Table 1

RESULTS

Materials collected from the Farm Drop Zone sites reveal both similarities and dissimilarities among the loci (Table 2). Based on stage analysis (after Norwood et al. 1981) of the flaked lithic debitage, flakes and shatter indicate that final tool production and maintenance occurred at all loci, and some biface production also occurred (Hector et al. 1988). While the nature of activities reflected in the debitage from the different loci appears similar, the intensity varied. Chert was the dominant material type represented in the debitage.

TABLE 2

SUMMARY OF MATERIALS COLLECTED FROM THE FARM DROP ZONE SITES

Location	Flakes/ Shatter	Tools	Points	Ground Stone	Beads/ Ornaments	Shell	Bone (g)
LAn-1296							
A	442	0	5	0	0	0	10.4
B	385	10	3	23	3	0	99.1
C	60	0	0	13	2	0	11.6
D	885	8	1	7	9	1	29.9
E	4365	40	6	113	38	5	750.0
F	6	0	0	0	0	0	0
total	6143	58	15	156	52	6	901.0
LAn-1158							
A	105	0	0	*	0	0	0.2
B	11	0	0	1	0	0	9.2
C	5	0	0	0	0	0	0.6
D	7	0	0	0	0	0	0.0
E	23	0	0	0	0	0	0.6
total	151	0	0	2	0	0	10.6
Lan-1240	4	0	0	0	0	0	0

* numerous fragments of a schist metate
Source: (Hector et al. 1988:Table 4)

LAn-1296 was the only site in the area to produce flaked lithic tools. All of the loci of this site displayed similar types of tools, similar tool production strategies, and similar incidences of bifacial and unifacial retouch. Both chert and obsidian were important raw materials. Among the flaked tools were 15 projectile points or small bifaces. These items are subject to collection by casual collectors and the numbers recovered are probably low in proportion to other materials. Only 5 of these items were complete enough to allow them to be assigned types within the Heizer and Hester (1978) typology, although two points from previous investigations were available to augment this sample a bit. The typeable points included 3 Rose Spring corner-notched, 1 Desert Side notched, 1 Humbolt, and an Elko corner-notched point. One point was similar to Pinto points. These types of projectile points occurred over a wide range of time in the Mohave desert--from 3350 B.C. to A.D. 1720 by the Heizer and Hester typology.

Manos, pestles, and metates were also recovered, with the greatest number coming from LAn-1296 (Table 2). Food processing seems to have been an important activity at the sites.

Both fragments of shell and shell ornaments, primarily beads, were recovered, too. Bead types were primarily Olivella spire ground, wall, and callus types, although 1 thick clam shell cylinder was also recovered. A Megathura ring and two pieces of worked Haliotis shell were also recovered. Comparison of the ornaments to King's (1981) chronology for the Santa Barbara Channel area indicates that the collection is consistent with assignment to the middle and late periods, from 1400 B.C. to A.D. 1804, but the thick clam shell bead is similar to earlier types. Only 11 of the shell beads were burned.

A large amount of bone was recovered from the sites. The faunal material is the subject of a separate paper (Christenson 1988, 1989), so, except to mention that no human bone was recovered, I will only touch on this topic briefly in the conclusions.

Forty-two pieces of obsidian, including projectile points and flaked stone tools, were submitted for both source analysis and hydration measurement (Table 3). Paul Bouey reported that 40 of the items could be traced to the Coso volcanic field and that the Casa Diablo and Queen sources were represented by one sample each, based on X-ray fluorescence analysis.

