

HIGH-STAND SHORELINE SURVEY IN THE SEARLES LAKE AREA, SAN BERNARDINO COUNTY, CALIFORNIA

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The Late/Terminal Pleistocene shorelines of the California deserts have fascinated archaeologists at least since the 1930s, when the Campbells conducted their pioneering studies in the Lake Mohave area (Campbell et al. 1937). Their interest in the relationship of human occupation to ancient lake margins was extended into the northern Mojave Desert by Emma Lou Davis (1978) who, with a series of colleagues, spent a number of years working in the Ridgecrest area, mostly at Pleistocene Lake China and the Panamint Valley. Though Davis' contributions to the archaeological literature are well-known, she also had a significant local impact, especially among those who volunteered for her projects. One of these was the artist Sylvia Winslow, whose personal interests in local archaeology were fanned by Davis. As a result of their working relationship and friendship, Winslow scoured much of the region looking for potential early sites. One of the areas that looked particularly promising to her was the Christmas Canyon sub-basin of Searles Valley, located south of the town of Trona. The Christmas Canyon Area of Critical Environmental Concern (ACEC) was created by the Bureau of Land Management (BLM) at her suggestion in order to preserve what was clearly a dense concentration of sites on the south side of this geomorphological feature.

The Christmas Canyon area is a remnant of the Pleistocene system of lakes that covered the Great Basin until the end of the Pleistocene (Figure 1). Between roughly 30,000 and 15,000 years before present (YBP) (Bishoff and Cummings 2001) and again about 11,500 YBP (Smith et al. 1983, 1993), when these lakes were at their high stand, paleohydrological and geomorphological conditions resulted in the creation of a beach ridge where Christmas Canyon enters Searles Valley. This large beach ridge separated this small embayment from Searles Lake (and Valley) as a whole. This had two consequences. First, it contributed to the preservation of an intact Late Pleistocene and Early Holocene landscape, one that has not suffered from the subsequent erosion and degradation experienced by the vast majority of the California Desert. Second, and largely due to this first fact, this intact ancient landscape contains a dense, very well-preserved and extremely important concentration of Late Pleistocene and Early Holocene archaeological sites; that is, sites dating between 7,000 and 11,000 YBP, if not potentially earlier.

From 2002 to 2004, we conducted a series of projects within the Christmas Canyon sub-basin for the BLM. These included site micro-mapping within the ACEC itself, reconnaissance-level and intensive site surveys more widely across the sub-basin, and dating research. While there is still considerable work to be done within

this area, the following is a preliminary report on our studies, intended to highlight some of the key findings so far. One of these involves rock cairns and geoglyphs, which are unusually common in this area.

Rock cairns and geoglyphs are effectly ignored by many archaeologists, but they were of course particularly interesting to Jay von Werlhof (1987, 1995, 2004). We hope for this reason that the comments we offer below on their age, distribution and possible functions will contribute to the research on this topic that Jay pioneered.

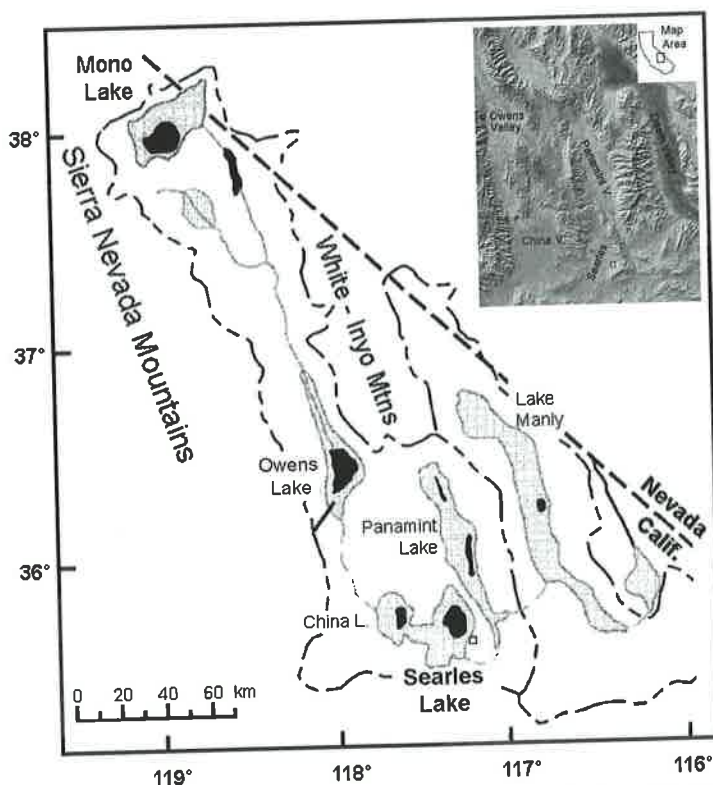


Figure 1. Series of closed hydrologic basins created by the tectonics of eastern California. During the wetter late Pleistocene, the surface hydrology of eastern California (adapted from Smith et al. 1983) connected a series of paleolakes that terminated at Death Valley about 140,000 YBP and Panamint Valley about 30,000 to 15,000 YBP. The timing of these lakes corresponds with glacial advances in the Sierra Nevada (Bishoff and Cummings, 2001). The small box on the southeast side of Searles Valley indicates the location of the Christmas Canyon field site.

SURFACE EXPOSURE DATING

The first of our projects provided the initial evidence pointing to the great age and therefore importance of the sites in this area (Cervený et al. 2006). Using a variety of chronometric techniques, 30 chronometric ages have been obtained from ACEC sites. These derive from surface stone tools, cairns, rock rings, rock quarry surfaces, and geoglyphs. Note that all of these types of archaeological remains are found exposed on the ground surface rather than buried in the soil and the dating techniques employed specifically address surface exposure dating. They include varnish microlamination (VML) dating; cation-ratio (CR) dating, lead-profile dating, and AMS ^{14}C dating of calcium carbonate coatings (see Dorn 2001 for a summary of these approaches). These are typically combined for any given specimen.

While all of these approaches represent experimental techniques, the combination of multiple independent techniques on individual specimens promotes confidence in the results. Whereas other methods may take an abundance of time (e.g. varnish microlaminations) or funds (e.g. accelerator radiocarbon dating), CR dating provides researchers a chance to obtain a snapshot—a quick and relatively inexpensive “overview” of the chronometry.

The CR ages range from 500 ± 200 YBP to $14,800 \pm 1500$ YBP (Table 1); that is, from the recent prehistoric past to the Pre-Clovis Period. (Note that the error factors given for these dates represent 2 standard deviations or 98% confidence interval). Fully one-third of these dates are greater than 7000 YBP (at 2 standard deviations) and thus pertain to the periods of greatest archaeological interest and significance, in the California deserts. Of particular note in this regard are ^{14}C ages of 7260 ± 40 YBP and 8440 ± 60 YBP on two rock rings, and ages of $14,800 \pm 1500$ and 8800 ± 2000 YBP on two different worked exposures of a jasper quarry. Put another way, ages were obtained from 13 different sites, and six of these sites—or 46% of them—had ages greater than 7000 YBP.

The general strategy of much of the dating work, particularly concerning rock features, involved identifying human alterations to natural landforms, settings, and contexts. Consider a boulder in a desert pavement. A key characteristic of the general Christmas Canyon geomorphological context is long-term stability. In the case of the boulder, this means that it has a particular orientation and position relative to the air, the ground surface, and the subsoil, and this orientation has been stable over time (Figure 2A). Note in this regard four different kinds of the rock coatings that will form over time on our boulder: black rock varnish, in the area exposed to the air; a centimeter-wide black line of very shiny varnish that occurs as a kind of ground-band; an orange iron film that occurs on the undersides of boulders; and a white pedogenic carbonate coating

that will develop, given enough time and given that the boulder is emplaced deep enough (e.g. 40 cm) in the subsoil.

