

TEMPORAL PATTERNS OF ARCHAIC LAND USE IN THE EL PASO MOUNTAINS, KERN COUNTY, CALIFORNIA

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Excavations at four sites in the El Paso Mountains of eastern Kern County, California, have shown a strong Rose Spring/Haiwee period occupation component, but have provided no direct evidence of later use. This paper reports evidence of Marana period occupation, based on analysis of an artifact collection from the El Pasos curated at the Maturango Museum in Ridgecrest, California. The analysis shows a Marana period use of the El Paso region as a whole, and also a difference in temporal pattern between the western and the eastern subregions: the former shows a peak in the Rose Spring/Haiwee period, and a decline in the Marana period, while the latter shows a continual increase into the Marana period. This difference in temporal pattern could indicate a cultural divide along the ridge of Black Mountain.

This paper describes the results of an analysis based on the Ron Henry Collection, curated at the Maturango Museum in Ridgecrest, California. The objective of this analysis was to investigate settlement and subsistence patterns in the El Paso Mountain region by studying chronological marker artifacts from the area. The particular research question of interest was whether there was any indication of occupation of this region during the Marana period, since data for this period were lacking from all reported excavations and surveys.

For the purposes of this analysis, the chronological nomenclature of Pearson (1995) is adopted (Table 1). This preserves the basic nomenclature of Bettinger and Taylor (1974), but makes it specific to a slightly more southerly area. Age B.P. is in uncalibrated radiocarbon years before A.D. 1950.

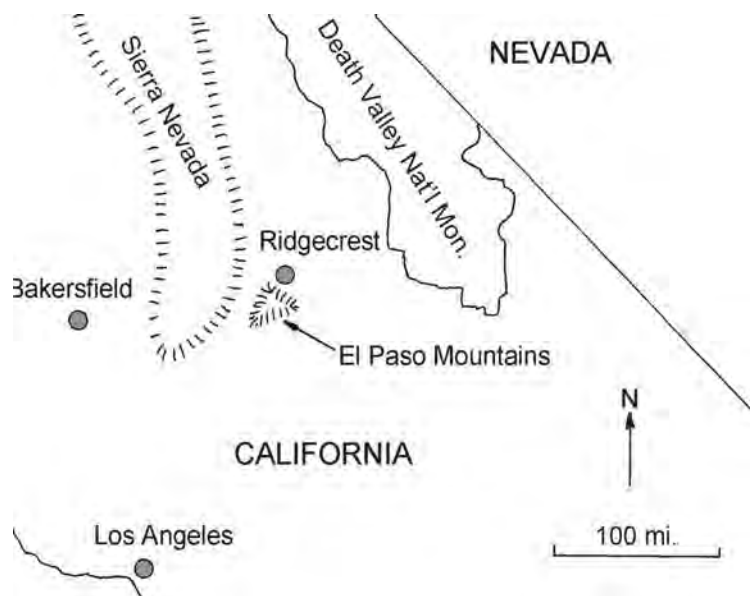
The highest point in the El Paso Range is Black Mountain, at 1,599 m (5,244 ft, USGS Garlock Quad, 7.5-minute series), and the mountainous terrain of the range is generally over 1,000 m in altitude. Rainfall today is sparse; the Navy weather station at China Lake in Indian Wells Valley reported an average between 7.6 and 16.5 cm from 1946 to 1979 (Naval Weapons Center [NWC] 1980). Water is very scarce today, and is confined to a few perennial springs such as Sheep Springs, although long-lasting surface water flows were observed in many washes during the El Niño years of 1998 and 2005. Prevailing winds are from the southwest.

Vegetation at the site today is dominated by *Larrea tridentata* (creosote brush) and *Artemisia tridentata* (sagebrush), with smaller annuals, notably grasses, interspersed (Harper 1986:52-53). Fauna include rodents, *Lepus californicus* (California jackrabbit), *Canis*

ENVIRONMENTAL SETTING

The El Paso Mountains (Figure 1) are a northeast-southwest trending range in eastern Kern County, California, paralleling the Garlock Fault. The southeastern flank of the range borders the Fremont Valley and is relatively precipitous, due to fault action; the northern and western slopes, which border the Indian Wells Valley and the Sierra Nevada respectively, are gentler. The mountains lie within the extreme southwestern corner of the Basin and Range Province, where it abuts the Mojave Block to the south and the Sierra Nevada to the west (Sharp and Glazner 1993:101), and are primarily sedimentary in origin. More recent volcanic activity has added basalt flows and intrusions, as well as erosional debris from the Mojave Block to the south, and today the mountains are overlain with aeolian sand deposits. For practical purposes today, the El Paso Range can be considered to be bounded by US-395 on the east, SR-14 on the west, and the Garlock Road on the south.

Figure 1: Location of the El Paso Mountains in California.



Period	Time Span
Historic	Post-A.D. 1850
Marana	600 B.P. - A.D.1850
Haiwee	1350 - 650 B.P.
Newberry	3150 - 1350 B.P.
Little Lake	6000 - 3150 B.P.
Lake Mohave	Pre-6000 B.P.

Table 1:
Chronological
Framework

Iatrans (coyote), *Gopherus agassizii* (desert tortoise), and numerous snakes and lizards (Harper 1986:57).

ETHNOGRAPHIC BACKGROUND

The region of the El Paso Mountains is generally included in the Kawaiisu territory, although the core area of the Kawaiisu was in the better-watered Tehachapi and southern Sierra Nevada mountains (Kroeber 1925:590, 602; Zigmond 1986:399, Figure 1). The Kawaiisu were first mentioned by Garcés in 1776 as being located in what are now known as the Tehachapi Mountains, and they were described in 1853 as harvesting resources east of Walker Pass (cited in Zigmond 1986:409). Apparently no ethnographic evidence describes them as living in the El Paso Mountains, although they probably did so in prehistoric times (Earle 2003; Sutton 1991, 1996; Underwood 2006). The region just to the north, at Coso, on the other hand, was Koso (also called Panamint) Shoshone territory (Earle 2003; Steward 1938:83; Whitley 1994:358), although multilingual villages also occurred (Barth 1969; Underwood 2006).