Hydration measurements, reported by Rob Jackson, range from a low of 1.9 microns to a high of 10.5 (Table 3). Different hydration rates have been published for Coso obsidian (Ericson 1981; Meighan 1981) and work is currently underway on developing source-specific rates for four recognizable kinds of obsidian from this source (Cleland 1988). Although the assignment of calendar dates to such measurements may be a questionable practice, the question of contemporaneity of loci can be addressed by comparing hydration thicknesses, if we assume that the obsidian from the site has undergone similar post-depositional processes. These comparisons indicate a wide span of time is covered by the occupation of the site (Figure 3). Measurements above 6.5 microns are sporadic and few, suggesting early but sporadic use of the area. There are two clusters of measurements between 2.5 and 5.9 microns, suggesting long-term use of the area at a higher level of intensity. A gap between 4.0 and 4.4 microns may represent a hiatus in the use of the area, although other explanations such as sampling error or disruptions in supply are also possible. Alternatively, the apparent hiatus might be the result of the use of obsidians from the Coso area that hydrate at different rates, producing different peaks for the same period of time. Even considering this possibility, it is apparent that there are differences in time of manufacture of obsidian tools within loci and, in some cases, even within the same collection units.

TABLE 3

OBSIDIAN SOURCES AND HYDRATION MEASUREMENTS
FROM THE FARM DROP ZONE SITES

Site and locus	Catalog number	Unit	Level (cm)	Source	Hydration thickness (microns)
LAn-1158					
Locus A	602	56	surface	Coso	9.2
LAn-1296					
Locus C	037b	4	surface	Coso	3.9
Locus D	430		surface	Coso	7.6
	261	29	0-10	Coso	5.2
Locus E	050b	7	surface	Coso	2.6
	050a	7	surface	Coso	3.2
	076	8	surface	Coso	5.9
	606	8	surface	Coso	10.5
	510	9	surface	Coso	3.4
	537c	10	10-20	Coso	2.8
	537a	10	10-20	Coso	3.0
	537b	10	10-20	Coso	3.4
	612	10	surface	Coso	1.9
	615	10	surface	Coso	4.8
	611	10	surface	Coso	5.2
	608	10	surface	Coso	5.6
	616	10	surface	Coso	5.6
	618	10	surface	Casa Diablo	7.2
	619	11	surface	Coso	2.5
	082	11	surface	Coso	3.5
	080	11	surface	Coso	5.0
	117	12	surface	Coso	4.7
	158	13	surface	Coso	3.6
	172	14	0-10	Coso	5.2
	170b	14	surface	Coso	3.5
	170a	14	surface	Coso	5.4
	182	15	surface	Coso	2.4
	202	18	0-10	Coso	5.1
	198a	18	surface	Coso	2.8
	198b	18	surface	Coso	3.7
	623	18	surface	Queen	3.7
	624	18	surface	Coso	4.5
	598	34	surface	Coso	3.0
	309	34	surface	Coso	4.8
	627	45	surface	Coso	5.9
Locus F	431		surface	Coso	4.5
Outside loci	604	69	surface	Coso	6.9

Notes: Obsidian sources provided by Paul D. Bouey. Hydration measurements by Rob Jackson of Lithochron. (Hector et al. 1988:Table 7).