Human modification, such as re-positioning the boulder, can change this orientation and thereby change the kind of rock coating that any single portion of the boulder develops over time. Because each of the original kinds of rock coatings signaled a particular position in the ground, changes in these coatings reveal both that the boulder has been moved, and that the move results in a kind of palimpsest of different rock coatings that can be used to constrain the age of this positional modification; that is, the human action that moved the boulder.

Table 1. Cation-Ratio Ages on Materials in the Christmas Canyon Area, Using the Cation-Leaching Curve Developed for the Coso Range Petroglyphs (cf. Dorn 1998).

Site	Sample	Cation Ratio Age
Site #1	01-BLM-XMAS-1c Chert Core	2100±500
	01-BLM-XMAS-1a Rhyolitic Flake	2300±600
	01-BLM-XMAS-2c Chert Core	8600±800
	01-BLM-XMAS-2a Quartz Flake	8000±900
Site #13	01-BLM-XMAS-3a Quartz Flake Scar from a scatter	7100±1000
	01-BLM-XMAS-4a Quartz Flake Scar from a scatter	6700±1200
	01-BLM-XMAS-5a Quartz Flake Scar from a scatter	6000±1000
Site #11	01-BLM-XMAS-27a refitted flake	800±250
	01-BLM-XMAS-28a refitted flake	950±250
Site #2	01-BLM-XMAS-6a Quartz Flake Scar from a scatter	2100±600
	01-BLM-XMAS-7a Quartz Flake Scar from a scatter	1600±300
	01-BLM-XMAS-8a Quartz Flake Scar from a scatter	1800±600
	01-BLM-XMAS-9a Quartz Flake Scar from a scatter	1500±200
	01-BLM-XMAS-10a Quartz Flake Scar from a scatter	2000±600
Site #3	01-BLM-XMAS-11a refitted quartzite cobble	600±200
	01-BLM-XMAS-12a refitted quartzite cobble	500±200
	01-BLM-XMAS-13a refitted quartzite cobble	600±200
Site #15	01-BLM-XMAS-23a chert flake	1800±400
	01-BLM-XMAS-24a chert flake	1500±500
	01-BLM-XMAS-25a chert flake	1500±400
	01-BLM-XMAS-26a chert flake	1900±700
	01-BLM-XMAS-3c jasper corer	1800±400
Quarry Area	Davey Flake	6600±1300
	Quarry Face 1	14,800±1500
	Quarry Face 2	8800±2000
	Quarry Face 3	800±200
	“Running Man” Geoglyph Chip	900±350
	Snake Geoglyph Chip (on flipped orange bottom varnish)	<300

If this boulder were rotated (Figure 2B), for example, in a way that exposed the former groundline/subsurface orange varnish to the air, this rotation can be readily identified. (Confidence that this change was due to human modification occurs if boulders in the immediate surrounding area lack any evidence of this repositioning, indicating that it did not occur for example due to general downslope movement). The varnish microlamination method (Liu 2003) can be used in such cases. In the case of our boulder from the Christmas Canyon ACEC, the method yielded evidence of a terminal Pleistocene age for the creation of this cairn (Figure 2C).

that carbonate coatings themselves have a kind of microstratigraphy, and we felt that by AMS dating only the lowest carbonate layers that are partly silicified, we would have a better chance of obtaining an inferentially useful AMS age. Using specimens graciously provided by Luz Ramirez de Bryson, we applied this technique to two samples from a site called Lagunitas, located near the playa bottom in the ACEC, where she was working.

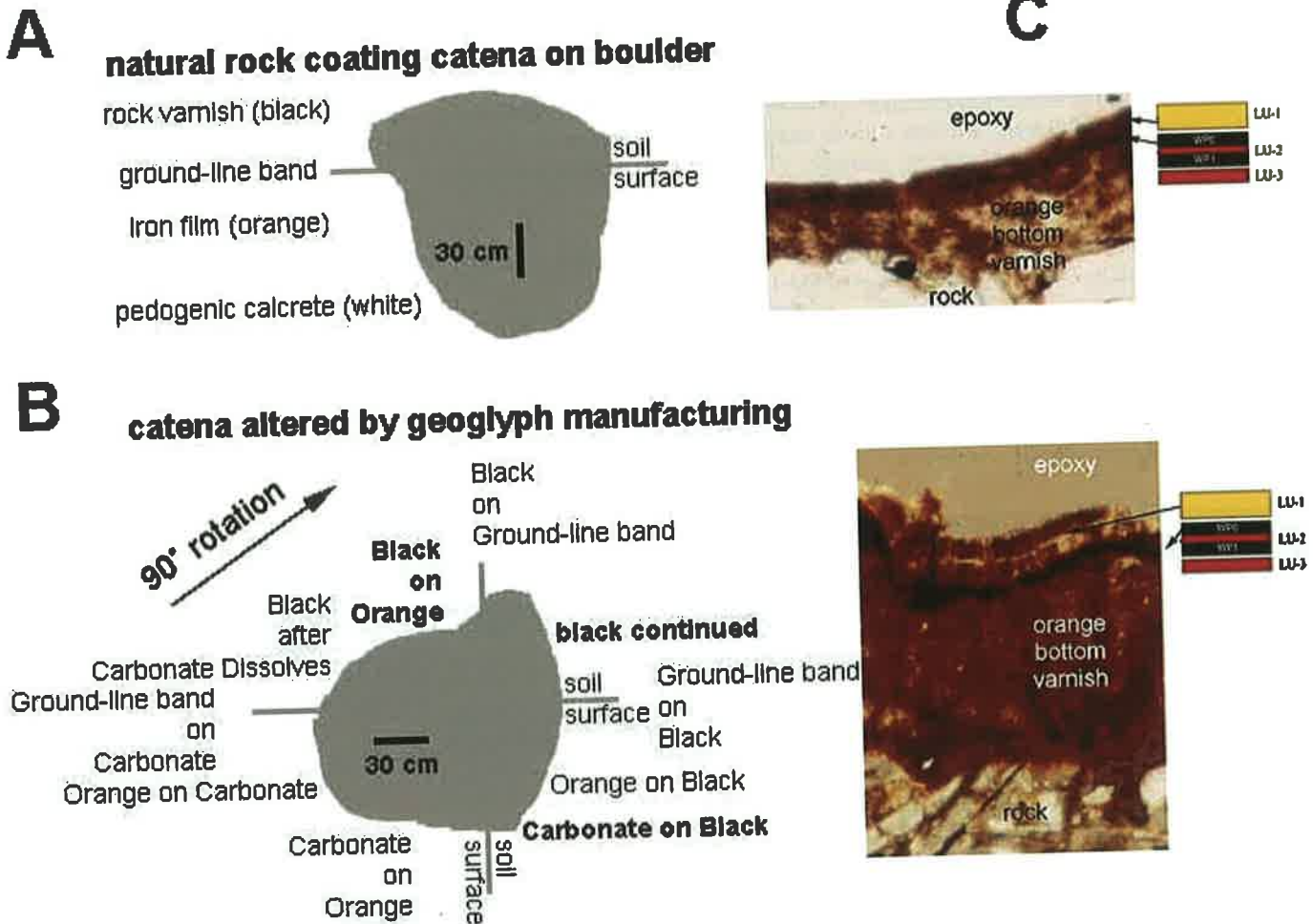


Figure 2. Changes to a boulder's position alter the orientation of rock varnish at a particular point in time. In this case, a cairn boulder was moved by humans sometime after the 14,000 YBP black layer was deposited (i.e. not seen in the microstratigraphy) and sometime before the 11,000 YBP black layer was laid down (i.e. seen in the microstratigraphy).