The ethnographic Kawaiisu were hunter-gatherers, pursuing a seasonal round to procure food resources. The major food resource was the acorn, available in the Tehachapi, Piute, and Sierra Nevada Mountains, and Zigmond (1986:398) suggested the Kawaiisu made little use of plant resources from the desert, which would suggest infrequent visits. However, Steward (1938:71) indicated the presence of Kawaiisu living full-time in the desert, specifically southern Panamint Valley, the Argus Mountains, and near Trona. It is likely that these people, termed "Desert Kawaiisu" by Earle (2003) and Underwood (2006), would have exploited the same resources as the Shoshone who lived in similar areas, notably *Pinus monophylla* (piñon) nuts, *Mentzelia* sp. (blazing star), *Oryzopsis* sp. (Indian rice grass), and *Prosopis* sp. (mesquite seeds) (Earle 2003; Steward 1938:72; Underwood 2006).

PRIOR WORK IN THE AREA

A review of site records at the Southern San Joaquin Valley Information Center shows approximately 320 sites recorded in the El Paso region as a whole, most of them on the western and southern sides. In the 1960s Apostolides conducted extensive surface surveys in the central El Paso Mountains and prepared a National Register of Historic Places nomination for the Last Chance Canyon Historic District

(Apostolides 1972). He also left survey notes on file at the Ridgecrest Bureau of Land Management field office.

McGuire et al. (1981; see also Moratto 1984:384-385) conducted local excavations at the Last Chance Canyon (CA-KER-261) and Bickel (KER-250) Sites. These sites are located on the western slope of the El Paso Mountains and were being impacted by off-road vehicle use. KER-261 is an extensive and deep site, showing occupation from 1,300 to 700 B.P., based on radiocarbon, obsidian hydration, and projectile point typology (McGuire et al 1981:45). KER-250 is a more ephemeral site, with a single radiocarbon date of 640 ± 75 B.P. (McGuire et al. 1981:109).

Gardner (2002) excavated the Coffee Break Site (KER-5043). This site was assessed as a multicomponent, seasonal habitation site in the Gypsum/Newberry and Rose Spring/Haiwee periods. Radiocarbon results showed two clear temporal phases, one at 880 ± 50 B.P. and the other around $2,490 \pm 60$ B.P.; no Late Prehistoric/Marana component was present (Gardner 2002:66). Obsidian hydration measurements show a similar bimodal structure (Gardner 2002:68, Table 14). Rose Spring and Humboldt projectile points were recovered, as well as ground stone and *Olivella* shell beads (Gardner 2002:44-55).

More recently, Rogers and Rogers (2004) conducted surface survey and limited test excavations at the Terese Site (KER-6188), and mapped and recorded five other sites nearby. These sites are on the northeastern slope of the El Paso Mountains, along a dry wash which drains to China Lake. The sites all exhibit rock rings, extensive ground stone implements, lithic scatters (chert and obsidian), and rock art. Based on obsidian hydration data, the sites appear to date primarily to the Haiwee period, with a limited occupation in the Newberry period (Rogers and Rogers 2004; Rogers 2005). The existence of Marana period occupation in this area is ambiguous but has been inferred from the presence of small rock rings distributed among the larger rings, based on the work of Delacorte (1995). Finally, it should be noted that the Sunburst Site (KER-6485/H) also has a historic component, evidenced by a glass bead (Rogers and Rogers 2004).

In addition to the formal surveys and excavations, a number of interested avocationalists in the Ridgecrest area have surveyed the area while hiking and have compiled maps and field notes. A field school from UCLA was conducted in the eastern El Pasos in the spring of 2004, but results have not yet been published.

Since the investigations described above did not yield explicit chronological indicators of Marana period occupation, a study of the artifact collections in the Maturango Museum was undertaken, focusing on the Ron Henry Collection.

DATA BASE FOR THE STUDY

The Ron Henry Collection was amassed over a period of 30 years by a local avocational archaeologist, the late Dr. Ron Henry, and was collected from the upper Mojave Desert and eastern Sierra Front. It includes flaked and ground stone, pottery, basketry, beads, and historic

Type	Desert Side-Notched	Cotton-wood Triangular	Rose Spring	Elko	Humboldt Concave Base	Humboldt Basal Notched Wide	Gt. Basin Stemmed Silver Lake	Gt. Basin Stemmed Lake Mohave	Leaf
N	6	17	39	17	4	2	1	1	9
% of Total	6%	18%	41%	18%	4%	2%	1%	1%	9%
% of Category	9%	26%	65%	50%	12%	6%	3%	3%	26%

Table 2: Results of Projectile Point Analysis

items. The collection was made systematically (Dr. Henry was a scientist), and source locations were recorded to the cadastral section level at least, and in many cases were noted on USGS topographical maps. The earlier part of the collection is referenced to 15-minute series maps, and the later part to 7.5-minute series maps; since the collection predates hand-held GPS units, Universal Transverse Mercator (UTM) coordinates were not recorded in the field. Most sites in the El Paso Mountains are on the Saltdale and Inyokern 15-minute maps. The collection, catalog, and maps are curated at the Maturango Museum, with an accession number of 87.53.

The analysis approach reported herein focused on projectile points, since they are plentiful in the collection and have been shown to be sensitive temporal markers. When associated time-sensitive artifacts such as ceramics or beads were encountered in the collection, they were noted and analyzed as well. Debitage, bifaces, scrapers, and cores were not analyzed, nor was ground stone.