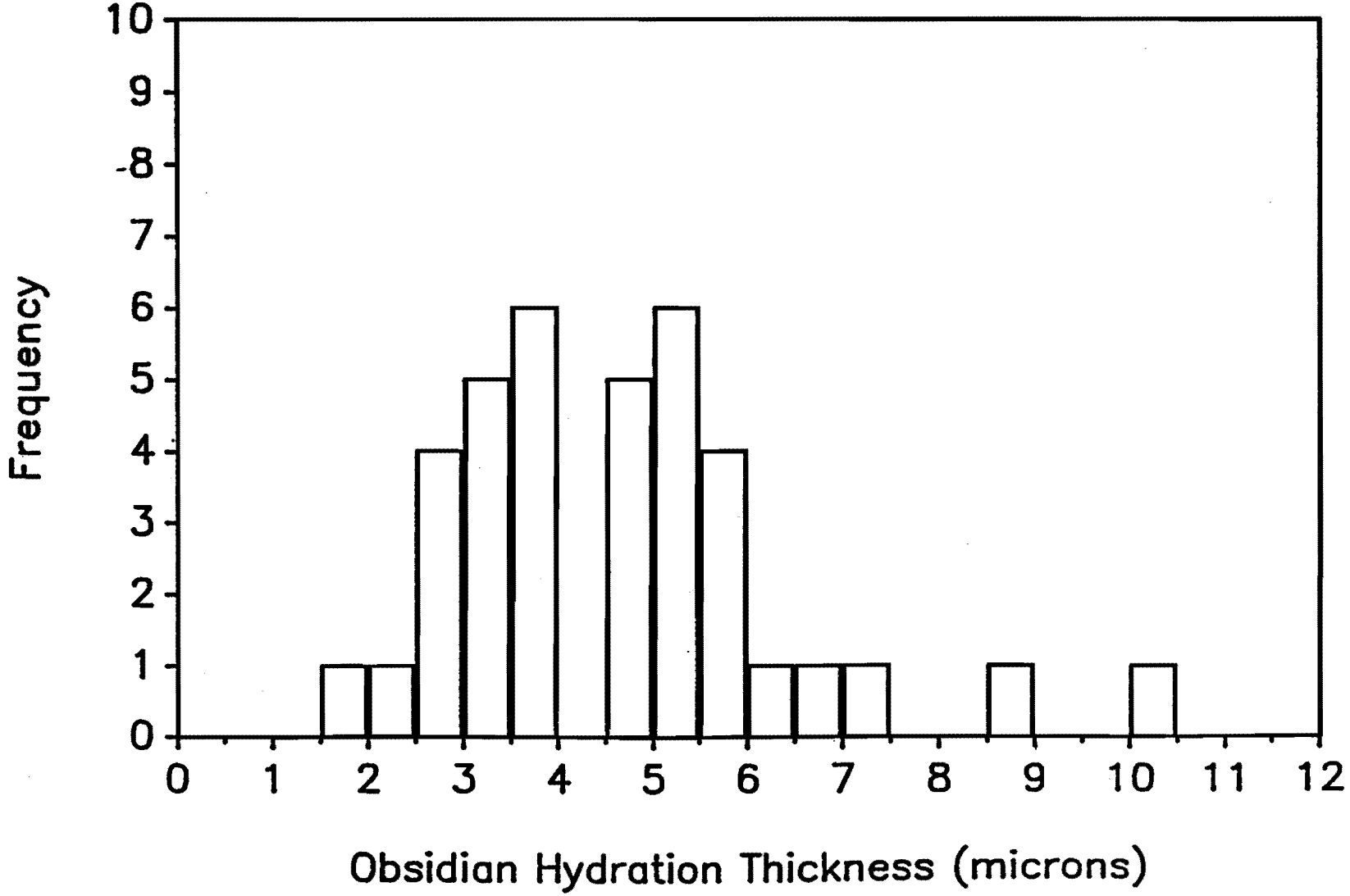

FIGURE 3. Frequency of obsidian hydration measurements.

CONCLUSIONS

The data just summarized allow us to evaluate the three alternative hypotheses about the nature of the occupations that created the loci that make up the Farm Drop Zone sites.

Hypothesis 1. The site areas represent a permanent village in a Desert Village adaptation

The lack of inter-household use areas such as cemeteries contradicts this hypothesis. The presence of cremations as noted by Sutton (1979b), suggests that people occupied the area for periods of time sufficient to die and be cremated. It should be noted that our investigations did not confirm the presence of cremations. Burned beads were recovered, but not in association with burned bone, and beads can become charred without being in cremations. Indeed, burned beads are found on Hohokam sites in houses, hornos, and in trash contexts, as well as in cremations (Gross 1987, 1988).

The lack of major midden areas also contradicts this hypothesis. Although areas of dark soil were noted and tested, the concentration of artifacts in these areas is not what would be expected from a village type of occupation, even if that village had been only seasonally sedentary. The artifact density does not seem to match that reported for two villages (LAn-488 and Ker-303) studied in the Antelope Valley.