One experimental area of dating research that we investigated involved the AMS dating of the carbonate rinds that coat buried portions of rocks (whether artificial or natural). Carbonate dating is known to be problematic because carbonate continues to form while the coated specimen is buried and because it can be an open system where newer carbon comes and goes. But we recognized

The innermost carbonate rinds surrounding a littoral cobble and a possible artifact both had a platy texture, probably as a result of partial silica replacement of the carbonate. The outer carbonate was powdery and after mechanical removal was not included in further sample processing. The innermost plates were mechanically separated from the host rock and cleaned of rock detritus. The platy-textured material surrounding the artifact yielded a

radiocarbon age of $10,200 \pm 50$ YBP (Beta-175484), correcting for stable isotopes. The platey-textured material surrounding natural cobbles in the same deposit yielded a radiocarbon age of $11,160 \pm 50$ YBP (Beta-175485).

Note that these two chronometric ages do not overlap, even at 2 standard deviations. This may be due to a failure in our experimental technique, or due to simple ("true") differences in the specimen ages, resulting from the fact that the sampling process was not precise enough or that they came from different depths in a stratigraphic unit and therefore are not quite identical in age. Still, they fall within the same temporal ballpark and, for this reason alone, they can be provisionally accepted. Moreover, note that the error margins on AMS ages such as these represent instrumental errors; that is, errors in the measuring precision of the instrument. While AMS dating is very *precise*, whether a given analytical age is *accurate* or not is another question entirely. (This is a fundamental distinction that unfortunately too few archaeologists adequately apprehend.) If we could calculate the accuracy of AMS ages rather than the precision of the instruments used to calculate the ages, we might find that the true uncertainties of these two ages overlap.

An inferentially stronger indication of the age of at least one of the ACEC sites was obtained through the chronometric analysis of a projectile point base collected from a desert pavement (Figure 3). This large-stemmed base and the site where it was recovered are

discussed in more detail below. Suffice it here to note that the base was dated using the VML technique, which yields a minimum age for the exposure of the underlying artifact surface. Using Liu's (2003) calibration verified in a blind test (Marston 2003), the VML sequence indicates that the artifact is likely between 14,000 and 11,000 ^{14}C years old. The dating work establishes that a large and significant concentration of early sites has been preserved in the Christmas Canyon sub-basin, including sites that might contribute to our understanding of the first peopling of the Americas. Moreover, the early use of the ACEC suggested by these dates is supported by independent evidence in the form of two additional projectile point discoveries. In addition to the VML-dated large-stemmed base, these include an unfluted Paleoindian point base and a Lake Mohave point base. These two artifacts and their archaeological and geomorphic context minimally confirm Terminal Pleistocene/Early Holocene use of the sub-basin, as suggested by our dating project.

MICRO-MAPPING AND SITE RECONNAISSANCE

A second project involved micro-mapping 16 sites at the northern end of the ACEC, and reconnaissance level surveying in the high-stand lakeshore area within the ACEC. This work resulted in a fairly detailed characterization of the archaeological remains within the ACEC specifically (although the density and nature of archaeological sites in other parts of the sub-basin were then of

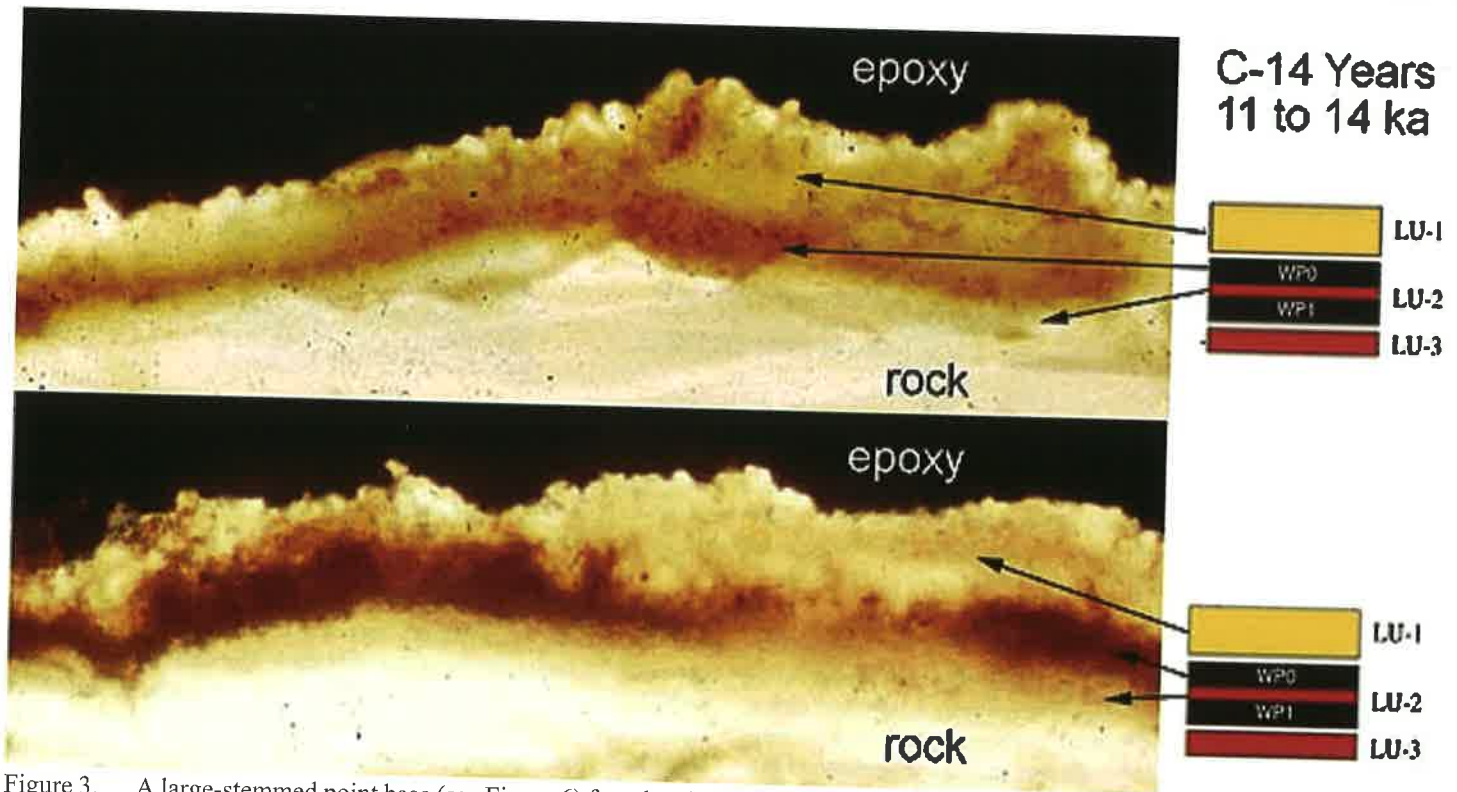


Figure 3. A large-stemmed point base (see Figure 6) found at the Christmas Ridge site shows a microstratigraphic sequence consistent with a terminal Pleistocene age.

course unknown). The groundsurface at these 16 sites, and much of the existing ACEC, is covered by an intact desert pavement. Included in this pavement are numerous pieces of “float” jasper, a crypto-crystalline that was commonly used for the manufacture of stone tools. Because this lithic resource is dispersed across the desert pavement in large cobbles mixed in with other kinds of rock (such as basalt), prehistoric exploitation of it was a widespread and somewhat opportunistic activity (that is, in comparison to the one known jasper quarry within the ACEC, where exploitation was intensive). The result, however, was the creation of a large number of discrete and intact “chipping stations”: locations where prehistoric peoples attempted to transform natural jasper cobbles into stone tools. These chipping stations are found across the areas of the ACEC covered by desert pavement, and from an archaeological perspective, they are extremely useful for interpreting the past because they represent a single behavioral event. How common these were in other portions of the sub-basin was initially unknown.

An example of the density of these types of sites within the ACEC, nonetheless, is provided by a survey transect that was approximately one kilometer long by 150 meters wide. This resulted in the recording of nine separate sites—or almost one site every 100 meters, suggesting that there are probably thousands of these sites in the ACEC as a whole. The chronometric dates on these chipping stations range from 500 ± 200 to 8600 ± 800 YBP; that is (at 2 standard errors), fully into the Paleoindian Period.