A review of the catalog revealed 39 entries, each representing a location, from the 300 km² of the El Paso Mountain district. Sites primarily represent the western, northern, and southern areas, with a gap in coverage in the northeast. There is no record of the total area Dr. Henry surveyed, so it is not possible to assess percent coverage. To investigate the research question described above, it was hypothesized that occupation chronology in the El Paso Mountains might be related to proximity to the Sierra Nevada, a perennial source of water and acorn resources even in xeric times. This could have led to differential exploitation, since the western El Paso region is easily accessible to the inhabitants of the Sierra, while the eastern El Paso region is more accessible to dwellers in the Mojave Desert. If so, then differing chronological indicators might be found in the western and eastern portions of the El Paso region. To detect this, the database was partitioned into two subregions: western, comprised of the west and northwest slopes of Black Mountain; and eastern, encompassing the east and southeast slopes of Black Mountain, extending east to US-395. All artifacts were analyzed by these two subregional categories.

It should be noted that each accession number corresponds to a box of artifacts in the original catalog by Dr. Henry, and often contains multiple items. For entries that contained lithics, beads, or ceramics, the artifacts were taken from storage and examined. The analysis approach as applied specifically to projectile points, beads, and ceramics is described below.

RESULTS OF COLLECTION ANALYSIS

Lithics

A total of 225 projectile points and bifaces was examined. Analysis of projectile points was performed following the basic methodological approach of Thomas (1981) and Thomas and Bettinger (1976:280), with refinements on point identification based on Basgall and Giambastiani (1995), Yohe (1992), and Gilreath and Hildebrandt (1997). Further refinements in Humboldt typology were made based on Garfinkel and Yohe (2004). The methodology was applied in a qualitative sense, generally without quantitative measurements. Analysis focused on items which were either obviously projectile points, or which could be reasonably construed as fragments of points. A generally conservative strategy was followed, in that items which could not be classified with reasonable certainty were designated as unidentified. As a result, the identified points total 96, with the remaining 129 items being unidentified (indeed, many of them are more likely to be large, early-stage bifaces rather than points). Table 2 summarizes the breakdown into point types, grouped into categories of arrow point and dart point. A complete tabulation of points and sources is available in Rogers (2004).

Projectile points were made of obsidian, cryptocrystalline silicates (ccs), and basalt. Table 3 presents the breakdown by material category. Clearly obsidian was the material of choice overall, and overwhelmingly so in the case of arrow points. This seems to follow the distribution observed by Gilreath and Hildebrandt (1997) in the Coso region.

Beads

Five beads were identified in the collection from the El Paso Mountains, three *Olivella* sp., one *Tivela* sp., and one glass. The beads and their measurements are summarized in Table 4.

Table 3: Projectile Point Materials.

	N	Percent	N	Percent
Obsidian	58	94%	14	41%
CCS	4	6%	18	53%
Basalt	0	0%	2	6%
Total	62	100%	34	100%

Acc. #	Material	Dimensions (mm)	Remarks
61	<i>Tivela</i> sp.	Circular, 5.0 O.D., 2.2 I.D., 1.7 thick	White disk
71	<i>Olivella</i> sp.	10.3 × 9.0 × 3.4 thick; 1.9 hole diameter	Hole drilled from inside
363	Glass, blue	Cylindrical, 5.0 long, 4.6 O.D., 2.6 I.D.	Bead is split longitudinally; diameter uncertain
364	<i>Olivella</i> sp.	9.2 × 7.4 × 3.1 thick; 1.4 hole diameter	Hole drilled from inside
364	<i>Olivella</i> sp.	Circular, 4.2 O.D., 1.2 I.D.	Small cup bead

Table 4: Beads from the El Paso Mountains (I.D. = inside diameter; O.D. = outside diameter).

Pottery

Pottery sherds were present under a few accession numbers. All are Paiute-Shoshone ceramics, assessed as Owens Valley Brown. Accession #50 contains a significant number of sherds, including rim sherds; the others are much smaller quantities, including one isolate. Table 5 summarizes the samples examined.

CHRONOLOGICAL IMPLICATIONS

El Paso Region

Projectile points may be assigned to periods based on the work of Bettinger (1976, cited in Moratto 1984), Basgall and Giambastiani (1995), and Gilreath and Hildebrandt (1997). The assignment of Desert side-notched and Cottonwood triangular to the Marana period, Rose Spring points to the Haiwee period, and Elko points to the Newberry and Little Lake periods is relatively uncontroversial (sources above). Jennings (1986:117, Figure 3) shows the Humboldt point as essentially synchronous with the Elko, although with a slightly earlier initiation and slightly later termination. Recently, however, Garfinkel and Yohe (2004) have reanalyzed Humboldt points from the western and southwestern Great Basin, and proposed that the Humboldt concave base and the Humboldt basal-notched wide (basal width >24 mm) correspond roughly with the Jennings time scale, but the Humboldt basal-notched narrow (basal width <24 mm) are older, probably from Little Lake period. Finally, based on obsidian studies, Gilreath and Hildebrandt (1997) found that leaf-shaped points and Great Basin Stemmed points are largely Lake Mojave period and older (Gilreath and Hildebrandt 1997:73, Table 16).

Table 6 integrates these perspectives into a single point type chronology for the point types represented in this collection and is the

basis of this analysis, recognizing that some of the Humboldt period assignments are not exact (Garfinkel and Yohe 2004:110, 111). The cautions of Yohe (1992) concerning the simplistic assignment of point types to chronological ages are recognized, but the risks of error are accepted for this first-order analysis.

Bead specimens in the collection also provide chronological indicators. Bennyhoff and Hughes (1987) defined a comparative taxonomy of *Olivella* sp. beads, and argued that beads could be used as indicators of trade routes. They further found that certain bead types were manufactured at specific periods, and hence were effective temporal indicators. More recently, Milliken (1999) has extended the database of Bennyhoff and Hughes to include recent data from sites in the Owens Valley. Analysis of the El Paso beads was performed following the classification taxonomy of Bennyhoff and Hughes (1987), with chronological assignments based on the more recent work of Milliken (1999). Table 7 summarizes the results.