The lithic materials are not consistent with the expectations for a village occupation. The variation in the assemblage is small, the debitage reflects primarily tool finishing and maintenance, and evidence for biface production is limited.

As Christenson (1988) reports, the faunal assemblage does not support the Desert Village hypothesis either. Both the variety and amounts of bone recovered differ considerably from expectations for such an occupation.

Finally, the available chronological information is not consistent with expectations for a village site. The obsidian hydration measurements indicate that the area was used for a relatively long period and that there are differences in intensity of use through time. The shell ornament and projectile point types are consistent with this conclusion. With a sedentary village occupation, we would expect such time depth to be associated with substantial quantities of refuse and developed middens. Such is not the case at the Farm Drop Zone sites.

Hypothesis 2. The various loci are the result of repeated usage of the area for camping to exploit particular resources.

This hypothesis is contradicted, to a degree, by the presence of cremations noted by Sutton (1979b). Again, however, our investigations did not locate any evidence of cremations.

On the other hand, the general amount of material recovered appears consistent with the level of intensity of occupation and refuse generation expected under Hypothesis 2. Such occupations, because they were of short durations, would not have developed formalized midden areas, and no such areas were observed.

The lithic assemblage appears to be somewhat focused, with only a small amount of variability in it. Much of the debitage resulted from tool maintenance or final finishing. Ground stone items were relatively plentiful, underscoring the importance of processing activities, again in agreement with the implications of a resource camp. The bone, too, supports this hypothesis.

The sites produced no evidence of structures, which would be expected at a village. Features were limited to hearths, rock circles, and burned rock concentrations, all of which could be expected at camp sites.

The timespan suggested for site occupation by the obsidian hydration measurements, the shell ornaments, and the projectile point types, is long. It appears that the site was used repeatedly over a long period of time, but with varying degrees of intensity.

Hypothesis 3. The loci are the result of groups passing through the area rather than camping to exploit particular resources.

This hypothesis is contradicted by the presence of milling equipment (representing food processing) at a number of the loci. Groups moving through the area would not be expected to invest in such site furniture for camps along their route.

Nonlocal materials are found at the sites, but in a sense all rock at the site is nonlocal material, since the old lake sediments that underlie the area do not contain rock suitable for flaked lithic artifact manufacture, groundstone manufacture, or for heating/boiling stones. The debitage analysis indicates tool maintenance and resharpening which contradicts the notion of quick occupations.

In summary, our data support hypothesis 2. Repetitive activities conducted at each locus resulted in reiteration of artifact attributes throughout the site areas. Locus E of LAn-1296 was probably a focus of activity and was probably reused more often than other loci, based on artifact variability, evidence of tool use, large amounts of obsidian, and large quantities of ground stone relative to the other loci. Despite some differences between loci, strong similarities are exhibited in tool production techniques and raw material selection. Exploitation of mesquite and a limited range of fauna appear to have been the foci of the activities at these camps.

These results serve to remind us that there are often multiple pathways that could have led to particular end results in the archaeological record. Based on surface observations at this site complex, the area meets generally accepted criteria for being labeled a village. It is a large, complex set of loci that has a variety of artifact types present. Consideration of other mechanisms for the creation of such a pattern led us to test alternative hypotheses, one of which offers a more plausible explanation of the site based on the data we were able to collect.

It is obvious that, if we are correct in our conclusions, this site is only a small part in a much larger settlement system. Whether the site was used by people practicing a strategy of short-term residential mobility or one of logistic mobility in which materials were taken back to sedentary or long term residential bases such as the two village sites noted in the western Antelope Valley would be a logical area for further investigation. To fully understand this complex of sites and to fully benefit from the potential data still preserved in it, it will be necessary to place it in its broader context.

NOTES

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