A second characteristic of the ACEC—and, as we ultimately discovered, of the sub-basin as a whole—is an unusually large number of rock features. These range from small piles of cobbles to larger, almost sentinel-like cairn structures that are visible on the horizon, to small and also large rock rings, to concentrations of cobbles embedded in the groundsurface. The functions of these features are not yet known, although it is likely that different ones were made for different purposes (see below). Blair and Fuller-Murillo (1997), for example, documented over a dozen kinds of rock circles in the ethnographic record. These ranged from hearths, to sleeping circles, hunting blinds, pot rests, caches, and storage areas of various kinds and ritual constructions.

Certain of the Christmas Canyon rock rings appear to be hearths, while others are likely “habitation” structures of some kind: perhaps foundations for brush shelters, perhaps “spirit circles” or vision quest structures. Some of the rock piles may also be remnants of deadfall traps. But a concentration of over a dozen small rock cairns at a site on a low fan in the southern extreme of the ACEC belies any argument that all of these were made for “economic” or subsistence purposes. Almost certainly, this concentration of cairns was ceremonial in origin, signaling the diversity of kinds of archaeological topics and questions raised by the sites in the district. Indeed, the importance of the sites in the Christmas Canyon sub-basin with respect to questions of prehistoric religion (cf. Whitley n.d.) is further seen in the large numbers of geoglyphs (“earth

figures”, formed by low rock alignments) that are also present. Historically at least, these were created as part of ritual activities conducted during vision quests and it is likely that a similar purpose existed in the prehistoric past (Whitley et al. 1999a; 2004).

Again, chronometric ages obtained on a few of these rock features emphasize their importance: dates of 7260 and 8440 YBP place two of them in the Early Archaic Period. Features associated with older sites suggest that some of them may be even older (see Figure 2).

One overriding goal of our studies was to determine whether the archaeological conditions identified in the ACEC were characteristic of the Christmas Canyon sub-basin as a whole. Of obvious and particular concern was the presence of intact Late/Terminal Pleistocene and Early Holocene landforms, with associated sites.

Because the Christmas Canyon sub-basin was part of an extensive Pleistocene lake system (which included the Owens, China Lake, Searles, and Panamint basins), and because this lake system was influenced by widespread paleoclimatic trends, the implications of well-established ancient climatic events can be used to guide preliminary archaeological research and interpretation, especially concerning Late/Terminal Pleistocene and Early Holocene prehistory. For example, the sub-basin was filled with water, to an elevation of about 2263.8 ft or 690 meters (above modern sea level) from approximately 30k to 15k YBP (Bischoff and Cummings 2001), creating a lake that was roughly 300 feet deep. The lake waters receded dramatically and quickly thereafter, due to drying conditions after 14,000 YBP, probably creating marshlike conditions on the very bottom of the basin during Paleoindian times. A resurgence in lake waters occurred circa 11k YBP, probably reaching the overflow point (Smith et al. 1983) before the lake finally dried out entirely after 10k YBP.

The general hydrological pattern is shown in Figure 4, which summarizes the circumstances for the Owens River system that connected the Sierra Nevada with Searles Valley (see Figure 1). Some initial observations are relevant with regard to this reconstruction and its implications for the Searles area. First, the Late Pleistocene Tioga (post-16,500 YBP) high-stand is easily identified geomorphologically and is known to fall at about 690 m elevation (above modern sea level). Its precise age is yet to be determined, but roughly 14-15k YBP is a reasonable approximation for the high-stand at Searles Lake. Confidence in this high-stand is provided by the correspondence of available ages (cf. Smith et al. 1983) with the timing of overflow of Owens Lake (Bischoff and Cummings 2001).

Second, the circa-11,000-YBP wet pulse and partial basin refilling is controversial and still ambiguous, but based on decades of study by George Smith (Smith et al. 1983). While there is general agreement that such a wet event occurred throughout the southwestern Great Basin, there is no concurrence on its magnitude. This issue is particularly problematic with regards to Searles Valley

and the Christmas Canyon sub-basin, which contain numerous minor transgressive and regressive lake terraces and beach strandlines. Despite considerable effort, geomorphologists have been unable to conclusively identify the elevation of the Terminal Pleistocene high-stand in the Searles region.

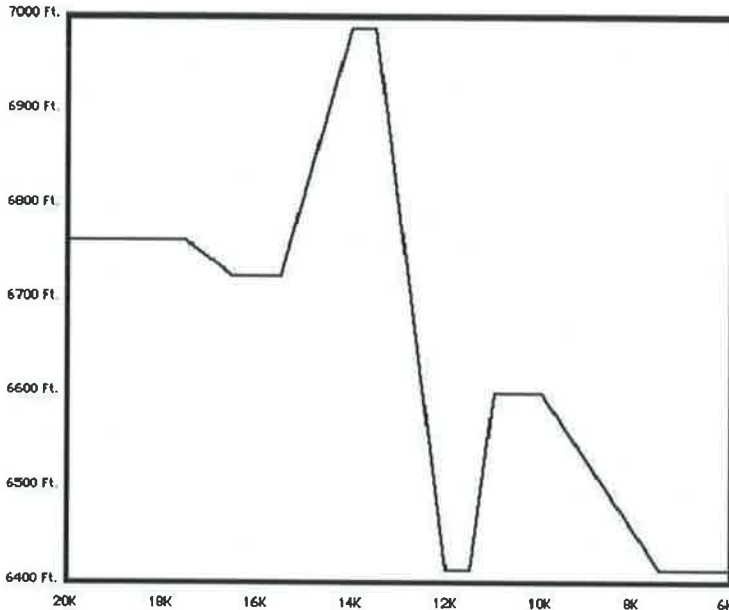


Figure 4. General levels of Pleistocene Lake Russell (after Lajoie 1968; Smith and Street-Perrott 1983).

Third, archaeologists commonly perceive of lake in-filling as a time-progressive process involving the filling of the lake at the top of the series, its overflow into the next lake, and so on down the line. The implication here is chronological, with the last lake filling after all the others. In fact, much of the movement of water down a drainage system is subsurficial, with lakes filling due to hydrostatic charge, not solely due to a spill-over effect when upstream waters reached a particular elevation. Although certain of the Pleistocene lakes certainly did coalesce, overflow alone was not responsible for the creation of the lake system, and the complete lake system existed before the overflows occurred.

The implications of these general conditions are relatively straightforward. Any archaeological sites in the sub-basin that pre-date about 30k YBP—if such exist—are most likely buried in lake deposits. Preserved sites that date to the earliest part of Pre-Clovis Period, before 14-15k YBP, necessarily must be located above the high-stand lake level, at 690 m elevation. Pre-Clovis sites that are between 14-15 ka and 11 ka as well as Paleoindian-aged sites that are 10k YBP or less, on the other hand, potentially may occur anywhere above the playa bottom. Given that the lake edge would provide a good habitat for hunting and gathering during both of these time periods, however, we can predict that Pre-Clovis sites would be located immediately above the Tioga high-stand whereas

Paleoindian sites would be most common immediately alongside the (then-marshy) playa bottom, roughly 275 feet lower. Sites during the low stand between 14 ka and 11 ka could have experienced terminal Pleistocene reworking as Searles Lake rose and then fell.

Moreover, and perhaps most importantly, the water that filled Searles and the sub-basin was saline, hence the massive deposits of mineral salts that have accumulated in these playa bottoms and are now mined in nearby Trona. Habitation sites logically would be located along the lake shore or marsh edge, providing access to the rich plant, animal, and fish resources present in these locations. But they would also be tied to fresh water sources: streams that entered the lake or marsh, providing potable water.