Chronological assignment of ceramics in the southwestern Great Basin is based on the introduction of Owens Valley Brown ware, which occurred relatively late compared with pottery in the Southwest. Madsen (1986) reviewed the data and concluded that Owens Valley Brown, or equivalent, was introduced into the southern Nevada area about 1000 B.P., and spread north and northwest from there in a process which Eerkens (2004) links to intensive seed harvesting and the development of the idea of private property. Madsen estimated 700 B.P. as a probable date for the introduction of Owens Valley Brown ware into the Owens Valley-Death Valley area, which places it primarily in the Marana period.

Results For Subregions

Projectile points in the collection were sorted into typological classes and allocated to the subregions as shown in Figure 2. Table 8

Table 5: Pottery from the El Paso Mountains.

Acc. #	N	Remarks
50	24	5 rim sherds, 19 body sherds. Thicker examples have micaceous temper and are fired brown on outside, gray in inside. Thinner examples are gray throughout.
61	1	Body sherd, gray, coarse temper, scraped smooth.
365	8	1 rim sherd, 7 body sherds. Gray with red areas, coarse temper, scraped smooth.

and Figure 3 show the resulting distribution of projectile point types, again excluding those in the unidentified category.

Using the temporal assignments discussed above in Table 6, the point counts were grouped into temporal marker categories, as shown in Table 9 and Figure 4; the marker count was then transformed into a marker frequency distribution by dividing the count by the total for the subregion (Figure 5).

It is clear by inspection of Figure 5 that there is a quantitative and qualitative difference between the temporal sequences in the two subregions. In particular, the artifact frequency in the western subregion peaks in Haiwee times and then declines, while it continues to increase in the eastern subregion. To determine whether the differences are statistically significant, a Kolmogoroff-Smirnoff test was applied (Bury 1975). This is a powerful test for independence of distributions, whose application was pioneered by Thomas (1988:394-402) for analysis of temporal patterning in projectile point data from Monitor Valley, Nevada. The test consists of comparing the two cumulative distribution functions point by point, determining the maximum difference \bar{A} , and comparing that to a threshold D , which is a function of sample size and confidence level. If the value of D is less than \bar{A} , then the two distributions cannot be distinguished at the specified confidence level (Bury 1975:206). In this case D is .3293 for a confidence level of 85 percent and .3524 for a confidence level of 90 percent.

For the distributions derived from Figure 5, the maximum difference D is 0.3330, so the conclusion is that the difference in projectile point distributions between the two subregions is not significant at the 90 percent confidence level, but is significant at the 85 percent level. This suggests some degree of confidence in the differences in occupation patterns, as evidenced by diagnostic projectile points, but drawing a more definite conclusion will require further data. The implications of this pattern are discussed below.

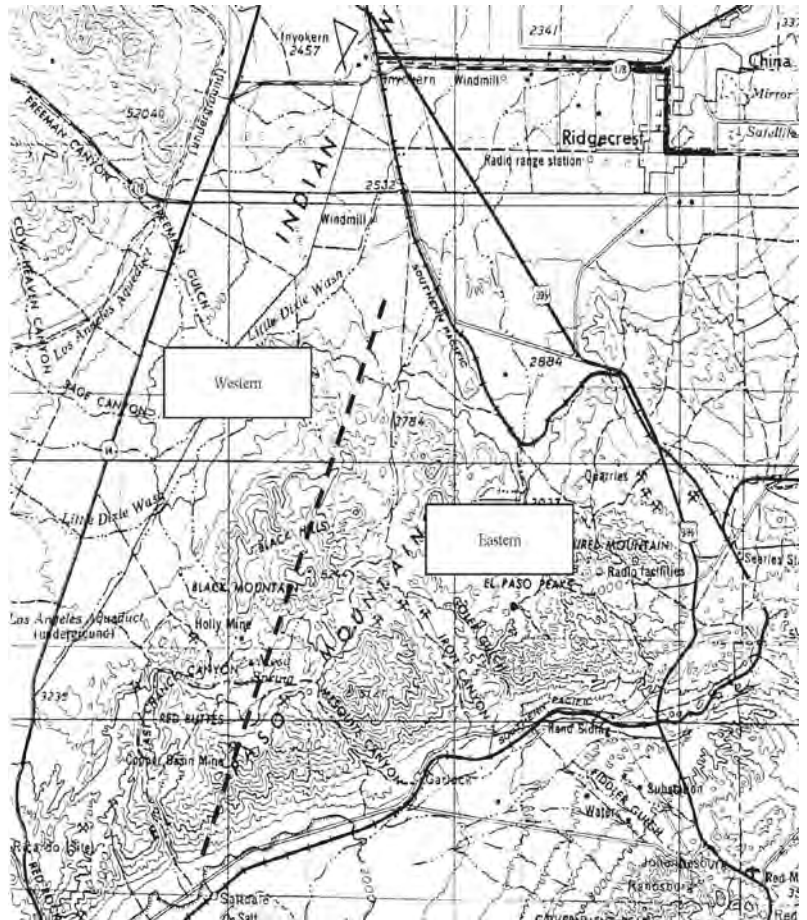


Figure 2: El Paso Mountains, showing sub-regions used in the analysis. Grid is 10 km UTM, north is up.

Table 6: Projectile Point Chronological Markers

Period	Point Types
Marana	Desert side-notched, Cottonwood triangular
Haiwee	Rose Spring
Newberry/Little Lake	Elko, Humboldt concave base, Humboldt basal-notched - wide
Little Lake Mojave	Pinto, Great Basin stemmed (Silver Lake and Lake Mohave), Humboldt basal-notched - narrow, leaf

Table 7: El Paso Mountains Bead Chronology

Acc. #	Material	Type	Age	Reference
61	Tivela sp.	Thick disk	800 B.P.; Late Haiwee/Marana periods	Milliken 1999:68, 85
71	Olivella sp.	F2a	1800-1300 B.P.; Late Newberry period	Milliken 1999:68, 91-93
363	Glass, blue	Category A	Historic; AD 1785-1820	Milliken 1999:72
364	Olivella sp.	F2a	1800-1300 B.P.; Late Newberry period	Milliken 1999:68, 91-93
364	Olivella sp.	K2	800-170 B.P.; Marana period	Milliken 1999:68, 82

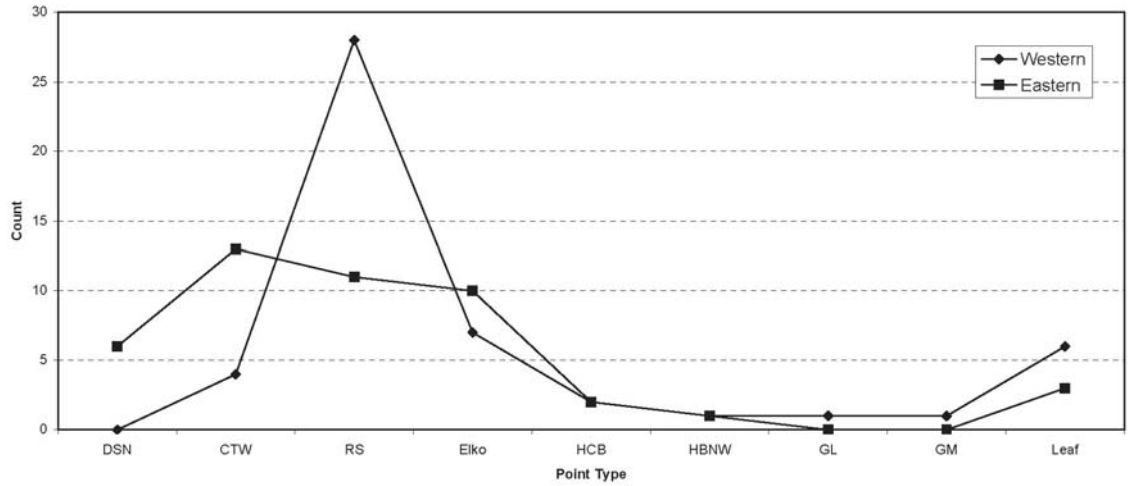


Figure 3: Distribution of points by sub-region.

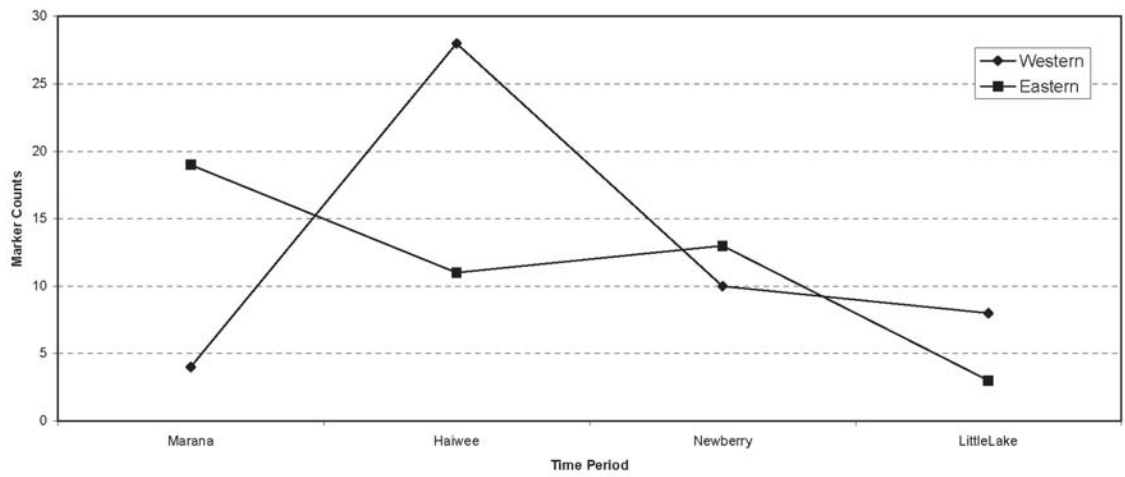


Figure 4: Marker point counts by period and sub-region.

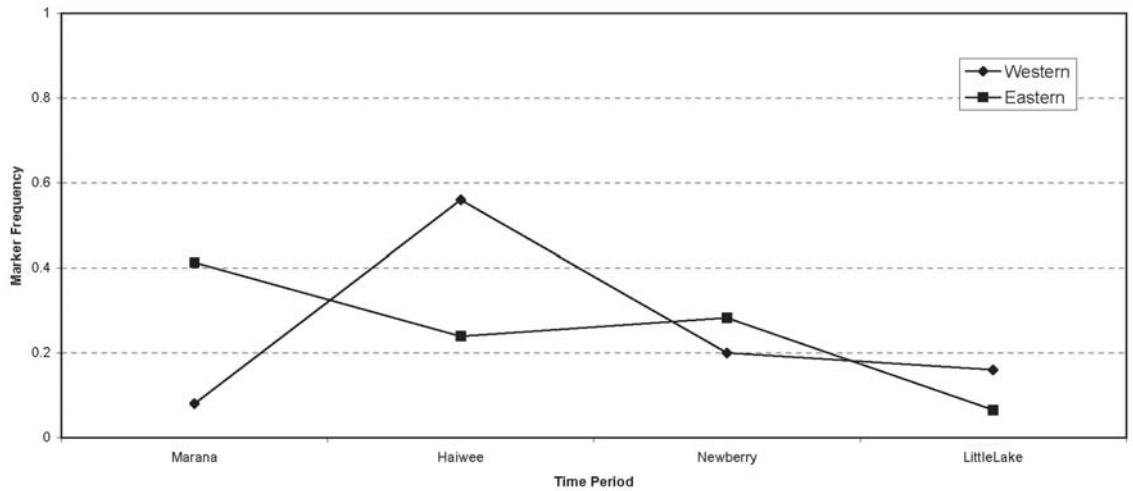


Figure 5: Marker frequencies by period and sub-region.