This “coastal geomorphology” model for Late/Terminal Pleistocene settlement location was developed from our archaeological work along the southern California coast. The model was tested in the Christmas Canyon sub-basin during our reconnaissance-level survey of the ACEC high-stand shoreline area. Based on a dry-lab map exercise, we predicted the existence of possible Late/Terminal Pleistocene settlements on a high-stand terrace area immediately west of the largest drainage. This terrace area, called “Christmas Ridge,” is unusual in that it incorporates a portion of the Garlock Fault scarp. This scarp created a kind of “peninsula” and (slightly lower) “reef” that jutted out into the lake during the high-stand, thereby forming a protected embayment. We suspect this embayment may have been an important environment inasmuch as, during the high-stand the south side of the sub-basin was largely a steep beachface yielding an unprotected reflective shoreline and would have suffered from wave action.

Figure 5 illustrates the site complex that proved to be present in this area, containing 12 sites and an aboriginal trail. We have not yet had an opportunity to test these sites and their ages are for this reason still unknown. But two circumstances support the possibility that some or all of them may be Late/Terminal Pleistocene in age. First, they are consistently associated with a heavily oxidized full-glacial soil which necessarily formed before roughly 10k YBP. If these sites contain sub-surface components, these necessarily will be of equivalent age. Second, a projectile point was found on the surface of one of these sites. This is a large basalt-stemmed base, and it is typologically unlike existing point types for the Far West (Figure 6). VML dating, discussed above, suggests that this artifact is older than 11k years (Cervený et al. 2006:Figure 3).

Micro-mapping within the ACEC, in other words, demonstrated the existence of a dense concentration of sites, particularly small chipping stations and rock features. Varnish dating of a sample of the sites and features suggested that some might be Late/Terminal Pleistocene in age. Reconnaissance-level surveying provided additional evidence potentially supporting our provisional interpretations; that is, that the Christmas Canyon sub-basin contains early sites associated with preserved shoreline features.

INTENSIVE SHORELINE SURVEY

The final project we conducted was part of a much larger survey of the Spangler Open Area, which was jointly undertaken by ASM Affiliates, Inc., Ancient Enterprises, Inc., and W&S Consultants. Our segment of the larger survey project was partly motivated by the archaeological conditions that had been previously identified in the nearby Christmas Canyon ACEC. Specifically, our contribution was designed to determine whether the conditions in the ACEC, including the presence of possible early sites, were duplicated elsewhere in the sub-basin. It was also aimed at testing our model for a Pleistocene village site location within the Christmas Canyon sub-basin as a whole.

Fieldwork for our portion of the project involved intensively surveying a transect that followed the Tioga high-stand shoreline around the Christmas Canyon sub-basin. This involved a corridor that is 17 by 1/4 miles in size, centered on the 690-m contour elevation. It also included a 2434-acre study area referred to as Block 1. This consisted of a 1-km-wide by approximately 9.5-km-long transect that crossed the sub-basin N-S, near the mouth of Teagle Wash on the sub-basin's west side.



Figure 5. Recorded archaeological sites within the ACEC, located above the Tioga high-stand shoreline.

A total of 39 cultural resources were recorded. Twenty-nine of these are archaeological sites, per se, while the remaining 10 are isolated artifacts. Habitations were defined as sites with a diversity of artifacts and features, including especially the presence of tertiary flakes and/or evidence for hearths. (Although midden soil in some areas is also characteristic of villages, none was noted during the project.) At least some evidence for the existence of a subsurface deposit is also characteristic. Five of these types of sites were recorded. These sites are assumed to have served, probably repeatedly, as seasonal living areas. Their size and artifact/feature density varied, presumably as a function of intensity and longevity of seasonal use. Thus this type includes what are commonly referred to as villages as well as smaller camps.

Lithic scatters are sites predominated by (if not exclusively containing) debitage. Eight such sites were recorded. Lithic scatters are generally (but not invariably) associated with the presence of raw lithic materials. They varied significantly in size, probably partly as a function of immediately available raw lithic materials. Some of the larger lithic scatters may in fact have been camps or villages, with this fact unrecognized during the survey based on a paucity of surface evidence.

Rock cairns/structures are piles, concentrations, and/or arrangements of natural rock cobbles and small boulders. In some cases these features were present on other of kinds sites. Sites were recorded generically as cairn sites when



Figure 6. Christmas Ridge site projectile point base.

archaeological remains were exclusively or nearly exclusively limited to these kinds of features.

All but one of the cairn sites are assumed to be prehistoric rather than historic. This attribution was based on a variety of factors and circumstances, including the presence of associated artifacts and evidence for antiquity in the features (e.g., surficial revarnishing over crack varnish). Negative historical evidence (e.g., lack of any evidence for mining, inappropriateness of geological setting for mining, morphology of the cairn) also assisted in distinguishing prehistoric/aboriginal from historical/Euro-American rock features.

Perhaps surprisingly, prehistoric/aboriginal cairn sites proved to be the most common kinds of sites in the study area, with 13 recorded. Three historic sites were also recorded, along with 13 isolated artifacts.

Three primary issues result from the archaeological concerns which originally motivated and informed this study and the nature of the results that were obtained. The first of these is chronology in the larger sense, and the possibility of Late/Terminal Pleistocene sites more specifically. The second involves the high-density of rock cairns and structures and their significance. The third is the general distribution and density of sites.

Chronology

Temporally diagnostic artifacts, first, were quite rare. Aside from a 1910 dime found at a historic camp, only two diagnostic artifacts were found. One of these is an isolated Humboldt projectile point fragment made of obsidian. Humboldts are poorly dated points. Consensus suggests that they ranged from about 6000 B.C. to A.D. 600, and perhaps even later in eastern California (Justice 2002:157), meaning that they have minimal chronological value. A second point fragment was found on a large lithic scatter. This is made of jasper and exhibits pot-lid flake scars from exposure to heat. It is a large atlatl point that generally (though not perfectly) resembles a Gypsum series of points. These date from roughly 2000 to 800 B.C. (ibid:294), during the Late Archaic period.

A small quantity of obsidian was also identified and collected from the sites, intended for hydration dating (in progress at the time of this writing). Hydration dating may prove useful relative to the ages of the sites where these specimens were found but, given the general rarity of obsidian in the project area (and in truth the unreliability of hydration dating), this may not resolve the chronological picture in any larger sense.

More important for temporal placement, even if any resulting inferences or interpretations are intrinsically provisional in nature, are the geomorphological context and nature of the sites. Three (related) factors are significant in this regard: (1) site location relative to the Tioga high-stand; (2) presence/absence of alluvial fan deposits and sand sheets masking Pleistocene/Holocene landforms; and (3) the nature of the soils on site. As is clear, potential Late

Pleistocene sites can be identified (based on surface evidence) only on intact landforms at and above 690 m elevation. Terminal Pleistocene/Early Holocene sites could occur and be identified on intact ancient groundsurfaces anywhere above the playa bottom. In both of these first cases oxidized soils should be present on site as an indicator of stability and age. Sites on active alluvial fans or sand sheets, in contrast, are necessarily more recent in age; the soils at these locations lack stability and aren't oxidized, and these sites can occur at any (fan) elevation. Recent surface sites obviously also can occur anywhere, with the association between these sites and their context and soils coincidental. The contextual and soils evidence used in site age assessments is then necessary but not sufficient information for age determination, absent clear indications of the presence of a subsurface deposit (e.g., from an arroyo cut-bank).

Note that alluvial fan development proved to be occurring along almost the entirety of the northern side of the sub-basin and over much of the southwestern side, with a sand sheet on the playa bottom; that is, the majority of our study area was masked. Unlike the ACEC, the study area does not contain extensive exposures of preserved ancient landforms and then large numbers of exposed early sites. Intact preserved landforms instead proved to be isolated features that were the exception rather than the rule.

Four locations nonetheless were recorded that potentially may comprise early sites. These are as follows:

Site #04-10: This site is located on a large SW-NE-trending ballena/ridgeline on the southwest side of the sub-basin, about 2.5 km southeast of Teagle Wash. An ephemeral drainage trends W-E, curving along the upland (S) side of the ballena and site, exiting into the basin at the east end of the site. The site in other words sits on what would have been a small "peninsula" during the high-stand, backed by a stream.