Point Type	Western	Eastern
Desert side-notched (DSN)	0	6
Cottonwood triangular (CTW)	4	13
Rose Spring (RS)	28	11
Elko	7	10
Humboldt concave base (HCB)	2	2
Humboldt basal notched - wide (HBNW)	1	1
Great Basin stemmed - Silver Lake (GL)	1	0
Great Basin stemmed - Lake Mohave (GM)	1	0
leaf	6	3
Total	50	46

Table 8: Point Types by Time Period and Subregion.

CONSIDERATION OF ERROR SOURCES

Clearly, any quantitative analysis of this type is subject to errors. In this case, four error sources can be identified: location accuracy, completeness of survey coverage, attribution of category types to chronological periods, and the assignment of particular artifacts to categories. These sources are discussed below.

The accuracy of the locations where artifacts were found affects the ability to attribute them to particular subregions. A review of the Henry Collection catalog in the Maturango Museum verifies that all the locations except one were described to township, range, and section, and 14 were described to a quarter section; some extended sites were described as covering more than one section. The description to township/range/section is entirely adequate to assign a site to a subregion, so location is not an issue.

Completeness of coverage, a classic problem in sampling, is less obvious. Plotting the sites on the map shows relatively uniform coverage, except in the northeast corner of the El Paso region, north and east of Sheep Springs. There is no way of knowing at this time how much of the area was actually walked over, but the entire region seems to have been visited. On the other hand, the survey was certainly judgmental rather than truly random, since it appears that canyon bottoms and upland plateaus received preferential attention. Over all,

Table 9: Marker Count by Chronological Age.

Period	Western	Eastern
Marana	4	19
Haiwee	28	11
Newberry/Little Lake	10	13
Little Lake Mojave	8	3
Total	50	46

the coverage seems to be large enough to allay fears of inadequacy, and is probably higher than most professional surveys.

The errors arising from attribution of marker artifacts to classificatory categories were specifically addressed by Thomas (1981), who developed a quantitative algorithm for classification in an attempt to remove ambiguity from the process. However, the algorithm was developed for the specimen set from Monitor Valley, Nevada, and it is not clear how well it works for the southwestern Great Basin. Accordingly, the approach used here was qualitative only. In an attempt to minimize some of the ambiguity that Thomas noted, a conservative strategy was followed here, in that a point or bead was attributed to a category only if confidence was high; otherwise it was classified as unidentified. In this analysis, 74 points were identified as arrow-size, and 62 of them (84 percent) could be assigned to a typological category with good confidence. A total of 150 points was classified as dart-size, but only 23 percent of them could be confidently assigned to a typological category. (In addition, one point was too fragmentary to classify as either arrow or dart.) Thus, the percentage unidentified was much larger for dart points than for arrow points — a not-unexpected phenomenon, since dart points tend to be older and hence exposed to damage for a longer period. The effect of this is that the presence of Newberry and Little Lake period occupations is probably underrepresented in the analysis, but it probably does not affect the conclusions for Marana and Haiwee periods.

The final error source considered here is the temporal duration assigned to specific marker artifacts. Yohe (1992), in particular, cautioned against uncritical acceptance of specific periods for artifact types. With all due caution, however, the attributions are accepted here as valid for a first-order analysis, with the proviso that, if greater temporal resolution is required, an analysis based on radiocarbon, amplified by obsidian hydration, would be essential.

A final caveat on the analysis is that, since it is based on an avocational collection, the data are devoid of clues from the cultural and natural landscape. It would have been of great interest to know if a particular set of artifacts was found in association with, say, rock rings or milling features or dense growth of *Oryzopsis* sp. Unfortunately, the data do not exist, and all we can do is work with what is there.

DISCUSSION

For the region considered as a whole, this analysis demonstrates that indicators are present in the collection for El Paso Mountains land use in all periods from the Little Lake period to the Historic period. This conclusion is based on temporally diagnostic artifacts: projectile points, beads, and pottery. The Historic period is represented by the glass bead, pottery (Owens Valley Brown Ware, which persisted into historic times), and an unidentified historic artifact (acc. #62, which appears to be the handle of a miner's tool). The Marana period is indicated by Desert side-notched and Cottonwood triangular points, Owens Valley Brown Ware pottery, and an *Olivella* sp. small cup (K2) bead. Haiwee period

artifacts include Rose Spring points, and the Newberry/Little Lake period is represented by Elko and wide Humboldt basal-notched points and *Olivella* sp. small saddle (F2a) beads. The earliest period represented, the Lake Mojave period, is indicated only by projectile points, specifically Great Basin stemmed, both Silver Lake and Lake Mojave.

Temporal trends in projectile points in the El Pasos are shown in Figure 6. Clearly a peak in projectile point frequency (presumably reflecting a peak in land use) occurred in the Haiwee period, which is also suggested by obsidian dates reported from KER-6188 (Rogers and Rogers 2004) and by data from KER-5043 (Gardner 2002) and KER-261 (McGuire et al. 1981). The Historic period was ignored, since no projectile points dating exclusively from that period were included in the collection. However, the projectile point frequencies in Figure 6 do not indicate relative intensity of use through time, since the time intervals are not of equal duration. The long duration of the Little Lake and Newberry periods brings the curve down and accentuates the Haiwee period use further.