This site is very large (~430 x 250 m) in size. It contains an extensive but low-density lithic scatter and a number of features, including five low rock cairns along the north brow of the landform; a rock alignment, a campstone (hearth) feature, and a bedrock grinding slick. An oxidized paleosol is exposed in rodent backdirt piles, indicating that the site area has been stable since (at least) the Terminal Pleistocene. The campstone feature appears to be eroding out of the groundsurface, suggesting that a subsurface deposit may be present. Although the site may have multiple temporal components, its location (immediately above the high-stand) and the soils present make it a candidate for high-stand occupation.

Site #04-12: This is a small lithic scatter located around a tufa tower on the north side of the sub-basin, about 675 m southwest of the Randsburg Wash (Christmas Canyon) Road. While most of the N side of the basin is covered (or being covered) by an alluvial fan, localized conditions here have left exposed a small portion of the Terminal Pleistocene/Early Holocene landscape, which is about 15 m below the Tioga high-stand elevation.

The site consists of a low- to moderate-density lithic scatter that is about 25 m in diameter and is predominated by heat-treated jasper, chalcedony, and chert flakes. Site soil is slightly oxidized sand that is most likely either Terminal Pleistocene/Early Holocene or Middle Holocene in age (given the development of the primary Mojave Desert sand sheet between about 7000 and 5000 YBP). The debitage appears to be eroding out of the sand, but testing is obviously required to verify the existence of a subsurface deposit. If such is present, site age is dated by the soils and likely falls somewhere between the Middle Holocene to Paleoindian periods.

Site #04-20: This site is a large but low-density lithic scatter located on a stream terrace on the south side of Teagle Wash at about 695 m elevation; that is, immediately above the mouth of Teagle Wash during the Tioga high-stand. Artifacts present at the site were limited to about 40 chalcedony biface thinning flakes and three obsidian flakes. All of the chalcedony appeared to be heat-treated, which is a characteristic of Paleoindian lithics. Site soil is a highly oxidized clayey silty sand that is reddish brown in color and is clearly quite ancient. A subsurface archaeological deposit here necessarily would be minimally Paleoindian/Early Archaic in age, given the soils. The site location also makes the site a candidate for high-stand age.

Site #04-21: This site is something of a match for the previous site inasmuch as it occurs on the opposite stream terrace on Teagle Wash (i.e., on the north side), in essentially the same elevational position and relationship to the high-stand. It consists of a series of campstone features that are eroding out of slightly oxidized silty gravely sand that is itself capped by lacustrine sands and gravels. The site appears to be a temporary camp/habitation dating to the Pleistocene or Early Holocene.

Sites #04-20 and -21, in fact, logically may represent an early-dating site complex, given the presence of oxidized soils and buried habitation remains and their location at the outlet of Teagle Wash, the largest drainage in the region. Subsurface testing is obviously required to evaluate this possibility, however.

In summary, geomorphological conditions in our study area proved poorly suited for the preservation of early sites, given the general absence of intact Late Pleistocene/Early Holocene landforms. This circumstance emphasizes all the more the significance and rarity of the conditions and sites within the nearby ACEC. And it also underscores the general difficulties in conducting Pleistocene/Early Holocene archaeological research in eastern California. As we have emphasized previously (Whitley and Dorn 1993), the transition from the Pleistocene to the Holocene involved more than just a change in climate and vegetation. It also represented a major shift in erosional versus depositional regimes worldwide. Accompanying this circumstance in the Mojave Desert were periods of sand sheet development during the Terminal Pleistocene and Mid-Holocene (Bach 1995). Both of these events had profound implications for site preservation and archaeological inference. Unless and until these facts and natural processes are adequately accommodated in

our archaeological research, we cannot assume that the absence of evidence for occupation represents legitimate evidence for an absence of occupation.

Rock Cairns and Structures

A second issue is the presence, age, and significance of rock cairns and other structures. These features were seemingly unusually common in the ACEC, and for this reason their possible presence within our lakeshore study area warranted investigation. As noted above, what we generically refer to as rock cairns were the single most common site type that we recorded during the intensive survey project (13 out of 26 prehistoric sites, representing fully 50% of this total); indeed, rock cairns were significantly more common than lithic scatters (only 8 or 31%). Note however that individual rock cairns were also present on habitation sites and some lithic scatters, so even these figures slightly underestimate the importance of this aspect of the Christmas Canyon sub-basin archaeological record.

We have discussed above the characteristics that we used to distinguish prehistoric/aboriginal from historical/Euro-American cairns and have noted that Blair and Fuller-Murillo (1997) documented a series of uses for rock circles in the ethnographic record. These include: caches, dehydration palettes, planters, water-catchers, living structure outlines, sleeping circles, fish traps, hunting blinds, vision quest circles, leaching stations, basket/pot rests, ceremonial/initiation ritual components, and hearths. Jay von Werlhof (2004) has also outlined a series of surface features and their functions. His discussion concerns Yuman-speakers in the lower desert, in the Colorado River Valley area and, for this reason, it emphasizes modifications of desert pavement rather than the creation of rock structures, per se. Still, these are conceptually similar to rock features, and his list of five types of such sites is clearly important to consider. It includes vision quest rings (about one meter in diameter); two-to-three-meter clearings with a rock cairn in the center, representing the Yuman-speakers' sacred creation mountain, Avikwa'ame; a two-to-three-meter clearing with a single boulder functioning as a kind of altar; two concentric circles with a foot trail leading outward, again representing Avikwa'ame; and a wide foot path leading upslope to a large cleared circle (5 – 10 meters in diameter), sometimes with a central cairn, representing the Xam Kwitcam ritual pilgrimage path leading to Avikwa'ame.

Von Werlhof's (2004) list is obviously (and intentionally) specific to Yuman-speakers and, for this reason, it emphasizes the symbolic importance of the Avikwa'ame (Newberry Peak), which was the central feature in the sacred landscape for these Colorado River dwellers. The particular characteristics of the site types on von Werlhof's list are, for this reason, unlikely to be applicable to Christmas Canyon, which was part of Numic territory, at least ethnographically. But there is an important implication of his list that notably contrasts with the one compiled by Blair and Fuller-Murillo's (1997). This is the emphasis that von Werlhof places on ritual rather than mundane functions, an emphasis that, given the

economic-technological-mundane bias of most archaeologists, might seem quite foreign. But, as Walker (2002) has emphasized, American archaeology has overemphasized the place of the mundane in archaeological interpretations—what Walker calls an overemphasis on “practical reason”—resulting in a misapprehension of traditional nonwestern cultures, where religious/ritual activities were both very common, and inextricably intertwined with everyday life. Von Werlhof’s list may not be directly applicable to Christmas Canyon, but it is a cautionary bromide about interpretations that necessarily assume that mundane functions are somehow more likely than religious/ritual ones. Indeed, von Werlhof’s ethnologically based typology suggests instead that the overemphasis on mundane functional interpretations reflects a presentist western bias. This should be an embarrassment for anthropologically trained researchers who have no excuse for failing to understand the range of variation found in cultures.

Note further that Blair and Fuller-Murillo’s (1997) discussion is limited to *rock circles*, per se; that is, roughly circular or donut-shaped concentrations of cobbles. Our use of the term “rock cairns” generically is intended to include their “rock circles” and other rock constructions that they do not consider. These specifically include *cairns* or stacked piles of cobbles and small boulders; *alignments* (geoglyphs) or horizontally arranged arrays of rocks; *campstone features*, which are the most common expression of hearths; and miscellaneous rock constructions, such as deadfall Figure-4 rock traps.

Hunt (1960:189) illustrates an archaeological example of a Figure-4 trap. This has loosely piled cobble walls on either side of a lower flat rock and a flat upper deadfall which was supported by the stick Figure 4. One example of a rock cairn in the ACEC appears to be a collapsed deadfall trap.