This analysis therefore supports the findings previously reported (Gardner 2002; McGuire et al. 1981; Rogers and Rogers 2004) of a major Haiwee period use of the area. In distinction to these findings, however, the present analysis suggests significant Marana and Historic period use of the area, further supported by the report of an Historic period glass bead at KER-6485/H (Rogers and Rogers 2004). (The rock rings at KER-6188 and other sites may be Marana period threshing features, as suggested by Delacorte [1995]; however, his conclusions were drawn in the Bishop Tablelands area, some 300 km north of the El Pasos and among a different ethnic group, and thus need to be confirmed in the El Pasos.) Indications for Newberry and Little Lake period use of the El Paso Mountains area are weaker, but nonetheless present.

If the differences between the projectile point distributions of the western and eastern subregions are accepted as significant, a similar analysis can be applied to each subregion. When the subregion frequency data of Figure 5 are normalized to period duration as well, the result is as shown in Figure 8. Despite the fact that the difference is significant only at the 85 percent level, there seems to be a clear distinction between the temporal trends in the two subregions.

The western subregion shows a peak in the Haiwee period, with a subsequent decline, while the eastern subregion shows a continued increase into the Marana period. Furthermore, the one bead from the western area is *Tivela* sp. (acc. # 61), which is late Haiwee to early Marana in age (Table 7), and pottery is represented by only a single sherd (also acc. # 61). Finally, it should be noted that the western subregion also borders the Sierra foothills, where Williams (2004) reported a site at Freeman Spring (KER-6106) with a significant Rose Spring/Haiwee period component but no later components.

The eastern subregion has a much stronger Marana period component. In addition to the late projectile points, significant amounts of pottery were present, plus the Historic period glass bead (acc. # 363). This subregion is also closer to the central Mojave Desert

than is the western subregion, and might have been attractive to occupants of the desert for its perennial springs (few though they were) and as a source of lithic resources (chert and quartzite) and seeds. In this vein, Allen (2004) reported evidence for both Haiwee and Marana period occupation from the Red Mountain Archaeological District 20 km to the southeast of the El Paso area.

The implications for southwestern Great Basin population models are ambiguous. Sutton (1991) proposed a model in which the region was occupied during the Newberry and early Haiwee periods, when mesic climatic conditions generally prevailed, but was essentially abandoned with the onset of the Medieval Climatic Anomaly (MCA). Gardner (2002) tested a refinement of the model specifically derived for the El Paso region. She proposed that the majority of the population would have occupied the Koehn Lake borderlands during the lake high stand between 1430 and 970 B.P., exploiting lacustrine resources (Gardner 2002). As the climate became increasingly xeric with the onset of the MCA, populations would have moved to progressively higher and better-watered areas such as the El Paso Mountains and Sierra Nevada; finally, at the height of the MCA, the El Paso area would have desiccated and been abandoned.

Any such abandonment would have occurred in late Haiwee and early Marana times, since the Haiwee-Marana transition does not correspond with the onset of the MCA. The MCA is generally regarded as having started during the latter part of the Haiwee period, and the climate was ameliorating by Marana times. If the El Pasos were in fact abandoned during the MCA and later reoccupied, the temporal resolution of the present analysis was not fine enough to distinguish it.

Obviously, a major limitation to the present analysis is the coarse granularity of the temporal data, which are based on projectile point typology. Greater resolution could possibly be attained by making obsidian hydration measurements on the points, although this is debatable. A strategy based on obsidian hydration measurements was not employed, because it would have required damaging the points in the collection, and an analysis based on typology was deemed sufficiently accurate to address the research question posed here.

Even with this limitation, the present analysis suggests the El Paso area was utilized in Haiwee times and continued to be utilized in the Marana period to some degree, which implies that some explanation in addition to climatic change is required to explain occupation patterns. A possible explanation for the observed pattern might be that the El Pasos were exploited on a regular basis during the mesic climatic interval preceding the MCA (corresponding to the reported high stands at Koehn Lake), leading to the indications of significant use found by this analysis for the Haiwee period (Figure 8). Following a period of depopulation in the late Haiwee and early Marana periods due to the MCA, the western El Pasos might have been exploited intermittently by people from the Sierra Nevada, while exploitation of the eastern El Pasos was by populations from further east. In this view, Sierran populations (Kawaiisu) would have had little need to visit the desert valleys or El Paso Mountains in Marana times, because they already had access to the resources they required in the well-watered Sierra, thus leading to the drop in usage in the western El Pasos seen in the Marana

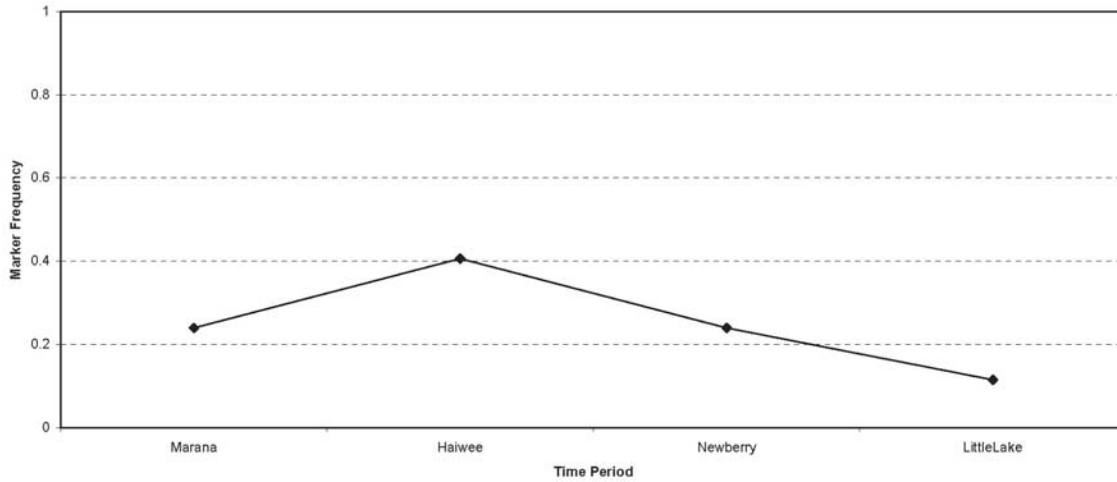


Figure 6: Temporal trends in projectile points in the El Paso Mountains, by sub-region