Campstone features are particularly common in habitation sites and probably too frequently are ignored by archaeologists. We have discussed them in some detail elsewhere (W&S Consultants 2001), and we recorded a number of examples of them during this project. In summary form, these are concentrations of fire-affected rock resulting from stone boiling or from use as hearthstones. Hearthstones are fire-affected rocks that we believe were originally placed in fires as heat-sinks and then heat-radiators—a logical practice in areas where fuel is both relatively rare and small in size, and where a burning fire would die out relatively quickly. These also might result from sweat lodge use. Blair and Fuller-Murillo (1997) note that, where available, limestone was also added to campfires and earth ovens to extend cooking time and heat radiation.

Hearthstones typically are volcanic in origin (e.g., basalt), to prevent explosion upon intense heating (as occurs with certain igneous and sedimentary rocks). Stone boiling can employ almost any kind of rock because less prolonged heat is involved. Regardless of precise function, campstone features are clear

indications of hearths and at relatively ephemeral camps (e.g., single night stays involving small groups) may be the most visible aspect of the archaeological record.

There is an archaeological implication of campstone features that warrants mention. The hollow, circular ring of rocks that is the contemporary Euro-American conceptual model of a “proper” campfire may be inappropriate as a model for the form and structure of prehistoric hearths. Indeed, where we have seen ethnographic examples of indigenous campfires (in Central American and sub-Saharan Africa) there are at best three rocks abutting the fire itself (thereby providing stable tripod-like support for cooking vessels), not a ring of rocks. And none of the archaeological hearths (as indicated by concentrations of charcoal and ash) that we have excavated in southern California, the Great Basin, Mesoamerica, and southern Africa has been encircled by cobbles. Campstone concentrations, in other words, are probably better hearth indicators than small circles of rock. Relatively small circles of rocks, in fact, are more likely vision quest structures than hearths, if they are truly aboriginal in origin, and about a meter or more in diameter, as suggested by von Werlhof (2004).

Stacked cairns and alignments (geoglyphs) had a few different uses. Perhaps the most common of these involved ritual activities. As we have noted previously (Whitley et al. 1999a; Whitley et al. 2004), stacked rock cairns were created in south-central California during shamans’ vision quests (Gayton and Newman 1940:43; Applegate 1978:34), in the Colorado Desert by non-shamans seeking supernatural aid (Patencio 1943:73; Bean et al 1992:96), and during children’s vision quests on the Columbia Plateau (during which they also painted rock art to portray their visionary imagery) as well as during Plateau rituals more generally (see Teit 1896:227, 1900:317, 320-321, 1906:275, 1909:590, 1930:194, 283, n.d.; Anonymous 1916:3; Steward 1936:413; Cline 1938:138-139; Mandelbaum 1938:111; Malouf and White 1953:35; Leechman et al 1955:38; Caldwell and Carlson 1956; Chartkoff 1983; Buckley 1986; Jett 1986; Keyser 1992:47-48; York et al 1993; Winthrop et al 1995; Hann, Keyser and Minthorn n.d.). In both cases the creation of these structures was related to the perceived need for intense physical exertion (including running long distances) which, along with fasting, isolation and meditation, were common components of the Native American vision questing tradition—and which obviously promoted the induction of a visionary experience.

Rock cairns certainly could have mundane purposes. Earth ovens are the most obvious of these and, in regions where agave is common, these are typically found in sandy wash bottoms (where soil conditions allow easy digging). Earthoven form is also relatively distinctive, typically consisting of large mounds of fire-affected rock in a soil and ash matrix. Use of rock cairns as trail markers/directional aids is also a commonly cited function, but we know of no ethnographic data that support such an interpretation, and it seems somewhat implausible (inasmuch as trails are quite visible on the desert groundsurface). Cairns have also been

suggested to have served as “dummy hunters” used to drive game. In the last case, location and viewshed would serve as functional indicators.

Stacked rock cairns and alignments were also created during rituals. Ritually produced examples are obviously distinctive morphologically from earth ovens, at least, and they should be common in areas where vision questing was regularly practiced. The Coso Range was probably the most important such location in the Great Basin, as indicated by the ethnographic record and by its massive concentration of petroglyphs (Whitley 1998a, 1998b, 2000; Whitley et al. 1999b). The Panamint and Searles Valley areas contain the largest known concentration of rock cairns and alignments/geoglyphs (von Werlhof 1987; cf. von Werlhof 1995, 2004)—as our own studies indicate. This does not appear to be a coincidence, for two reasons (Whitley et al. 2004). The ethnographic record concerning the creation of rock structures during vision questing is limited in California, as is the record on vision questing more generally. But if we use the nearby and very rich Columbia Plateau ethnographic record as a model, one pattern is quite clear: the process of conducting a vision quest was lengthy, it involved multiple expeditions, and it moved across the landscape. One result is that, on the plateau at least, the rock structures created during vision quests were never in the same locations as the rock art that was also made at the end of this ritual period and process. That a massive concentration of rock cairns and alignments is present in the valleys and ranges immediately east of the Cosos, where the petroglyphs are concentrated, fits the pattern suggested by the plateau data even though, unfortunately, there are no known ethnographic data of any kind (positive or negative) specifically identifying such a practice among Numic-speaking peoples in the Great Basin.

That the Searles/Panamint archaeological data fit the Plateau ethnographic pattern is encouraging. Perhaps more importantly, there is archaeological confirmation of the association of rock cairns with shamans and vision questing in this region. This has been found on the “Panamint Islands” in the Panamint Valley, north of Searles Lake proper. As we have illustrated previously (Whitley et al. 1999a; cf. Whitley et al. 2004), quartz crystals were almost universally associated with shamans, the breaking of quartz occurred during vision questing and is associated with vision quest activities and structures, and quartz hammerstones were used to create petroglyphs. Concentrations of broken quartz cobbles have been found in association with rock cairns on the Panamint Islands, and a large quartz crystal offering has been identified within one of the cairns. The implication here is obvious: the concentration of rock cairns and alignments at this location was associated with shamanic vision questing. Although we found no fractured quartz or quartz crystals associated with any of our Christmas Canyon cairns, at least some of them are likely to have been made during vision questing.

Our prehistoric/aboriginal cairn data are summarized in Table 2.

Table 2. Cairn Data

Site #	Association	Description of cairn(s)
04-1	w/ lithic scatter	horizontal concentration lg. cobbles
04-3	w/ lithic scatter	rock ring lg. cobbles
04-4	w/ lithic scatter	linear array, partly buried
04-5	isolated	collapsed (?) vertical lg. cobbles
04-7	isolated	vertical pile lg. cobbles
04-8	isolated	vertical pile lg. cobbles
04-9	w/ scatter	2 horizontal conc. small cobbles
04-10	w/ habitation	5 vertical piles lg. cobbles 1 alignment
04-13	isolated	collapsed (?) vertical lg. cobbles
04-14	isolated	collapsed (?) vertical lg. cobbles
04-18	isolated	horizontal concentration lg. cobbles
04-22	w/ lithic scatter	3 collapsed (?) vertical lg. cobbles
04-23	isolated	2 embedded circular concentrations
04-24	isolated	horizontal concentration lg. cobbles
04-25	isolated	lg. rock ring
04-27	isolated	vertical pile lg. cobbles
04-28	isolated	horizontal concentration lg. cobbles
04-29	isolated	vertical pile lg. cobbles

Vertical rock piles (Figure 7) are invariably made of large cobbles and small boulders. We suspect that a number of our recorded cairns represent collapsed or fallen examples of these vertical piles, based on the size and distribution of their constituents, but these may represent a separate type themselves. On the Panamint Islands, vertical rock piles are associated with broken quartz cobbles and a quartz crystal. At least in some cases, they therefore resulted from shamanic vision questing activities. A ritual origin for at least some of the Christmas Canyon examples seems likely based on location (e.g., on exposed alluvial flats where hunting would be unlikely) and associational context (e.g., where multiple examples were created in close proximity). Furthermore, although there are at least two aboriginal trails within the sub-basin, they do not have any associated vertical rock piles, to our knowledge.