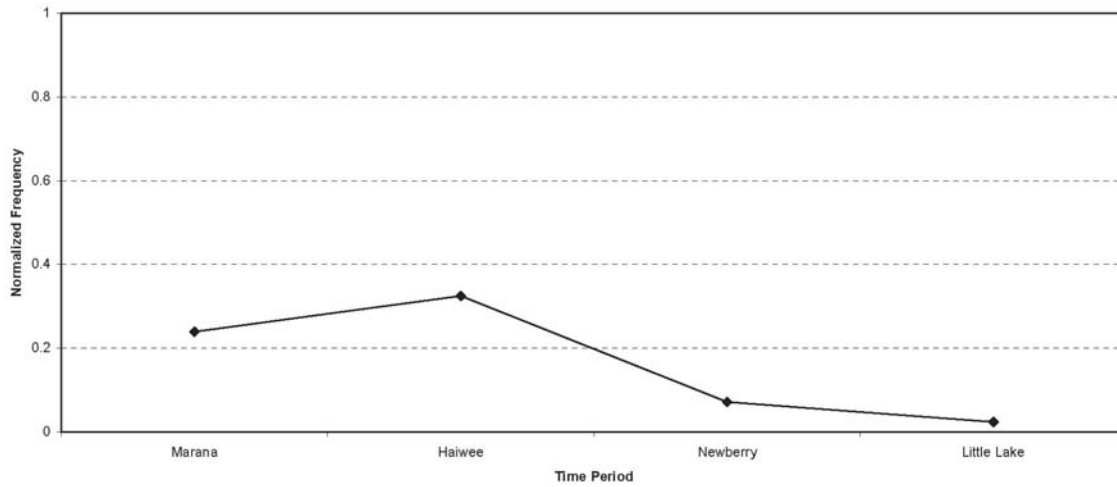


Figure 7: Projectile point frequencies through time, normalized by period duration.

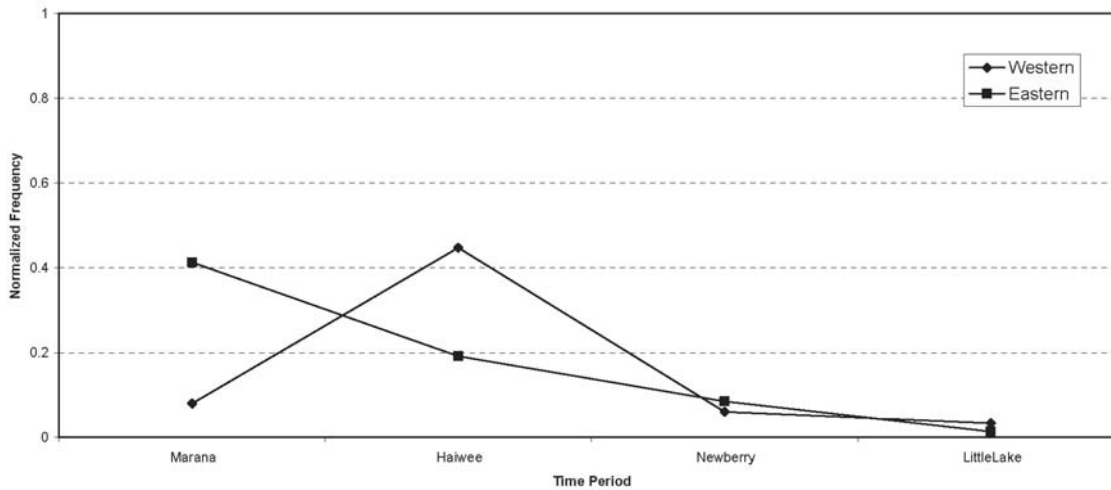


Figure 8: Projectile point frequencies for western and eastern regions through time, normalized by period duration.

period. Alternatively, game depletion might have been a factor in decreased use of the western subregion in this period.

For the eastern El Paso subregion, different influences may have been in effect. The springs and other resources of the eastern El Paso area might have continued to be very attractive to populations such as the Desert Kawaiisu living further east in more xeric areas. This would have led to continued, and possibly increasing, use of the eastern El Pasos into the Marana period, as indicated by this analysis (Figure 8). It is thus possible that the crest of the Black Mountain formation was a de facto cultural divide, with areas exploited by Kawaiisu to the west and Desert Kawaiisu to the east.

Overall, the projectile point data suggest the presence of people but not necessarily long-term occupation; projectile points could have been the result of foraging expeditions or trips to exploit chert and quartzite resources. Such occupation could have been relatively frequent but short-term, and could account for the large number of rock rings to be found in the El Pasos. On the other hand, the ceramic evidence suggests longer-term use, at least in certain eastern areas such as Sheep Springs, which may have provided perennial water. And the site complexity and midden depth at KER-6188 suggests either long-term or repeated occupation. Much more work is needed on this point.

Thus, analysis of projectile points, beads, and ceramics in the Ron Henry Collection does provide indications of settlement sequences in the El Paso Mountains. The three artifact classes suggest use of the area from Newberry/Little Lake through historic times, with some indication of an earlier Lake Mojave period use. The results of this analysis suggest that further collections analysis may be fruitful as a means of elucidating the prehistory of this little-explored area.

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