There appear to be at least four different types of rock structures in our study area:

- 1 - Vertical rock piles
- 2 - Rock alignments
- 3 - Approximately circular concentrations of embedded cobbles
- 4 - Rock rings

Rock alignments (Figure 8) are patterned arrays of cobbles. As noted previously, these geoglyphs are particularly common in the Panamint/Searles region (Whitley 2000), and it is not surprising that a few have been identified in the Christmas Canyon sub-basin. Efforts have been made to identify and then decipher an iconography in these rock features (Davis 1981). But the simple fact is that very few of these features exhibit a clearly recognizable form and, when such a form is evident, it invariably involves the simplest of geometric patterns (such as our example from Site #04-10, a straight line).



Figure 7. Vertical rock pile from Site # 04-8.



Figure 8. Small rock alignment on Site # 04-10. Note GPS (pointing N) for scale.

Here the issue is straightforward: iconography exists only for purposes of graphic and visual communication, which is a social process. If there is no consistency or patterning in a body of graphic imagery (such as repeated motifs), then there is no basis for

inferring that the graphic forms represent an iconographic corpus and that they served a social communicative purpose. A comparison with the Columbia Plateau ethnographic and archaeological records clarifies this point. Rock alignments were commonly created there during vision questing. Like rock cairns, these were built at some distance from the rockart sites where the primary visions were received and recorded by painting or pecking. And like rock cairns, the alignments were created as part of the physical exertion involved in the vision quest ordeal, with no intended iconographic meaning. Alignments were in this sense created for *instrumental* purposes in that they lacked *referential* meaning (Whitley 2005), and our use of the generic term “geoglyphs” to describe them is misleading. They are arrangements of rocks but they are not glyphs. The distinction between horizontal alignments and vertical stacks of rocks, then, is in some cases artificial and potentially very misleading.

A third type of rock structure is a roughly circular concentration of embedded stones or cobbles (Figure 9), a number of which were identified in the study area. These vary in overall size and in the size of the constituent rocks (perhaps simply as a function of what is immediately available). Blair and Fuller-Murillo (1997) include these in their study of rock circles and interpret them as the remnants of storage caches: cobbles placed over excavated cysts, buried baskets, and so on, to mark and protect them (e.g., from scavenging animals). Blair and Fuller-Murillo also interpret more or less donut-shaped concentrations of these embedded stones as “opened” or disturbed caches. There are certainly ample archaeological examples of caches in midden deposits and caves covered by rocks, and this interpretation of at least some of the Christmas Canyon examples seems quite plausible. (The excavation of certain of these features potentially could test this interpretation.) Moreover, it is possible that some of the features that we have identified as collapsed vertical rock piles may instead be opened caches; at this point more research is required to adequately distinguish possible different origins and functions for these features.

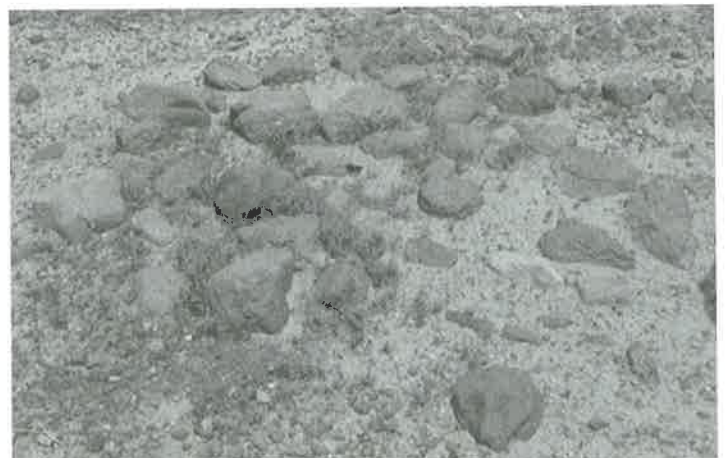


Figure 9. Circular concentration of embedded cobbles from Site # 04-9.

The final cairn type is the large rock ring, one example of which was recorded. Blair and Fuller-Murillo (1997) suggest that these types of structures may have served as leaching stations, pot rests, caches, or drying palettes. Such a structure also might have served as a hearth although, if so, it seems unlikely that this example would have been aboriginal or prehistoric, given its size. It may then have been a vision quest structure, not a feature created for mundane purposes.

Rock cairns and structures in other words proved to comprise a significant portion of the archaeological record in our study, extending the pattern seen in the ACEC. Though little studied by most archaeologists, their commonness in this area suggests that they would be a fruitful topic for additional research, as Jay von Werlhof's (2004) pioneering research has shown.

Site Distribution and Density

A few final comments need be made about site distribution and density. As should be clear, site density was significantly lower within our study area than in the nearby ACEC. This appears to be the result of the different geomorphological conditions in the two areas. The preserved ancient landforms within the ACEC contain within them a substantial even if dispersed quantity of raw lithic material in the form (especially) of float jasper, and the majority of ACEC sites are small chipping stations associated with this lithic resource. This resource is all but absent on the open alluvial flats and sand sheet that characterize the remainder of the sub-basin. Whether or not exposures of this resource (along with similar sites) are buried by alluvium and the sand sheet is unknown (though this is likely). What is known is that the character of the archaeological record differs dramatically between the two areas, yet this may not necessarily reflect significant differences in prehistoric landuse patterns and adaptation.

CONCLUSIONS

A few observations need to be made in light of the archaeological record in the Christmas Canyon area. The first concerns potential or putative early sites and their relationship to Late/Terminal Pleistocene shorelines. As our work within the ACEC proper illustrates, the potential for these kinds of sites and site environment relationships is obviously high in areas like the ACEC, with particularly good landform preservation. But possible early sites may be present even in regions having in gross terms poor Pleistocene landform preservation, as a couple of examples from our larger shoreline survey showed. Preservation of likely landforms in these cases may be fortuitous, but the archaeological discovery of the sites on them was much less than hit and miss. In fact, we predicted sites at these exact locations partly because of the preserved landforms, but also because of their setting at the mouths of major washes along the Pleistocene lake shore.

The Pleistocene lakes, as we have suggested above, were more like the coast than like modern western lakes, for a number of reasons. One of these is salinity which, in at least some of the lakes, would have restricted major settlements to fresh water sources—which is to say to stream or river mouths. But another potentially important factor would have been wave action. This was much more significant along the lake shorelines than one might initially think, given the sizes of these lakes and the kinds of winds that the desert region experiences. Unprotected steep shores, which are common on many of the Pleistocene lakes, would have been regularly pounded by waves. This in turn would have made them dangerous to access and use and suboptimal for the support of lacustrine resources (including lake margin vegetation and the fauna that this would attract).

Protected shoreline settings with a freshwater source, then, would have been the most favorable locations for Late Pleistocene villages. This is exactly the kind of setting and context present at Christmas Ridge, where we have recorded a complex of sites sitting on an ancient paleosol. A projectile point base from this site complex has been VML dated between 11,000 and 14,000 YBP. Obviously this is a provisional date, and it remains to be seen whether intact sub-surface deposits are present in this location and whether additional chronometric work will support this initial assay. But there is at least room for optimism concerning Late Pleistocene archaeology in this area.

The final point that we would like to emphasize concerns the rock cairns, structures and alignments that are relatively common in the Christmas Canyon sub-basin—and, as von Werlhof's (1987, 1995) work has shown, in the Panamint/Searles region more generally. Despite his efforts and those of a few additional archaeologists such as Blair and Fuller-Murillo (1997), the profession as a whole is surprisingly ignorant and apparently little interested in these kinds of features. It is not uncommon, for example, for archaeologists to almost immediately assume that cairns are necessarily historical mining claim markers, regardless of whether any mining activity ever occurred in the area in question. We hope that this attitude will itself soon disappear and that more effort will be exerted towards studying and understanding these kinds of rock features, enigmatic though some of them may still be. Jay von Werlhof's research on this topic has certainly provided a solid foundation and direction that California desert archaeologists would be wise to follow.

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